YOUR DEGREE IS NOT ENOUGH

Education for GenNext



Author of 2 BEST sellers

Rajendra Pratap Gupta

Mc Graw Hill

Includes a Global Survey on Education

INSIDE THIS BOOK

- Why are some students / people more successful than others?
- Which subjects /topics can make you futuristic in your approach?
- What are the jobs of the future and how can you prepare yourself for them?
- What is Gig economy, and what can you do to make the best out of it?
- Will automation take away the jobs of professionals like doctors and lawyers as well?
- There are six different ways to study, but do you know what are the best methods to study?
- Do you take stimulants like coffee or tea, for attention? But, do you know what works best?
- What is more important – Intelligence Quotient (IQ) or Emotional Quotient (EQ)?
- Is EQ inherited or can it be improved? How can you improve your EQ?
- How can you maximize your UIP (Unique Individual Potential)?
- What is the right age to teach your child and till what age the brain develops?
- Is your child not interested in a subject or studies, and wishes to pursue something different than his parents or peers? Should you push the child hard to go for your wishes?
- Will gaming help or harm?
- Do you know that certain teaching styles may be adding to cognitive overload of students and how can you reduce the cognitive overload?
- Why do we forget something, and then remember it next morning? Do you know how brain works?
- Will learning a new language or music help you become brainy?
- Does music or sports help you to study better?

- What is the importance of friend circle in your life?
- How can you spend your spare time?
- Do you give up sleep for professional work or studies? Do you know the consequences of cutting down on your sleep time?
- Can a person have multiple intelligences?
- Do you know about the left brain and right brain? Is it a myth or a reality?
- Is it too late to catch up with knowledge?
- Can your hobby become your profession?
- Do Autistic children have unique abilities?
- Do you know what you must read and watch?
- Will your degree be enough to wade through these rough times!

This book attempts to answer many such questions with scientific reasoning and facts

Only hope for a bright future lies in realizing the potential of the children of today, and that cannot happen without having a 'Futuristic Education System'.

When I interact with kids, I am overwhelmed by their aspirations, clarity of purpose, exposure, and their ability to work hard. I am convinced that the world would be a much better place if we let them decide for our future. But when I think of the mess we have created, I feel sad! The biggest challenge we present them is the starting point in their lives- the most crucial phase; a failed education system! A wrong start is a sure way to lose the war for a bright future. We need to correct our mistake - now! We need to go back to the drawing board. We must Reinvent Education!

Reviews from Global Leaders

Rajendra has worked with me for more than a decade and a half, and provided significant inputs during the drafting of two election manifestos of the ruling party. He has also been involved in drafting various policy documents of the government. This book shows his ability to navigate complex domains like education and present it in an innovative manner with new ideas for transforming education. I am sure this book will serve as a valuable resource in igniting the debate on prioritising and transforming education.

Prof. Murli Manohar Joshi
Former Minister for Human Resource Development, Science & Technology & Home Affairs
Government of India

The author rightly identifies education as a key driver for competitiveness, peace and prosperity of nations - with compelling evidence. After reading the results of the global survey on education in the first chapter, one thing is clear - that the divide between the under-developed , developing and the developed world is fading, when it comes to the need for transforming education and this book shows the way forward. Coming from an authoritative, learned, and thought- provoking global policy maker, known for transformative ideas, this book is an eye-opener. This book is an 'Essential reading list'- category. Rajendra's message in the end is loud and clear for policy makers across the world; 'If you don't teach, you don't reach'. Well-done Rajendra!

Dr. Dipu Moni, MP, Minister of Education,
Government of People's Republic of Bangladesh

As we enter the next wave of internet-based application development, I believe we will see the greatest impact in the public and regulated sectors, especially education. This "must-read" book offers a treasure trove of insights on how best to harness these emerging forces to ensure the greatest positive impact throughout our education sector. My expectation is that this book will serve as a reference guide for educationists in the generations to come.

Aneesh Chopra, First Chief Technology Officer (2009-2012) of the
United States of America & Assistant to the US President, Barack Obama

Prof. Rajendra has rightly pointed that the future will be defined and designed by people with the NIQ (New IQ) – Imagination Quotient, and for that to happen, our education system needs to move from Academic Intelligence to also Working Intelligence. The book dwells in detail on what works and what doesn't, when it comes to studying, and the best part is that all the topics mentioned in the book are backed by scientific evidence; be it the way we need to study, or the role of sleep and caffeine, or cognitive overload and how memorization works. This book has the potential to change your career and life's trajectory. An important book for students and professionals!

Dr. Sam Pitroda, Inventor, Innovator, Policy Maker &
Former Advisor to the Prime Minister of India

Rajendra has done a compelling job in making a strong case for transforming education in sync with the rapid and increasingly

disruptive global changes occurring in industry, skills and jobs owing in part to the rise of deep technologies from communication to computing to intelligent machines. The book-contents are comprehensive, well-researched, and backed by evidence, facts, data and case studies. The book will appeal to all the stakeholders in education including students, teachers, administrators, political executives, policy makers and indeed to all those passionate about the future of education.

Prof. Ashutosh Sharma, Secretary to the Government of India
Department of Science and Technology

Rajendra and I worked together a decade ago developing innovative Bottom of Pyramid (BOP) models for Unilever. This is Rajendra's 3rd book, where he focuses on education reforms with an overarching theme on innovation. The global survey mentioned in this book will undoubtedly become a landmark for designing new educational systems in a faster moving world. Many approaches under development are already obsolete. This book addresses the issue and provides a clear direction for moving forward. I am sure it will be immensely helpful if we identify and implement new models for an education system that targets "Working Intelligence" and not just "Academic Intelligence". Congrats Rajendra . This book will be a game changer !

Neal Matheson, former Global Chief Technology Officer, Johnson & Johnson Consumer Products & Chief Technology Officer, Global R&D, Unilever

Prof. Rajendra has done a fabulous job in putting an in-depth research on the topic, with concrete examples, of how technology is replacing and creating jobs, and what the future holds for us. I am sure the readers across the globe will benefit immensely from the book.

Sir Muir Gray, CBE, First Chief Knowledge Officer, NHS, U.K.

Prof. Rajendra Pratap Gupta is an extraordinary blend of lateral-thinking, innovation and astute policy-making for a sustainable, desirable world.

He was a member of the National Education Policy Committee tasked with the development of India's New Education Policy – Rajendra's visions are grounded in the possible.

He has been formative, informative and transformative in shaping contemporary Indian policy on the most important of social indicators – education and health.

Having led India's health policy – which has become the basis of the largest insurance scheme and comprehensive primary healthcare network in the world, Gupta is applying his credentials to his first passion – the power of education.

In this book, Rajendra combines prowess, principles, and policy for a practical, clear-eyed persuasive analysis of education. A tome of 300 pages reads as a persuasive page-turner of pedagogic policy as he glides from one page to the next with alacrity and purpose for a comprehensive education system for all. In 'Your Degree is Not Enough - Education for the GenNext' – Gupta transcends the temptation to fetishise technology, jobs and skills – and instead paves the way for a future of pedagogy to infuse purposeful, informed and responsible citizens – brimming with potential, actual and 'crystalised intelligence'.

Tanya Spisbah, Director – Australia India Institute & former Diplomat at the Australian High Commission

If you have to read ONE book on education and career planning, just read this one. This extraordinary book will open your eyes to enormous possibilities and make you wonder why the policymakers haven't thought of these things all these years. Rajendra's earlier books have led to policy

changes and paradigm shifts. This book too can be adopted as the Bible for reforming education system. This book is a must-read for students to know what real learning is, for teachers to adopt the best teaching methods and for the government to realise what its education policy should look like. One of the best books on education for all those who have a stake in the future.

Bhavna Vij-Aurora – Outlook Magazine

This book is a befitting tribute to the old adage: 'Life is a school'. It has a great message for students and teachers alike. Not only Prof. Rajendra Gupta has pointed out flaws in the education system, but he dives deep to offer a prescription. Rajendra's honesty, courage and independent thinking is reflected in his thoughts and writings. The model Futuristic Education Policy for Global GenNext that Rajendra pitches is the way forward. This book will make you rethink on how you studied and how you can still change it! – an academic attraction that will give it a long shelf-life.

Dalip Singh – The Economic Times

About the Author

Prof. Rajendra Pratap Gupta is a leading policy maker, who has contributed to policies across health, education and economy; and has been contributing to policy making for over a decade – not just in India, but globally.

He had one of the fastest rise in the corporate world, and became the COO in the 8th year and CEO in the 9th year of starting his career. He has served at senior most levels at Fortune 20 and Fortune 500 companies in India, and advised organisations across the UK, the US, Europe, the Middle East and India. Besides, Prof. Rajendra has been invited by global organisations like the United Nations, UNESCO, World Bank, Asian Development Bank, World Health Organization, World Economic Forum, International Telecommunications Union, United States of America, Governments of Japan, Finland and Bangladesh, and also by the Ministry of Health, Ministry of Human Resource Development, Ministry of Labour and Employment and The Planning Commission – Government of India, for his views on diverse range of topics.

He played an important role in drafting public policies and became the youngest person to draft the election manifesto of the leading political party – Bharatiya Janta Party (BJP) at the age of 37 in 2009. He also played a key role in drafting the BJP's Lok Sabha Election Manifesto in 2014. He has played an important role in drafting the National Health Policy 2017, National Education Policy, the policy (schemes) for Building and other Construction Workers (BOCW) – Ministry of Labour and Employment, Government of India and the State Health Policy for Uttar Pradesh. He is the founder of HIMSS India, Disease Management Association of India (an organisation with a special consultative status with the United Nations ECOSOC), Continua India, PCHA India and the 'Government Industry Dialogue' Initiative.

He was recognised in 2012 by the Sheriff of Los Angeles; named the 'Thought Leader of the Year' three years in a row by ICT Post; featured among the '25 Living Legends of Healthcare in India' and nominated to

World Economic Forum's Global Agenda Council. He has authored two best-selling books 1) *Healthcare Reforms in India: Making up for the lost decades*. This book led to major reforms in India and the 'Pre-emptive care model' proposed in the book was incorporated in the National Health Policy and 2) *Your Vote is not Enough* – Key ideas presented in this path breaking book are under implementation by various ministries of the government.

He is a former advisor to the Union Minister for Health and Family Welfare, Government of India, and has also served as member of the National Education Policy Committee, Ministry of Human Resource Development, Government of India; Member, Khadi & Village Industries Commission, Ministry of MSME, Government of India. Besides, he has served on several committees of the Government.

He holds a bachelor's degree in Science and Social Science and a master's degree in Innovation and Change Management from the UK. Besides, he has done the executive education program from the Harvard Business School and Kellogg School of Business, USA. He has served as a 'Distinguished Professor of Innovation' at a Central Government University and is an Hon. Professor at Amity University. He has travelled extensively and delivered over 200 talks across the world.

Other books from the author

- *Healthcare Reforms in India – Making up for the Lost Decades*
- *Your Vote is Not Enough – A Citizen's Charter to Make a Difference*

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Education for GenNext

Prof. Rajendra Pratap Gupta

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Disclaimer

- All the charts, diagrams and data are sourced and their references are given.
- Data are only for indicative and representational purpose.
- For Global Survey on Education, the data in the charts have been added and rounded off to the nearest digit, so may not add up to 100. Error is +/–0.01%.
- Weblinks given are functional at the time of writing.
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2

To My Reader

Dear Reader

Thanks for browsing through this book. It is important to me that you don't buy it just for its title or preview comments; and so, it is my duty to walk you through the idea behind the book and what it delivers to you after you have gone through it.

Right from being a student (learner) at school, to all throughout our lives, we are bombarded with a curriculum and told what to do and what to study, and finally our examination scores are expected to decide our future. But we are never taught on how to study, and what works and what doesn't, when it comes to studying? Is the duty of education just to help us get into a job and earn our living? Is our degree enough for our living? This book is an attempt to answer many such key questions.

As I progressed with my education, I studied hard to make my grades better, and I also topped in studies. But do I use any of the subjects I studied? Did it help me, except may be in getting my first job? Not really! What went wrong? Was I wrong as a student, or did the system fail me? I was, for sure, smart enough to make up for the shortfall in my education, and in fact, I worked hard and made my way to be considered capable of drafting the policies for various sectors for billions, and advice some of the world's largest corporations, organisations and multilateral bodies of the United Nations. But did that have anything to do with my education? Not really! What has worked for me and what did not, and what I experienced in my studying across India, the UK and the US, and my interactions and varied experiences with people compelled me to write this book. When I started to write this book, I wanted to address the issue of radical reforms needed in education, but as I delved deeper and deeper into the topic of education, trying to find answers for issues that I faced as a student

(learner), my outlook for the book changed, and this makes the book not only relevant and useful for you, but also interesting, as it, for the first time, covers issues which hitherto have not been attempted in a single book.

Let us not expect any transformational results with just incremental changes, because we are living in such a dynamic time where the past knowledge does not necessarily predict or decide the future. We must continuously reimagine our education, reengineer our skills and update our knowledge to stay relevant with the fast changing times.

We need to look beyond what we have been doing, and this is what the section on the draft 'Futuristic Education Policy for GenNext' is all about; the specific action plan that a nation needs to consider for leveraging maximum potential of the learners, and making a nation future ready.

During the course of my journey in writing this book, I never realised that I would stumble upon such invaluable chunks of scattered knowledge across islands of excellence. What I have attempted to do is to connect the dots and present it in a meaningful manner, and on a much wider canvass. Of course, I have also made recommendations, and even presented some original and radical ideas to transform, and this is my role as a policy-maker. However, one thought which bothered me while I researched this field of education extensively was the feeling that – (while I studied in school, college and universities and luckily, had the experience of going to institutions in India, the UK and the US, and my passion to gain knowledge still drives me to study further), I was forced to learn all what is outside me, but nothing of what I have inside, and this 'inside' is my foundation for any learning/information acquisition. So, I might have acquired a lot of external information, I would call it superficial knowledge – but no one ever taught me what is inside, how knowledge acquisition and assimilation has to be done, what is my speed of reading, how my brain works and how to study and what works and helps us in knowledge acquisition. This lack of inner understanding and its synchronisation with the external information did more harm to me than good. I looked at key people who changed the world – be it science, engineering, technology, philosophy, business – name it and you will see that either they abhorred education or didn't pursue it and dropped out. Of course, a few would have brushed with the so-called education system a little longer, but they are aberrations and outliers and they cannot be taken as poster boys, produced as a result of our current

education system. We cannot keep teaching what we have done for over 300 years and expect our learners to be futuristic.

The word ‘Education’ comes from a Latin word ‘Educere’, which means – to ‘draw out’ or the pulling forward of the wisdom from within. The word ‘School’ comes from Greek word ‘Skhole’, which surprisingly means ‘leisure’, ‘spare time’. But we seem to have practically distorted the meaning of both ‘school’ and ‘education’.

This book has tried to address the key issues around education (learning), information (knowledge) and wisdom (which is the result of first two), and all three are different. I may have education, but it does not translate into knowledge, I may have knowledge, but it does not make me wise. As I look back and reflect, I think education system has failed me as a learner, and I have wasted more than two decades of my life in the education system. Why should you or your kid repeat this experience? The current education system presents education to the learner and does not give any scope to present learner to the education and that’s a fundamental change needed. This book is all about overcoming the system which fails us more than often. Also, let us not forget that, without a proper policy for education, education is like an adventure sport for any nation. Play it well or you risk your living!

Book begins with a 113-nation survey on education, and this perhaps, is the biggest survey ever done for a book on education. The findings are interesting and compel us to think about the current education system and call for a radical transformation. The book covers the key issues and ideas that we need to understand, address, and include in education. Should we continue to teach the academic subjects as we have been doing since ages and in the same format and style? Then our education is all about AI (Academic Intelligence) and not WI (Working Intelligence) and so, this calls for not just reforming education but we need to go back to the drawing board. It is health, education, internet and mobility which will change the future of human civilisation, and education remains the overarching theme amongst all these key constituents.

Towards the end of the book, I bring forth the facts to make a compelling case for why education needs to be on the top of the political agenda and its importance to a nation and the future of humanity.

Happy reading, debating, writing and action!

3

Global Survey on Education

The Human Development Report 2019 (UNDP, 2019) starts with the following statement in the foreword, *"The wave of demonstrations sweeping across countries is a clear sign that, for all our progress, something in our globalised society is not working'*. Education systems across the world are in a similar chaos.

But as a researcher and policy maker, I cannot rely on my hunch. It has to be backed by evidence. Since this book is global in terms of its recommendations, I considered it important to check through a survey, about what people feel world wide of the current education system, and whether it needs reforms? The findings from the study (based on the survey) with residents from 113 countries echo the sentiment, and point in one direction: that education systems across the globe are in need of a major reform.

The questions that were asked included – their age; educational back ground (qualifications); employment status; if their education helped them realise their full potential or achieve their life's goals; if they had children and whether the current education system prepares the children for the future; what is more important – degree or experience; and if the education system needs a major overhaul. The answers have to be analysed individually but when we connect the answers to different questions, a very important message comes out – that the education system has lost its relevance and needs a major overhaul.

This survey had 622 respondents from 113 countries and covered more than half of the world from every nook and corner, every age group, and every income and work profile. If we look at the educational qualification of the people who responded, majority of them were post-graduate and above. Also, irrespective of the country or region, the results of the survey indicate clearly that the education systems across the world are in a crisis of

relevance. Initially, the plan was to cover 50 countries, but I saw people started responding from across the world and appreciated that a survey on such an important topic was being conducted, and so, I enhanced the target from 50 to 100 countries. As I closed the survey, 113 countries had responded. Of course, I must state, that this survey was done through email with professional connects via LinkedIn; a website for professionals and people into job or looking for one or are there for professional networking, and my connects across the globe, via email. So, the survey will certainly have a limited bias. Why I call it limited bias, is because, as most of the respondents are achievers in their field (of the total respondents, 26.37% are professionals), they may attribute their success to education. Also, these are the people who have access to internet, and tools like email, social networking websites and professional websites like LinkedIn. But the survey responses to the questions give quite a firm and unequivocal response on almost all critical questions.

An important observation is, that the responses did not differ much, irrespective of the level of economic growth in these countries. They were similar at every stage, whether we crossed 25 countries, or 50 or 100 countries. The response had similar trends, which confirms the point that, whether it is the world's most powerful country, like the US, or developing countries like India, Pakistan and Bangladesh, or countries in remote Africa – all want a radical transformation in their education system.

Countries (113) which were covered in the survey

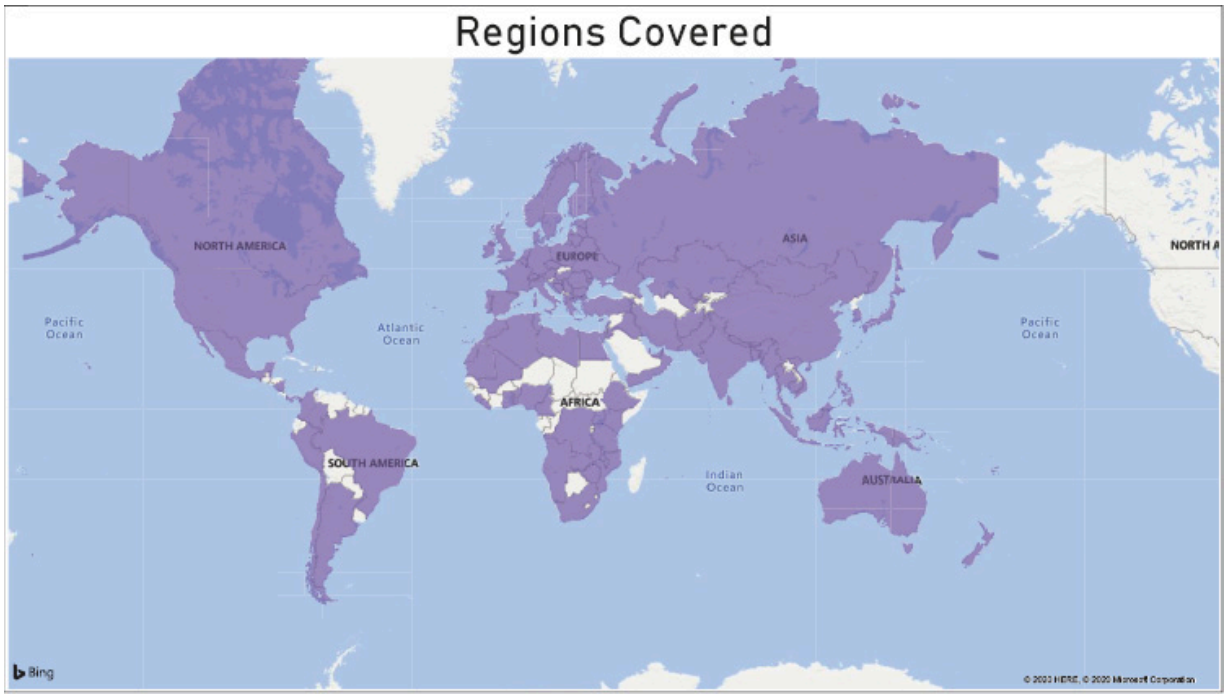
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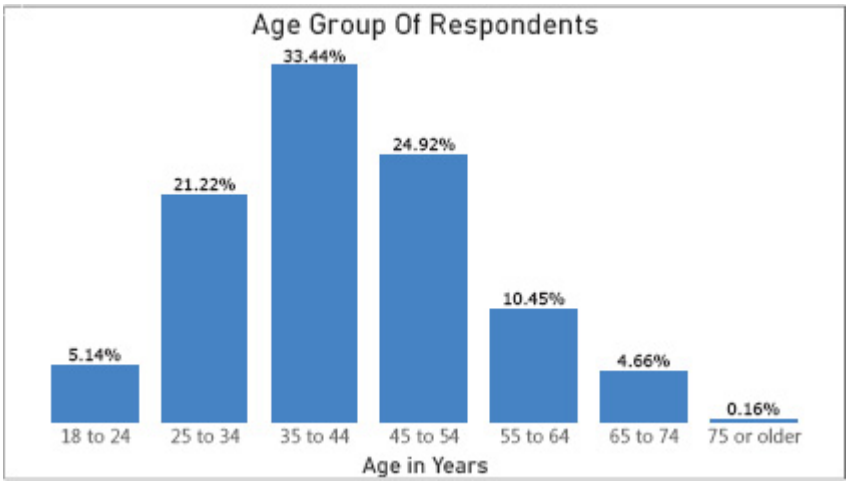
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107. United Republic of Tanzania
108. United States of America
109. Uzbekistan
110. Vietnam
111. Yemen
112. Zambia
113. Zimbabwe

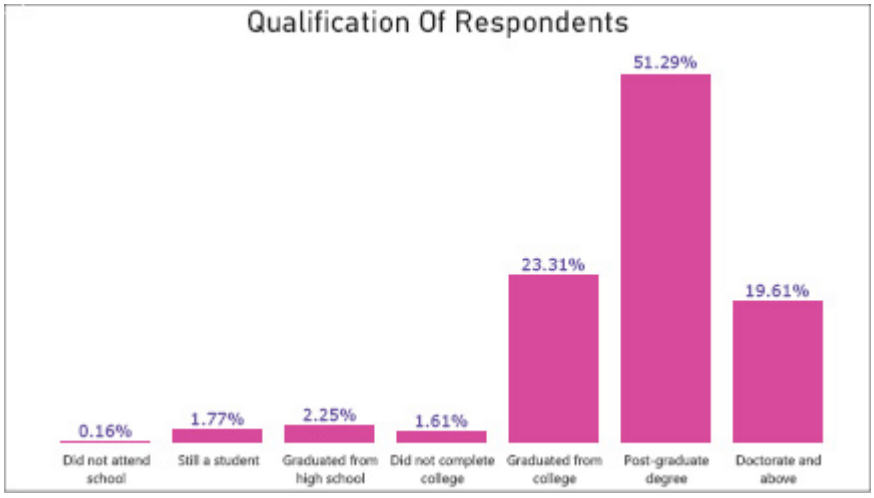


1. Age Group



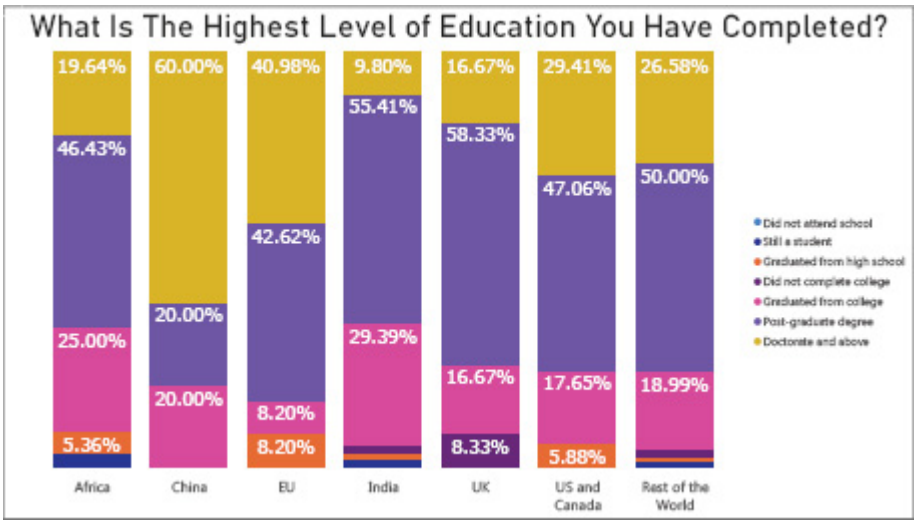
If we look at the age distribution of the respondents, all the age groups from 18-75 years plus are covered, but majority (more than 90%) of them, fall in the working age group (25-64). This is important from the point of analysing the responses to questions ahead, as those who are working will be the best judge of how education helped them in their careers or in achieving their life goals, or contributed to their overall satisfaction in life. 90.03% of people surveyed are in the age bracket of 25 years to 64 years.

2. QUALIFICATION



If we look at this data, majority of the respondents have a graduate degree and above – 94.21%. The highly qualified post graduate and doctorate

degree holders being 70.90%.

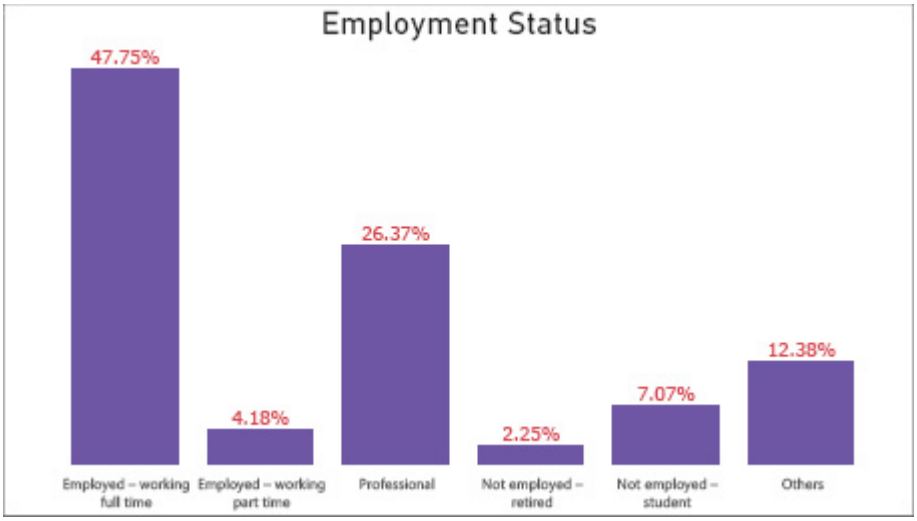


If we look at the qualifications of respondents across geographies,

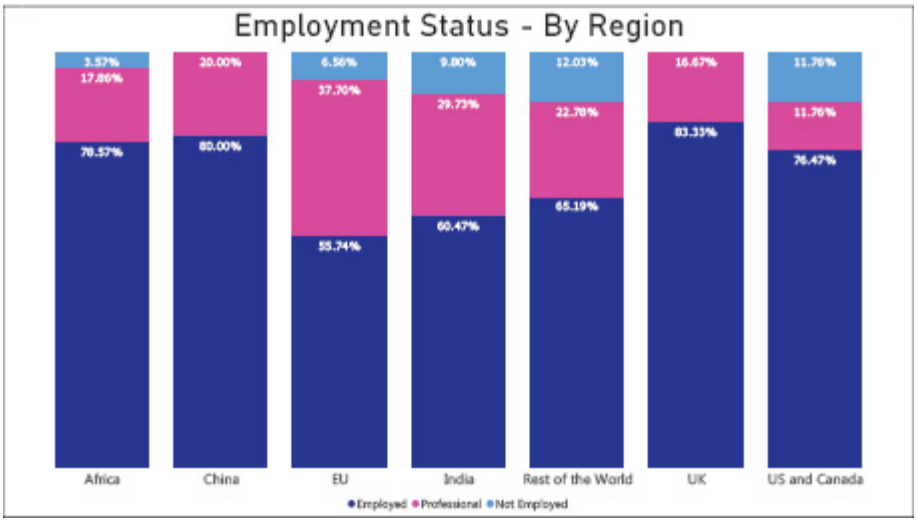
- In India, 65.21% were post-graduates and doctorates and above
- In Africa, 66.07% were post-graduates and doctorates and above
- In China, 80% were post-graduates and doctorates and above
- In EU, 83.60% were post-graduates and doctorates and above
- In the UK, 75% were post-graduates and doctorates and above
- In the US & Canada, 76.47% were post-graduates and doctorates and above
- For the rest of the world 76.58% were post-graduates and doctorates and above

So, this makes a perfect group of respondents to discuss the impact of education in their lives, as most of them had the opportunity to pursue higher education.

3. Employment Status



If we relate the data of the employment status with the educational qualifications and the questions ahead, it makes an interesting mix of respondents. With 70.90% of the respondents in the earlier question (Q No. 2) being post-graduate and above and, in this question, 74.12% people being either employed full time or professionals, I believe, it is just the kind of mix we needed to assess our next question.

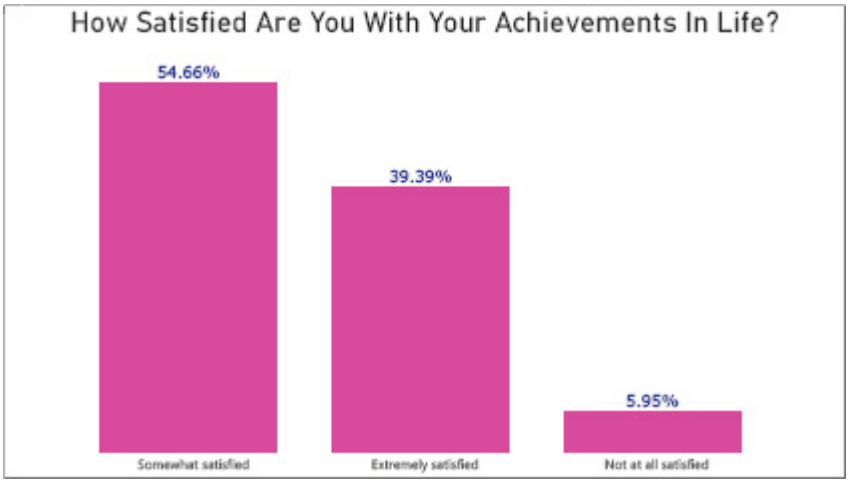


If we look at employment status across regions, on an average, 71.39% are working and 22.35% are professionals. Also, as seen earlier, 70.90% of the respondents were post graduate degree holders and above. Though this does create a bias that, the majority of the respondents in this survey are highly educated, but, on a positive note, it is assumed that the people who

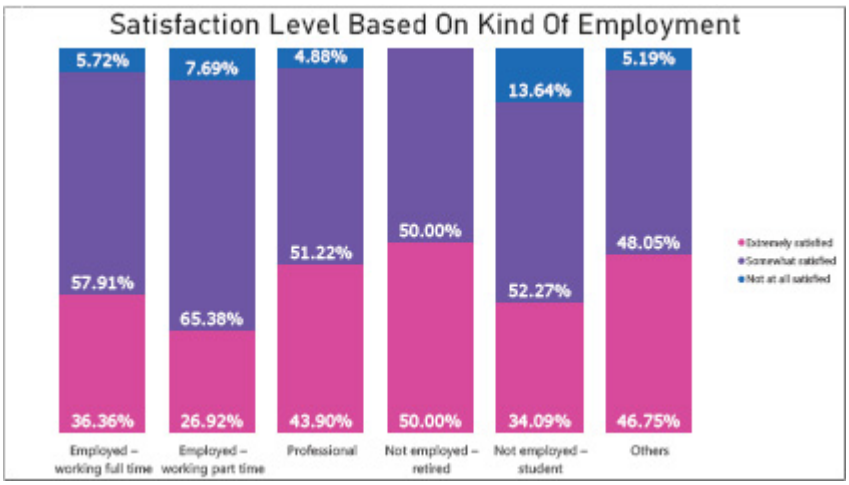
have undergone the grind of the education system and then the grind of finding jobs, have given well informed responses.

4. How Satisfied are You with Your Achievements in Life?

This question was clear and direct, 'How satisfied are you with your achievements in life?' So, the element of subjectivity and vagueness is filtered to an extent. Despite the majority being highly educated and employed, the satisfaction level is evident from the response, where less than 40% (39.39%) of the overall respondents were extremely satisfied.

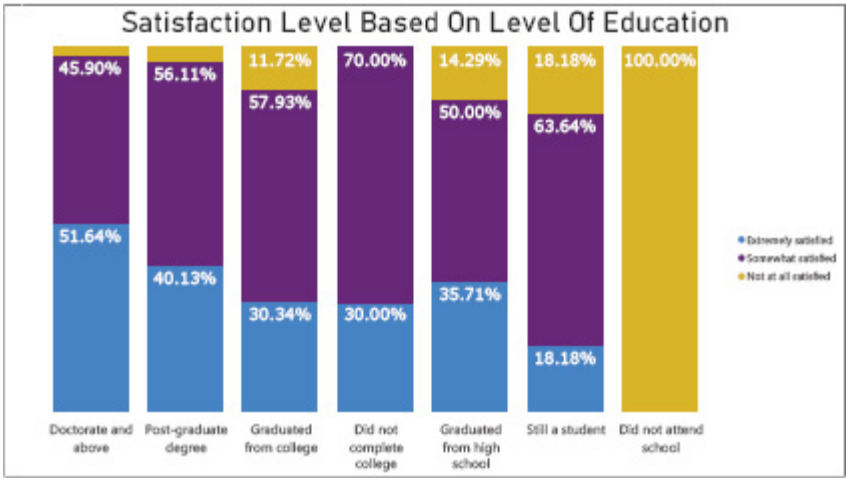


As most of the respondents are highly educated and working or are professionals, so this may have a bias of people being satisfied. However, it is glaring to note that despite devoting so many years to education, more than 60 percent were not extremely satisfied.



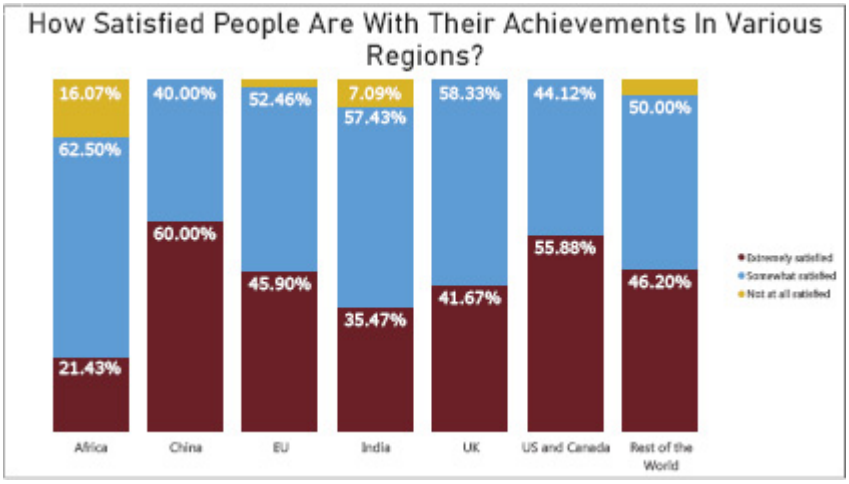
If we look at the data on satisfaction level based on the kind of employment, none of them have crossed the half way mark of being extremely satisfied. This raises a question mark on our education system and whether it leads to fulfilment of our life's key goal of feeling of achievement and being extremely satisfied. Though achievement and satisfaction are relative, and this relation needs further research.

Now, if we consider the data based on the kind of employment, even retired people, who had the highest number of respondents for being extremely satisfied, did not cross the half way mark of 50%.



If we look at the data on satisfaction with regards to the qualifications, satisfaction level was directly proportional to the level of education. Doctorates and above at 51.64% stated that they were extremely satisfied.

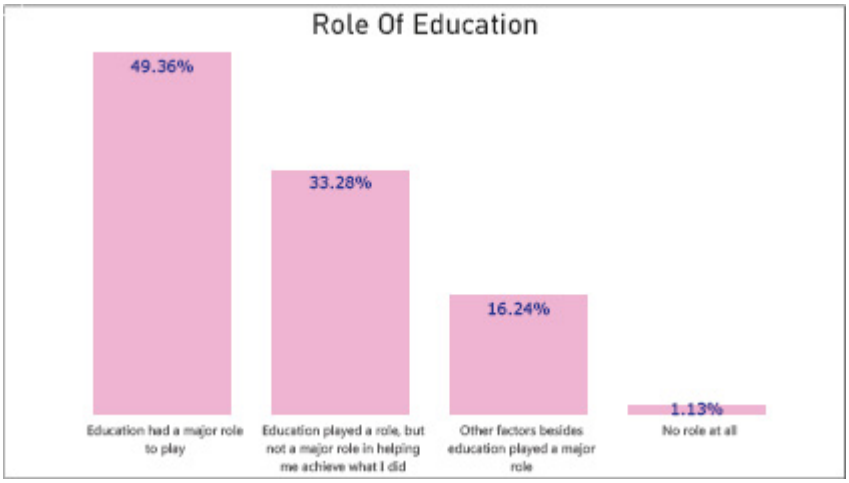
After that comes post-graduates, and 40.13% of the post graduate respondents were extremely satisfied. One thing stands out, once people go beyond graduation, and attain higher degrees like the post-graduate degree or a doctorate, the level of satisfaction increases. But still, the level (extremely satisfied) barely crossed the half way mark for doctorates.

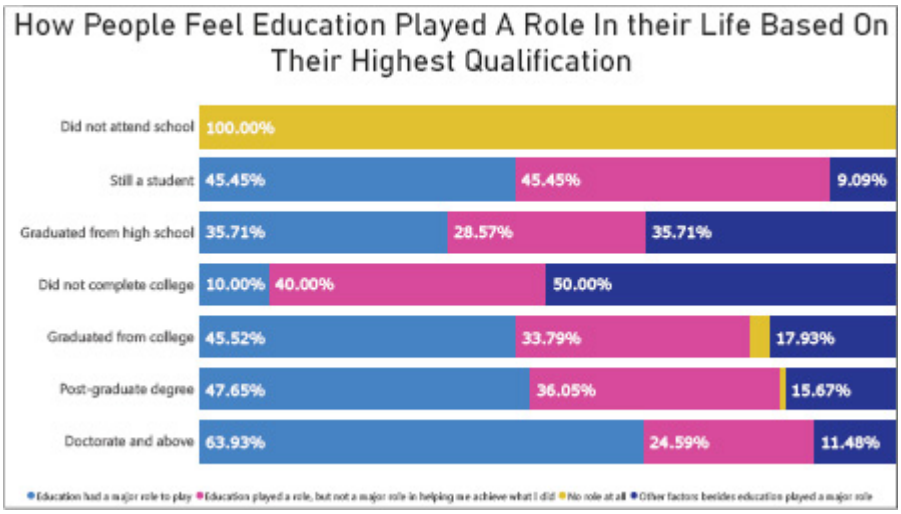


If we look at the satisfaction level across various regions; barring China, US and Canada, satisfaction(extremely satisfied) levels remain below 50%.

One of the key goals of obtaining education is to become satisfied. Also, higher education and employment does not necessarily lead to 'satisfaction' (extremely satisfied). This is an area (satisfaction) which needs further research.

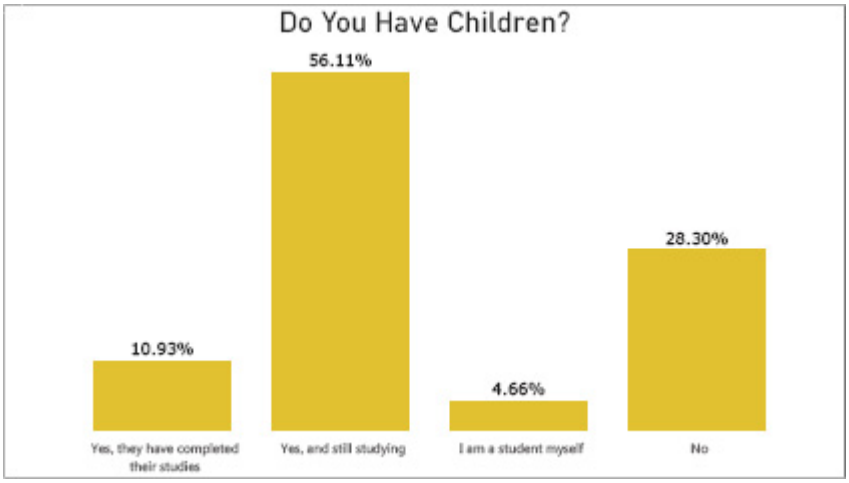
5. How Much Did Education Help You in Maximising Your Potential & Achieving Your Life's Goals?





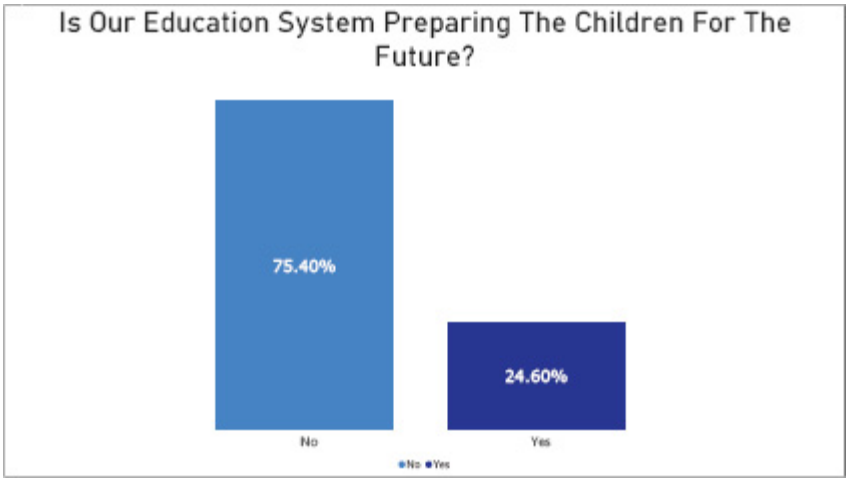
If we relate the respondents, of whom 94.21% have a graduate degree and above, 70.90% of the respondents having a post-graduation degree and doctorate degree and above, and 74.12% people being either employed full time or are professionals, but still, less than 50% (49.36%) believed that education had a major role to play in maximising their potential and achieving their life's goal. This is when 26.37% of the respondents are professionals. There are a few ways one can interpret this data, but for sure, one thing is clear – that more than 50% believe that education did not play a major role in maximising their potential or achieving their life's goal. So, this puts a question mark on the goals of education and the results of the education system.

6. Children & Their Education

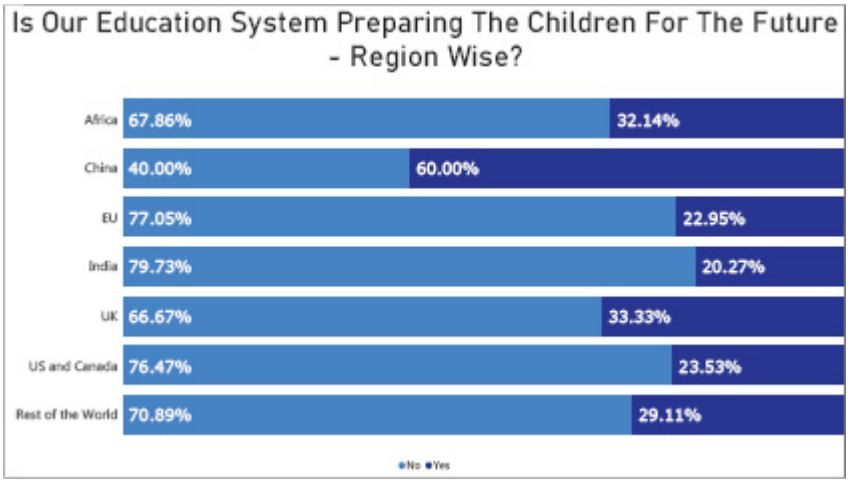


Out of the total respondents, 56.11% have children who are still studying, 10.93% of the respondents are parents whose children have completed their studies, 4.66% are students. This is a right mix which should be in a position to respond to the next questions about the changes required in the education system.

7. Is the Education System Future Proof?



The answer for this question raises another question on not just the future of children but also the future of education! More than 75% of all the respondents believe that the current education system does not prepare the students for the future.

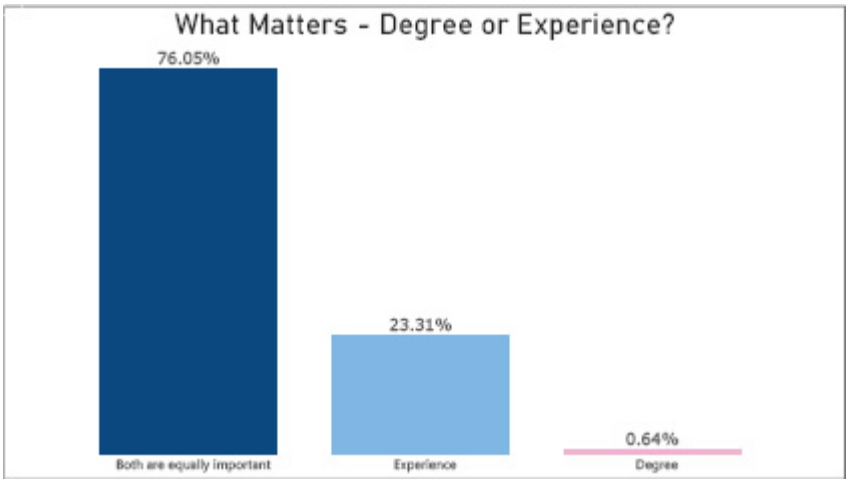


Even for the advanced countries like the US & Canada, UK & the EU, majority opinion is clear – that the education system does not prepare the children for the future. For India, with 79.73 % of the respondents feeling that the education system is not adequate to prepare the children for the future, it is the highest amongst all the 113 nations surveyed.

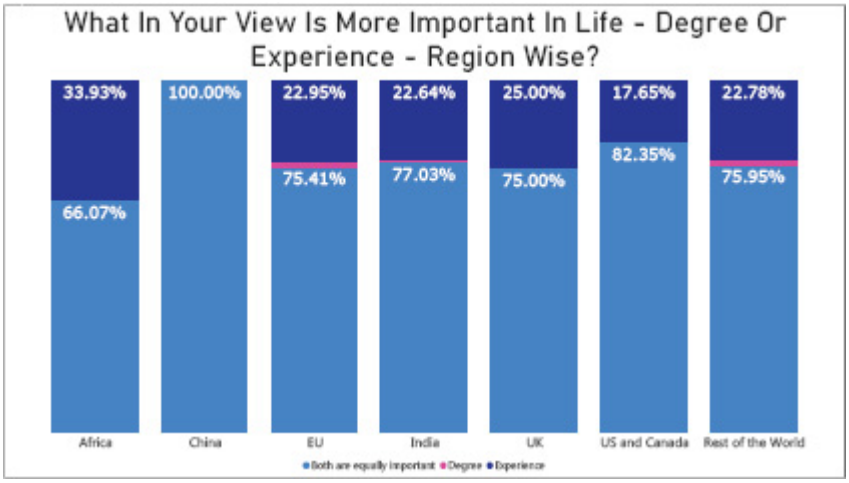
This is not only a 'moment of truth', but also a 'call to action' – to take immediate steps to transform the system. And this is not just for one country. It calls for a global action, akin to climate change.

Organisations like UNESCO, UNICEF and the United Nations should take a lead to drive this change in this truly globalised world.

8. What Matters - Degree or Experience

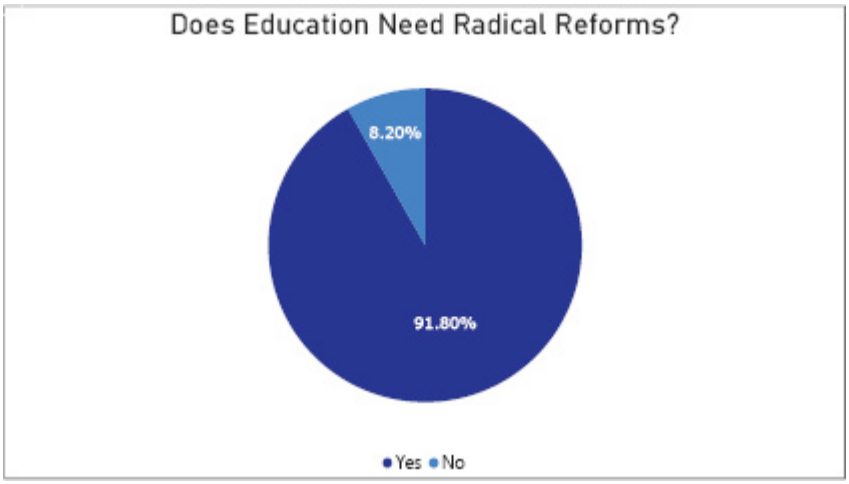


Initially, I wanted to give only two choices, degree or experience, but I added a third one. As we can see, less than 1 (0.64%) percent have voted for degree, and an overwhelming response has been for both – experience and degree.

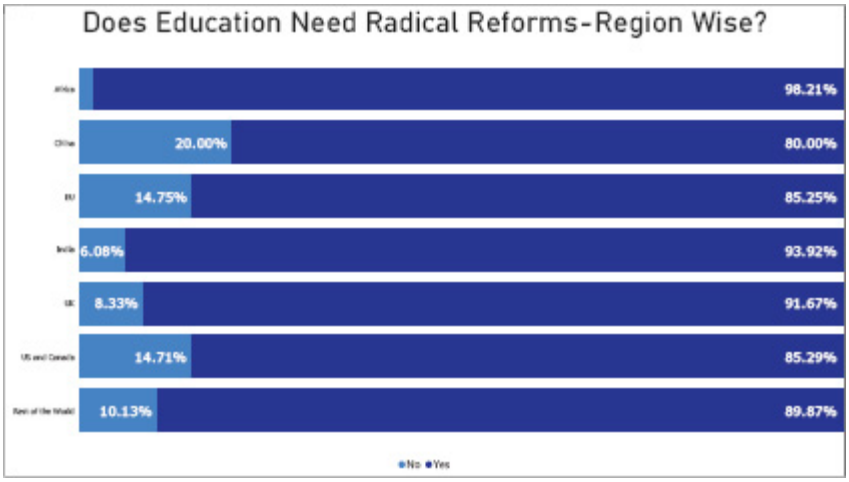


If we look at the global responses, in EU, 2% have indicated that only the degree is important and 1.27% of rest of the world (besides Africa, China, EU, India, UK, the US & Canada) believes so. India hardly has 0.33% saying that, degree is important. Clearly, the education system has to be based on ‘experiential learning’, and ‘experiential learning’ is emerging as an overarching theme for the reform in education.

9. Do We Need Radical Reforms in Education?



Lastly, the most important question: Do we need a radical reform in education? The response has been almost 91.80% echoing for a major overhaul of education system. This covers more than half of the world, every region and every age group and all forms of employment. Here's an absolute majority (91.80%) stating that education system needs a major overhaul.



When the responses were analysed region-wise, even the developed world like EU, UK, US & Canada unequivocally want major reforms in

education. Interesting to see that 98.21% of respondents from Africa, 93.92% respondents from India, 91.67% of respondents from the UK, 85.29% of respondents from US and Canada, and 85.25% respondents from the European Union want a major overhaul in education. So, when it comes to education, the expectation is, that the world needs to reinvent education. It is time to redefine the framework of education – right from pre-school to post-doctoral. We cannot aim at piecemeal reforms anymore. We have to reform the governance, delivery and financing of education at all levels, globally and immediately.

'*If we don't disrupt education, education will disrupt us*'.

4

Education System is Not Just About Academics and Degrees

Education system will have to create a new operating system for this country, which means, a complete overhaul of governance, delivery and financing of education – which delivers much more than just academics and degrees. We are living in the age of Quantum Supremacy: the Google, NASA and Oak Ridge National Laboratory have proven the ability of Quantum computers to compute in less than four minutes which the most advanced super computer might do in 10000 years (NASA, 2019).

Education 'system' has to become like a Quantum Computing Machine, like an agile processing system, which keeps reorienting itself to the needs of the time with the goal to maximise the potential, tap the 'resting knowledge in the brain' in every 'unique individual' which enters this 'system'; fire the ability of imagination, ensuring curiosity as an obsession and yet grounded in basic principles of life. It should create a life-long learner, who has the feet on ground, hands on the technology and eyes set on expanding the horizon. Today, old concepts in science, social sciences are just dumped into the heads of learners. So, we take them backwards even in teaching science (which to me is like teaching history, what has already been discovered through theoretical knowledge), but we don't do anything to open their minds to newer possibilities and positivity for the future and this, to me, appears to be the greatest challenge of our education system. We have to change this approach to ensure that learners of today do not just read books and pass exams and become glorified clerks, salesman or scientists doing just academic research for the future. We often see that learners are known by the school grades of a predefined fixed curriculum for all the learners, and if the learner does not do well in history, mathematics, science, etc., the teacher will tell the parent that, 'your ward is a laggard, stupid, fool, or a slow learner, and is not doing well', etc. But in

reality, it is not the learner who is stupid or etc., it is the education system, which fails to identify the unique talent of each learner and his/her 'specific intelligence', his/her unique capability in a particular field, and we bombard the learner with things that might not be his/her 'brain-type' or 'build-type'. In fact, according to me, when a learner achieves 99% and in some cases 100%, it is a 'failure in achievement'. Marks can never sum up an achievement and that is why high graders end up frustrated when they later fail in a competitive exam or in their professional careers. We need to impart knowledge and train a learner based on his/her uniqueness but rather, we make a learner feel bad for his/her failure in a particular subject, and force stuff down the head of the learner, believing that 'one curriculum fits all'. It is important to mention here, that in our education system, 'autism' is a disability, but autistic people are a repository for certain strengths and can see details which neurotypicals cannot, and can make a creative leap (Grandin & Panek, 2014, pp. 131-135). So, I am bringing here a few important 'constructs' or 'thoughts' to consider and implement in the education system – like the multiple intelligence, thinking patterns, the cognitive overload and mental load, among others, to realise the full potential of every child and to ensure that every learner is educated and trained in the subject, field or vocation, based on his/her 'unique build-up'. This needs an understanding by the learners, but most importantly, by the parents and the teachers to ensure that we do not produce a future generation of burnt out children by forcing our ideas and aspirations on our wards blindly, but consider them as unique gifted individuals different from others and ourselves as well. We need to break this age-old tradition of study hard, job (work harder) and then retire – to learn, contribute and enjoy simultaneously, lifelong!

Before we delve deeper, I wish to share an interesting real-life example. A college dropout met with an accident and was struck in the back of his head leading to a concussion. After a day or two, the world started appearing to this person as a mathematical formula. He told that he saw bits and pieces of Pythagoras theorem everywhere. He drew what he saw year after year and his art work turned out to be fractals which were mathematically precise. The best part was this person had no prior training in mathematics, and neither did he exhibit any talent for art! 'It's as if fractals were in his brain, just wanting to be freed' (Grandin & Panek, 2014, p. 152). As I wrote earlier, all the knowledge is resting in our brain, and the

education system has to become a catalyst and a channel to bring this to the fore, and finally lead to 'knowledge seeking' becoming an obsession for the learner!

Unique Individual Potential (UIP)

You cannot hope to build a better world without improving the individuals – Marie Curie

Every single individual is a unique being. One can make out from the finger prints, iris and other features that no single individual will match with another in this world born at any time. So, the education system and all stakeholders associated with it have to ensure that this uniqueness is respected and nurtured, and every learner is treated as having what I would term as 'Unique Individual Potential (UIP)'. For this to happen, it is important and fundamental to understand how our brain works. If we do not understand the functioning of the brain, unique intelligence capabilities of every learner, the mental load and cognitive overload of our education system; the knowledge imparted in our education system – instead of becoming a boon, becomes a bane. So, let us consider a few important points and how they are related to leveraging the potential of every learner.

Interest – Intelligence – Ability – Education

'Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid' – Widely attributed to Albert Einstein

'Education' for All, but not the 'Same education' for all

It is important to take note of two important facts–

1. By the age of two, most children have developed some sense of what is right and what is wrong.
2. Throughout childhood, this moral sense undergoes a characteristic development trajectory (Gardner, 1999, p. 71). According to the 'Theory of Mind', by the age of four or so, most children appreciate that other individuals have minds and these 'other minds' may not be

> privy to the information that the children themselves possess (Gardner, 1999, pp. 85-86). So, in the early years, the interaction between the learners is of critical importance in the life span of the being, and the education system cannot remain oblivious to these facts.

When a child comes into this world, the child comes with a role that he or she needs to play in making the world better. The education system has to treat each child as a 'New Child' and someone 'Unique' that the world needed, and acknowledge the ability of the child in form of the Unique Individual Potential (UIP) and the intelligence associated with it, rather than treating a child as just being one among the billions and pushing them into the outdated education system that treats everyone the same. Only a handful of Indians make it to the top positions across the globe – and they are mostly dropouts or outliers – they are aberrations, and their success cannot be attributed to our education system. We need to differentiate and understand that these 'wonderkids' are not actually 'dropouts' but 'opt-outs'. They opted out of the education system and did not follow the routine; be it Rabindranath Tagore, who did not complete his degree and later went on to become a Nobel Laureate in Literature, or Jiddu Krishnamurthi, who was indifferent to academic studies and failed in his examinations and yet became a pioneer in education and set up Krishnamurthi Foundation which runs schools (Pathak, 2016), Azim Premji – India's leading business tycoon and philanthropist, Kapil Dev – cricket captain who gave India the first world cup, Sachin Tendulkar who became the 'God of Cricket', Dhirubhai Ambani – who went on to set up the country's biggest conglomerate, or Mary Kom – who made a name for India in the world of boxing. If we look at people from abroad, the list would be endless – starting with Thomas Edison who invented the incandescent light bulb, Wright Brothers who did not attend college but became aviation pioneers, to John D. Rockefeller, Henry Ford, Bill Gates, Steve Jobs, Mark Zuckerberg, Ted Turner, Larry Ellison, Michael Dell and David Geffen. All these people have made a name for themselves while being outside the normal education system.

If we analyse further, people who made a profound difference and made it big in India have been uneducated or spent time outside India – be it Gandhi, Tagore, Bose, Sen, Khurana, Ambanis or Nadella, and the list is endless. So, we need to bring a radical change in the way we do the

knowledge transfer (educate)! We need to look at the vision, beliefs, competence of the child and treat him or her a unique individual. I think we need to consider the role each one plays in shaping this Earth – based on one's unique ability, and trust me, every learner is a prodigy whom we fail to decipher and unleash. As a member of the National Education Policy Committee, when I spoke with kids across urban and rural India, I found a big difference; one out of hundred wanted to become a teacher in urban areas but majority of the learner(s) in rural India wanted to become a teacher. Also, most valuable inputs came from the kids rather than the so-called experts and authorities in the field of education. Moreover, some kids wanted to become an artist, some wanted to be a civil servant, entrepreneur, scientist, police officer or sportsperson. So, we need to carefully look at the theory of multiple intelligence (Gardner, 1999) and based on that, we, as learners, parents and teachers need to treat everyone differently – discover their specific intelligence quotient and the 'natural gift index' (if a child is naturally gifted with some abilities). Even the autistic children are gifted and many are outstanding at numerical calculation, (Gardner, 1999, p. 39) and it is widely believed that even accomplished artists, like Vincent Van Goh and Fyodor Dostoyevsky had temporal lobe epilepsy and yet produced powerful and dramatic art works (Gardner, 1999, p. 63). If we do not give education to a learner based on his learning abilities and innate interests, one will end up being a burden on the society as a frustrated and unhealthy individual. Till the time, science (genetics) develops enough to 'tailor make' the learners DNA for a particular job, we need to redefine the DNA of our education system.

We need to check the specific intelligence quotient of the learner, as to what is the special intelligence trait(s) one has, and accordingly focus the education with the future of the learner in mind. Even identical twins brought up in different environments have different intelligences and so, the intelligences arise from a person's genetic make-up and their upbringing in a given culture and era (Gardner, 1999, p. 45). The education system should be able to identify, inculcate and nurture the specific or multiple intelligences of an individual, who is a unique human being (learner). Of course, I personally believe that some intelligences, and not all, could be substituted by hardwork and training of the mind.

In the 80s, Howard Gardner (Gardner, 1999) proposed the theory of multiple intelligence, and he has defined intelligence based on various

facets/traits. He postulates that there could be many more intelligence fields that will come forth:

1. *Numerical – Logical – Mathematical Intelligence: Involves the capacity to analyse problems logically, carry out mathematical operations and investigate issues scientifically. Mathematicians, computer scientists, logicians and scientists exploit logical-mathematical intelligence.*
2. *Linguistics Intelligence: Involves sensitivity to spoken and written language and includes core competence of phonemic discriminations, command of syntax, sensitivity to the pragmatic uses of language and the acquisition of word meanings. Lawyers, speakers, writers, poets are the people with high linguistic intelligence.*
3. *Musical Intelligence: Entails skills in the performance, composition and appreciation of musical patterns.*
4. *Bodily – Kinesthetic Intelligence: Entails the potential of using one's whole body or parts of the body to solve problems or for fashion products. Dancers, actors and athletes foreground bodily-kinesthetic intelligence. This kind of intelligence is also important for crafts-persons, surgeons, bench-top scientists, mechanics, athletes and many other technically oriented professionals.*
5. *Spatial Intelligence: Features the potential to recognise and manipulate the patterns of wide space (those used for instance, by navigators and pilots) as well as the patterns of more confined areas (such as those of importance to sculptors, surgeons, chess players, graphic artists or architects).*
6. *Interpersonal Intelligence: About a person's ability to understand the intentions, motivations and desires of other people and consequently, to work effectively with others. Salespeople, teachers, clinicians, psychologists, religious leaders, political leaders and actors – all need acute interpersonal intelligence.*
7. *Intrapersonal Intelligence: Involves the capacity to understand oneself, to have an effective working model of oneself – including one's own desires, fears and capacities – and to use such information effectively in regulating one's own life. People endowed with such an*

intelligence deal with career guidance, self-knowledge and self-transformation.

Later, Howard Gardner added three more intelligences (Gardner, 1999, pp. 47-55):

1. *Naturalist Intelligence: Demonstrates expertise in recognising and classification of the numerous species – fauna and flora and has a knowledge of the living world.*
2. *Spiritual Intelligence: Reflects the desire to know about cosmic entities and experiences, the realm of mythology, religion and it refers to anything; mind, body, self, nature, the supernatural.*
3. *Existential Intelligence: Is the capacity to locate oneself with respect to the furthest reaches of the cosmos – the infinite and the infinitesimal – and the related capacity to locate oneself with respect to such existential features of the human condition as the significance of life, the meaning of death, the ultimate fate of the physical and the psychological worlds, and such profound experiences as love of another person or total immersion in a work of art. People endowed with such an intelligence focus on spiritual matters, or matters of personal or communal identity.*

Intelligence can be identified, nurtured and reshaped with certain processes and trainings. Education system has an important role in channelising the intelligence of every learner in a positive manner so that the learner makes a positive contribution to the economy (and the society). The examples ahead are glaring to note for people in the teaching profession and how their way of delivering knowledge shapes the future of the learners. *For example,* both Goethe and Goebbels were masters of the German language; however, Goethe used the language to create great art, while Goebbels spawned hatred. Both Mahatma Gandhi and Niccolo Machiavelli stressed the importance of understanding other people; however, Gandhi encouraged empathetic responses, while Machiavelli directed his wit towards manipulation of others. So, education system has an important role to ensure that the hidden traits, or the more pronounced traits, are channelled in a more productive manner in the larger interest of the society.

Howard Gardner points that even those who are gifted with a particular intelligence or domain will accomplish little if they are not exposed to

materials that engage the intelligence. So, even the ordinary people when exposed to environmental interventions can become experts. And therefore, smarter the environment and the more powerful the interventions and the available resources, the more proficient the people will become – making genetics less important for the development of their expertise/proficiency (Gardner, 1999, p. 88).

One way this can be applied in education is, if we are able to identify the Multiple Intelligence (MI) among the learners early on. If we can set up museums based on MI, and when the students visit the various MI theme-based sections and the teacher seeks feedback from the learner, they should be able to ascertain the MI of the learners. Role play is another way to figure out the MI of the learners based on objective assessment and feedback. There could be various means to identify the intelligence capacity of the child, and accordingly the education system should nurture the MI.

Learners are Thinkers – Picture, Pattern or Word-Fact Thinkers

Learners, knowledge givers and parents need to be aware of the unique thinking capability or quality of a learner, which can be categorised into

(a) picture thinkers;

(b) pattern thinkers; and

(c) word-fact thinkers (Grandin & Panek, 2014, p. 185).

This differential thinking ability plays an important role in shaping the future career trajectory and the inclination towards the type of thinking can emerge in grade (class) second, third or fourth. So, it is imperative to nurture the abilities early on with blended knowledge transfer methods.

Picture thinkers are those who like hands-on activities. For example, building, art, cooking, etc., and they may not be good at algebra and mathematics. Such thinkers can excel in arts.

Picture thinkers are good at imagination and given the same toys, say a Lego, they will build something based on their imagination, whereas pattern thinkers will make an object fit together. Picture thinkers might not be good at algebra or other forms of mathematics. Pattern thinkers are good at maths

and music. '*They get the form behind the function'*. For pattern thinkers, reading might be a challenge, but they will be at ease in algebra, geometry and trigonometry. Such thinkers can excel in music and technology (Grandin & Panek, 2014, pp. 185-6).

Word-fact thinkers can recite all the dialogues of a play or a movie or remember numbers or dates from history. They may be average in mathematics or Lego building blocks or drawing, but they will be good at writing.

From these interesting patterns, I am intrigued, if a class with such diverse 'thinkers' can study the same subjects at the same pace in the same sequence without taking into consideration that every learner with his/her unique ability cannot study the same curriculum in the same manner?

These three thinking minds complement each other and our system should be able to make them work for the advantage of the larger canvas (Grandin & Panek, 2014, p. 199).

Jobs suitable for Picture Thinkers:

- Architectural and engineering drafter
- Photographer
- Animal trainer
- Graphic/animation artist
- Jewellery/craft designer
- Web designer
- Veterinary technician
- Auto mechanic
- Machine maintenance technician
- Hardware technicians/engineer
- Sound and light technicians/engineer
- Industrial automation designer
- Landscape artist
- Biology teacher
- Satellite map analyst
- Plumber

- Air handling unit technician
- Welder
- Plant engineer
- Radiological technician

Jobs suitable for Pattern Thinkers:

- Programmer
- Engineer
- Physicist
- Musician/composer
- Statistician
- Mathematics teacher
- Chemist
- Electricity technician
- Music teacher
- Science researcher
- Data analyst/scientist
- Investment analyst
- Actuary

Jobs suitable for Word-Fact Thinkers:

- Journalist and technical writer
- Desk-top jobs
- Specialty retailer
- Librarian
- Share market analyst
- Accountant and business analyst
- Special education teacher
- Speech therapist
- Supply chain professional
- Legal researcher
- Contract specialist at a dealership

- Historian
- Bank teller
- Tour guide
- Public relations/information

(Grandin & Panek, 2014)

Right-brained or Left-brained

There is a belief that learners could be right-brained, that is, they are creative; or left-brained, that is, they are rational. However, many neuroscientists are calling it a 'left-/right-brain myth'. Also, an important point to acknowledge is that, there is no task that exclusively relies only on either the left or the right-brain (Weinstein, Sumeracki, & Caviglioli, pp. 36-7). This reality must be considered by teachers, parents and the learners, rather than segregating the learners based on these 'myths' and making them think that they are either rational or creative but cannot be both! In reality, based on the evidence available, one can be both rational and creative.

Attention

This has been the most debated topic, and scientists are not able to agree on a definition across specialisations, but according to cognitive psychologists, attention is 'a focus on specific stimulus, or the ability to focus on specific stimuli or locations'. Also, attention is being considered as a 'limited capacity resource', and according to this 'limited capacity resource model', we have a certain amount of attention, and we have to apportion it to different tasks. Going by this model, if we are doing a difficult task which requires a high level of attention, there might not be much of it left for easy tasks or vice versa (Weinstein, Sumeracki, & Caviglioli, p. 51).

Also, it is important to note that the likelihood of a learner paying attention also depends on the quality of the content. Also, both the individual and the situational interest (how absorbing the text is or how enjoyable are the illustrations, and how engaging the teacher makes the

class) impact the attention in a learning situation (Weinstein, Sumeracki, & Caviglioli, p. 55).

Consequences of not paying attention is what psychologists call 'mind-wandering', which is, having unrelated or irrelevant thoughts than what is expected to be a focus. As easier tasks increase the level of mind-wandering, so also, if the task is very difficult, mind-wandering may increase so much that, the learners are not paying attention to what the teacher is saying in class, and so, mind-wandering can lead to a learner missing important points or a piece of information, and this is not just limited to class but can also happen during examinations, leading to poor results (Weinstein, Sumeracki, & Caviglioli, p. 56).

Recent studies have brought forth evidence that the attention span of brain is 20 minutes. After 20 minutes, the attention capacity reduces and only selective attention takes place (Brenden, Wealth of Information & Poverty of Attention, 2015). So, it is imperative in the knowledge transfer process that it is a two-way engagement with blended learning tools. Else, giving long lectures in a class do not serve the purpose. Going by the research and evidence available, it makes sense to have the curriculum – study material, in a blended form – video, pictorial and text, so that the cognitive load does not negatively impact knowledge transfer.

Working Memory, Short-Term Memory, Long-Term Memory and, Procedural Memory

It is important to understand the basics, whether one is a learner or a knowledge giver. Let us go a little deeper in the science of learning and memory. *The brain is made of neurons (nerve cells) which communicate with each other, and an active neuron may activate another neuron if they have a mutual connection (synapse). Memories are represented by a group of neurons which are connected to each other by synapses. When these active neurons in a certain group are synchronously active, we are able to recall a concept of an episode or we are able to do a task or process. In the scientific language, this pattern of active neurons is called 'engram'. Engrams can be connected to one another by synapses to create associations. One specific memory can be composed of multiple engrams. When we learn a new concept, its retention depend on constructing the*

engram and on forming associations with existing engrams, which in turn, depends on one's ability to retrieve the existing engrams and create connections actively while learning. When we learn something new, the neurons 'wire and fire' in response to the incoming information and create patterns. For consolidation of this connection, it needs energy, time and biological resources, and rest and sleep are known to play an important role in consolidation. These processes are important to understand for effective learning, as without knowing the underlying process, we cannot figure out the process for effective learning. The neuroscience of retrieval is composed of four steps/ processes – encoding, consolidation, storage and retrieval (Weinstein, Sumeracki, & Caviglioli).

Anything we do requires memory in one form or the other. Short-term memory is of a temporary storage capacity, of about 15–30 seconds, but it is important as it allows us to manage information for mathematical calculations and also switch between tasks. It is the short-term memory process which decides what is worth keeping for long-term. According to Atkin-Shiffrin multi store memory model, provides retention of information and skills indefinitely.

Working memory allows us to juggle things in our head and is related to academic performance. The working memory is dependent on the amount of information we can hold and manipulate at any given time. Also, research is throwing open the possibility that, with practice, we can enhance our working memory capacity, processing speed (the speed with which we process information) and attention control.

Procedural memory is about remembering to do something – like playing an instrument, and this skill-based memory is called the procedural memory and does not require us to think about the activities we are doing (Weinstein, Sumeracki, & Caviglioli, pp. 55-66).

Also, every time we try to reproduce something from memory, it follows a process of reconstructing, activating and altering it. It is like the same story retold multiple times gets more polished every time we tell it (Weinstein, Sumeracki, & Caviglioli, p. 67), and this has important applications when it comes to academics. So, those learners who think that something is wrong when they are not exactly able to reproduce what they have learnt so many times, are wrong in thinking that something is wrong with their memory. In fact, it is natural for the facts to undergo a

modification, as every time you try to recall, the information is not the same and it undergoes the three-step process of reconstructing, activating and altering. So, no need to worry, it is a natural process.

Creativity and Intelligence

It is important for the teacher to figure out creative learners and give them the right push, and for the rest, they need to nudge them or nurture them in their areas of interest.

It is important to understand the difference between creativity and intelligence. Creative people can solve problems, create products and are novel in their approach and end up changing the domain. They differ from intelligent people in their going beyond the normal and asking questions that are beyond logic (merely an intelligent question). Also, creative people are specialised in a domain, and/or discipline of craft. If we look at creative people like Leonardo da Vinci, he was creative in domains like painting and invention. Aristotle (384–322 BC), who was a student of Pluto (a great Greek philosopher) and teacher of Alexander the Great, researched and wrote on varied topics like botany, zoology, physics, philosophy, geology, poetry, theatre, music, physical fitness, linguistics, and medicines, besides others (Jaiswal, 2018). People like Vinci, Goethe, John Lennon, Marie Curie and Steven Spielberg have created an impact on the domains they have been in. *Intelligence may reflect what is valued in the community and it entails smooth and skilled operation of one or more 'computers' in the mind or brain of an individual.* Creative people are generally blessed with multiple intelligence. Like Einstein had outstanding logical-mathematical intelligence, but he was also blessed with extraordinary spatial intelligence. Similarly, Freud had logical-mathematical intelligence, but he was also endowed with extraordinary linguistic and personal intelligence. It is important to note*, intelligent people may not be creative. Those with inter-personal intelligence are likely to become influencers or performers and those with strong logical-mathematical intelligence are more likely to become masters and theory builders* (Gardner, 1999, pp. 116-124).

Given the evidence of environment, interventions and resources, I believe that the teachers (education system) have the ultimate responsibility

to work with parents – guardians of the learners, to see what is best suited for the learner and accordingly, the knowledge transfer must happen. For example, introverts have more likelihood of becoming poets, and extroverts would be more inclined to public speaking, debating and being political leaders (Gardner, 1999, pp. 85, 125).

A person who can use several intelligences together appropriately is more likely to be wise because a greater number of faculties and factors would have entered into the equation (Gardner, 1999, p. 133). Hence, the education system should be flexible in giving not just multiple, but unrelated subjects to choose from – right from formative years. I had the rare opportunity to study several diverse subjects in science (Botany, Zoology, Chemistry), social sciences (Economics, Tourism, History) and linguistics (German) during my graduation days, and I wish that it was available to all people. It makes a huge difference to how we study, what we understand and how we can turn out to be large canvas thinkers over time, due to our education. We must not forget that the learners of today are not just competing with other learners but they are competing with tools like AI (Artificial Intelligence). They have to be ahead of time in terms of their ability to comprehend and envision the future much earlier than others, to be prepared to succeed. The school system should be such that it can acknowledge, identify, trigger, activate and nurture multiple intelligences, and it should be constant and inbuilt in the education system at all levels – from preschool to post-doc, and this calls for a new, and an integrated approach for differential learning.

Issues that Impact Learning

In this section, I am giving a brief idea of important issues that impact learning and our understanding about the same. Also, certain suggestions are made on topics which need to be shared with the learners in the preparatory phase. The way to share should be ideally through a 20–30-minute module and a practical/ observation/experience or role playing approach (as appropriate), for them to understand the basic idea behind the module. However, question and answer assessment is not recommended for these modules.

Mental and Cognitive Overload

Where is the knowledge we have lost in information – T.S. Eliot

To me, the topic of mental and cognitive overload is as important as the curriculum, as the brain can only focus for a short span, say about 20 minutes, and after that, the attention capacity reduces and becomes selective (Brenden, Wealth of Information & Poverty of Attention, 2015). In the world of today, whether it is in school, college or university, or our professional workplace or at home, we are flooded with information in the digital age. We will have to factor the issue of mental and cognitive overload and its impact on learning – as learners, parents, teachers, designers and policy makers.

We are living in an age of information overload. There is an interesting classification of 'Digital Natives' whose lives revolve around technology; 'Digital Immigrants' (term coined by Prensky, 2001), who are predecessors of 'Digital Natives', who are trying to learn the language of technology; and then there are 'The Digital Outcasts' (term coined by researchers from the University of Sussex) and it applies to web users inflicted by illness and disability, waiting for the world of Augmented reality and Virtual world to become accessible to them (Brenden, Wealth of Information & Poverty of Attention, 2015). Today, the wealth of information available to the learner (Digital Natives) through the internet creates not only an information overload, but also, a cognitive overload and this impacts learning.

According to Prof. Glenn Wilson, 'infomania' or information overload can drastically reduce a person's IQ.

Mental load was defined by Moray (1979) (Plass, Moreno, & Brunken, 2010) *as the difference between task demands and the person's ability to master these demands.* So, we have to factor the mental and cognitive load to ensure that the learner's potential is realised to the maximum. Also, one of the key functions of learning is to store automated schemas in long-term memory so that the working memory load can be reduced during problem-solving (Plass, Moreno, & Brunken, 2010).

When designing a curriculum or teaching methods, one needs to consider the capabilities and limitations of human cognitive architecture. There are three important aspects of cognitive load to be kept in mind:

intrinsic load (generated by difficulty of reading/teaching material), extraneous load (generated by the design of the instruction and materials) and the germane load (the amount of mental effort invested in acquiring schema and automation). The three (intrinsic, extraneous and germane loads) produce a total cognitive load during learning. There is a link between learner's working memory capacity and the information gathering, information processing and regulation of processing which affect the cognitive load during learning. Further, from a learner's perspective, the cognitive load will increase when the learner does not have metacognitive (awareness and understanding of one's own thought processes) skill (Plass, Moreno, & Brunken, 2010). So, this important concept brings to fore the importance of knowing the innate abilities of a learner, which will go a long way in the journey of the education adventure.

Also, the cognitive load theory is based on the assumption that the function of learning is to store automated schemas in long-term memory [according to the information store principle, human cognition includes a large store of information which governs the bulk of its activity, and long-term memory provides this function (Plass, Moreno, & Brunken, 2010)]. This assumption is based on the distinction between automatic and controlled processing proposed by Schneider and Shiffrin (1977). Also, enough research has gone into establishing that there are two different ways (automatic and controlled) to process information. Automatic processing is fast, effortless and is not limited by the working memory capacity (Plass, Moreno, & Brunken, 2010). On the other hand, controlled processing needs our attention and consicious efforts.

When people are faced with new material, the cognitive load imposed by that material will consist of the intrinsic cognitive load determined by the instructional design used. If the total cognitive load is excessive, learning and problem-solving will be inhibited (Sweller, 1993).

It is important to note that learning is compromised when the total of intrinsic, extraneous and germane load exceeds the working memory capacity. Good instructional design will reduce extraneous cognitive load and use the freed cognitive resources to increase germane cognitive load and learning (Plass, Moreno, & Brunken, 2010), and hence, the instructional design is perhaps, in my view, more critical than the content, for the learner. Also that, the germane load is unlike the intrinsic and

extraneous load and has a positive relationship with learning, since germane load is a result of putting cognitive resources to schema acquisition and automation, rather than other mental activities (Plass, Moreno, & Brunken, 2010). Hence, the education system should be designed in a manner that the learner is not overloaded with intrinsic and extraneous cognitive load.

Besides the cognitive approach to learning, there are three other frameworks i.e. behaviourism, which focuses only on the observable aspects of learning; socio-cognitive theories of learning, which focus on the type of learning that happens even when there is no direct interaction with the environment, and the constructivist learning theory, which focusses on how people construct knowledge among themselves and how they coconstruct knowledge with others (Plass, Moreno, & Brunken, 2010).

TABLE 4.1: Cognitive load effects

Cognitive load effect	***Description***	***Primary cognitive load source***
Worked-Example	Studying worked examples results in better performance on subsequent tests of problem solving than solving the equivalent problems (Renkl, 2005).	Extraneous
Completion	Requiring learners to complete partially solved problems can be just as effective as worked examples (Paas & van Merriënboer, 1994).	Extraneous
Split-Attention	Multiple sources of information that are unintelligible in isolation result in less learning when they are presented in split-attention as opposed to integrated format (Ayres & Sweller, 2005).	Extraneous
Modality	Multiple sources of information that are unintelligible in isolation result in less learning when they are presented in single-modality as opposed to dual-modality format (Low & Sweller, 2005).	Extraneous
Redundancy	The presence of sources of information that do not contribute to schema acquisition or automation interfere with learning (Sweller, 2005).	Extraneous
Expertise reversal	With increasing expertise, instructional procedures that are effective with novices can lose their effectiveness, whereas ineffective techniques can become effective (Kalyuga, 2005).	Extraneous

Guidance fading	With increasing expertise, learners should be presented worked examples followed by completion problems and then full problems rather than worked examples alone (Renkl, 2005).	Extraneous
Goal-Free	Problems presented in goal-free form enhance learning compared with conventional problems (Paas, Camp, & Rikers, 2001).	Extraneous
Element interactivity	Cognitive load effects are only obtainable using high rather than low element interactivity material (Sweller, 1994).	Intrinsic
Isolated/interacting elements	Learning is enhanced if very high element interactivity material is first presented as isolated elements followed by interacting elements versions rather than as interacting elements from initially (Pollock, Chandler & Sweller, 2002).	Intrinsic
Variable examples	Examples with variable surface features enhance learning compared with examples with similar features (Paas & van Merriënboer, 1994).	Germane
Imagination	Imagining procedures or concepts enhance learning compared with studying materials (Leahy & Sweller, 2004).	Germane

A very important principle of effective learning, can be inferred, i.e. generating information is ineffective; therefore, presenting information to learners in auditory and visual manner best facilitates learning, and the more information is borrowed and reorganised, the less learners need to generate themselves and the more impactful the instruction will be. The borrowing and reorganising principle suggests that bulk of human knowledge repository comes from others, than acquired by problem-solving or similar activities. Also, reduction of extraneous cognitive load allows for increase in working memory resources devoted to intrinsic cognitive load, increasing germane cognitive load and enhancing learning – (Plass, Moreno, & Brunken, 2010).

When it comes to team-based learning, the constructivist methods might be good to consider as the constructivist approach leads to active engagement of learners in cocreating knowledge and this approach might be better in enhancing germane load and learning (Plass, Moreno, & Brunken, 2010).

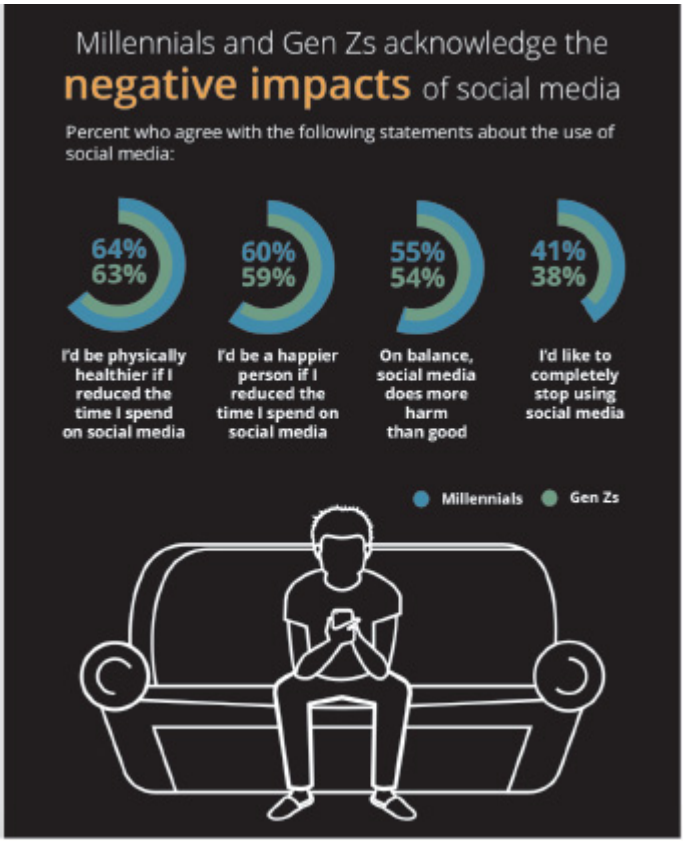
There is an interesting perspective to consider about education from evolutionary perspective. On one side, *we have the biologically primary*

knowledge which humans have acquired over many generations by immersion in society, like the basic problem-solv-ing, recognising faces, engaging in social relations and listening and speaking our native language, and this primary knowledge is acquired without much effort, subconsciously and effortlessly, and without external motivation simply by living in human society. Whereas, the biologically secondary knowledge is culturally dependent, acquired consciously and requires mental effort (Plass, Moreno, & Brunken, 2010). This is where our education system is supposed to deliver or function – in filling the gap.

Our current education system is loaded with a vast syllabus in the name of being essential information and a must-have, to create the best of competitive brains. But if we look at the cognitive load, *'providing too much information too quickly, even if the information is essential, is an example of extraneous cognitive load'* (Plass, Moreno, & Brunken, 2010) and certainly, it is detrimental to learning. Also, we need to have an instructional design where the working memory overload is reduced because if the intrinsic or germane load exceeds the limit of working load memory capacity for a learner's level, it could effectively become a form of extraneous load, restricting the learning process. Also, multimedia learning helps the learner to manage essential processing resulting in not overloading the learner's cognitive system (Plass, Moreno, & Brunken, 2010). Therefore, we must embed multimedia in our teaching method.

In the current generation, learners are spending too much time on the screen. According to Pew Research (Jiang, 2018), about 53% of the teenagers aged 13–17 feel that they spend too much time on their cellphone and most of this time is spent on checking messages, social media and gaming. According to another report (Anderson, 2018), teens spend an average of nine hours a day online, compared to six hours for those aged 8–12 years. These data are for the US, but even for India, it would be safe to assume that teens, as well as adults, spend two hours a day on mobile phone, which translates into 30 days a year spent on cellphones, and if the time goes up by two hours, it is a good two months a year on cellphone. So, the generation is bombarded with information and this in itself leads to mental load and cognitive overload due to viewing, reading and reacting on the screen time. This needs to be addressed before it is too late and starts negatively affecting the mental and physical health of youth and adults

alike. Already, it is coming out that poor academic performance can be predicted by higher levels of smartphone usage (OECD, 2019, p. 121).



Even, the millennials and Gen Z are aware that social media is harmful (Deloitte, 2019, p. 20). So, it is the responsibility of the education system to make them understand the impact it has on their cognitive load and how to meaningfully engage and benefit from the use of social media.

The point I wish to make here by quoting ‘Mental Load’ and ‘Cognitive Overload’ is that, we do not have to make the students memorise everything from dates of the king’s birth and deaths to battles, etc., to comprehensions and passages from Shakespeare; but make them sharp enough to pick up the most important messages from the knowledge imparted, so that they become wise. For example, why would I need to learn the birth date and death of Emperor Ashoka? I should be able to grasp an important lesson that, more than 2300 years ago, an Indian emperor ruled almost entire Asia and was among the greatest emperors running one of the biggest empires at that time. Still, the bloodshed in the battle of Kalinga changed him, and he

devoted his life to the spread of Buddhism in Asia and beyond. So, the message is - peace and not war, should prevail. Why add to cognitive and mental load by letting people learn all the dates? Just important events, regimes and rulers who made a historical impact, and what is the message for this generation, should be the aim.

We need to be selective about how much we can overload the learners; more so, if they have to be creative and future proof, we cannot overload them with facts and data of the past, but we need to share selective events and people who changed the course of humanity and history and what message it has for the future. We must not forget that, we can process only a certain amount of information at a given time and that for processing in long-term memory, it is prudent that we avoid overloading our mind with things which might be routine and not useful in the long-term.

Cognitive Offload

When we use stimulus or external sources and not depend on internal memory to reduce the cognitive demands of a task, it is called cognitive offloading (Riso & Gilbert, 2016). For our education system, this might be relevant in the context of offloading the routine stuff to avoid cognitive overload. At any time, I am working on multiple assignments, so I use digital tools like Wunderlist (now renamed, 'To-do' after acquisition by Microsoft), Evernote and Email, to keep saving ideas which I can refer back to in the future. Learners of this generation will have to rely on digital tools to ensure that they keep 'offloading' the routine and do not tax their limited memory with routine stuff.

Learning – What Works and What Does Not

Having discussed the multiple intelligence of learners and the cognitive overload and the mental load, I thought it was important to share suggestions on how to study. The education system is not just focussed on what to study, but is also pushy through its curriculum and examination system. I feel, it should also tell the learners how to go about studying and

what works and what doesn't, and what are the myths and reality about various issues and thoughts around learning and acquiring knowledge. This is an issue that bothers me and this book would be another academic book without an action plan, if I did not address it. I have always wondered that as a learner, which is like a bird in the ocean, how do I navigate the issue of learning and what are the options? As I was looking at the research done in this arena, I came across the work done (both primary and secondary research) by Yana Weinstein, Megan Sumeracki and Oliver Caviglioli (Weinstein, Sumeracki, & Caviglioli), and this section can be rightly attributed to their commendable research. It is important to know what is the best way to study and hope that this section will be enlightening to learners, knowledge givers and parents or guardians, alike.

There is an interesting comparison made between medicine and education, the two areas I have worked extensively for writing policies, and so, it is important to mention here that, while in medicine, there are multiple studies and trials done before the drug is considered safe for use, but in education, which is equally, if not more important, we do not use the same yardstick and rely more on intuition, which can be detrimental. Even in an advanced or rather, if I may use the word, 'developed' country like the United States, seldom teacher's education includes cognitive psychology related to teaching, and so, for the rest of the world, less said the better. Also, there is discrepancy between research and practice, which calls for more research in this area, and so the suggestions made in this section need more exhaustive research for evidence. Also, engagement of learners in defining research agenda is crucial.

Teachers are reluctant to change their teaching style even if they acknowledge that they may not be using the right tools or style. The reasons are multiple and include: time constraints, lack of access to academic journals, difficulty to interpret technical writing, lack of touch between researchers with realities in class-room and the resultant irrelevant recommendations and lack of trust with researchers. The knowledge flow is top-down and not bidirectional (which means that the flow of information is unidirectional – from the researcher to the teacher, whereas bidirectional manner requires a dialogue between the researcher and the learner) (Weinstein, Sumeracki, & Caviglioli, pp. 8, 9). In my view, the time has come, when the dialogue should not be just limited to researchers and teachers but also include the learners who, today, are more informed and

have more bright ideas, as they are not blinded by theoretical knowledge of the past. Also, once the researchers come out with new knowledge, the same knowledge must be disseminated and discussed with the teaching and learner community through a national digital platform or through focus groups or in debate clubs. This could bring about a much important change that is crucial to reducing the intrinsic and extrinsic cognitive overload.

It is important to understand that every learner is not alike in terms of grasping what is being taught, they can be verbal learners or they can be visual (Weinstein, Sumeracki, & Caviglioli, p. 5). I believe we can have learners who may be both, visual and verbal (auditory) learners. So, the teaching style has to be blended or if it is identified which learners are visual, verbal or both, accordingly, the teacher with an experience and proficiency in a specific field can be assigned. A better way is to use blended information sharing methods so that learners are not segregated but the teaching methodology takes care of the diverse group of learners.

Learning: Rote Memorisation and Understanding

Rote memorisation is remembering information without necessarily understanding it (understanding is being able to interpret and describe in one's own words). While people aspire to have the latter (understanding), but some believe that both memorisation and understanding are equally important to learning. (Weinstein, Sumeracki, & Caviglioli, p. 47).

Also, the teacher needs to understand and acknowledge that, while the learner may come with prior understanding and exposure about a topic or may be completely new to the topic, the teaching approach has to be one which is not just top-down (using our own knowledge to make the learner understand something), but also includes a bottom-up (with a stimulus) to make the topic understood by the learner.

For learners, their guardians and teachers, it is important to know that, there are six strategies for effective learning and these strategies are backed by extensive studies for decades (Weinstein, Sumeracki, & Caviglioli, pp. 7, 83) –

1. Spaced practice
2. Interleaving

3. Elaboration
4. Concrete examples
5. Dual coding
6. Retrieval practice

Of these six strategies, spacing and retrieval have received most support from the cognitive psychologists.

	Learning Strategy	*Brief about the strategy*	*Application examples (using childhood development from introduction to psychology)*	*Role of learners*	*Role of Teachers*	*Role of Parents*	*Remarks*
1	Spaced Practice	Creating a study schedule that spreads study activities over time rather than cramming before the exam	Learners can block off time to study and restudy key concepts such as attachment styles and developmental milestones on multiple days before an exam, rather than repeatedly studying the concepts right before the exam	Learners need to plan in advance and start with a plan for the calendar or a semester and then set aside a 'seat time and study time'. This 'seat/ study time' should be planned not just for the weeks before exams but for the entire calendar and must be adhered to	Teachers can introduce spacing technique in two ways (1) by creating opportunities to revisit information throughout the semester (spacing), or within one lesson (interleaving) and (2) by helping learners create their own effective study schedules This will ensure that the teachers do not rush up to teach the chapters/ syllabus in one go	Parents can help plan the calendar for studies during the start of the class and ensure that their wards follow the schedule as planned and show an understanding for this learning method by not forcing them to deviate from this approach	Repetitions spaced over time will lead to greater retention in the long run rather than cramming up before the exams and the learners, teachers and parents working together can make it successful
2	Interleaving	Switching between topics while studying. This involves switching between topics rather than studying a topic or a problem for too long. The topics which are somewhat inter-related but not too similar, and switching between these topics rather than studying them in one go or for too long.	After studying emotional development, learners can switch to cognitive development and then to social development; next time, learners can study the three in a different order, noting what new connections they can make between them.	Rather than studying a topic or problem for a long time at a stretch, switch it with another related topic. This will require planning by learners to keep related topics as a part of the 'seat time and study time'.	Teachers can help the learner by interleaving between chapters or topics and giving them timely guidance on what chapters or topics can be used under this technique.	Parents can keep a check on whether the child is switching between chapter and if it is helping to keep away mind-wandering and boredom associated with long spells of studying a problem or a topic. Keeping a track of the same and seeking honest feedback can help course correct, if things are not going in the right direction.	Benefits of interleaving are still under research and debate, and various issues like,its impact on attention, mind-wandering and reducing boredom might be beneficial,but other variables associated with it like,what level of similarity can be defined as ideal and also the kind of material can be interleaved. A close coordination between the teacher and the learner can be a great help to use this technique effectively.

3	Elaboration	Asking and explaining why and how things work.	Learners can explain how and why our memory changes across the lifespan; why don't we remember many things from when we were under five? How does our ability to remember change as we get older?	Ask the why and how of the topic and problem, and try to relate the answers between multiple things to be learnt. For the learner this technique will be of immense help to explain how and why things work from memory. Since more information is available on the topic, it might just help with cues about remembering the topic.	Teachers can guide the learners to come up with relevant 'how' and 'why' questions about the topics under study and then help the learners answer the questions, verify the answers and help them with feedback so as to help them to learn to use this technique more independently and effectively.	Parents can help learning in homework by asking about why and how the things they learn are related to what they have learnt earlier. Also, if this is used with retrieval, one can help arrive at the right level of why and how questions which will refine the usage of the technique.	Understanding occurs when the learner elaborates the memory by adding details to it and integrating it with existing knowledge. It is believed that one remembers better if it is processed deeply compared to when it is processed in a shallow manner. Memory theorists believe that elaboration is one of the best ways to enhance the learning and memory. Of the various elaboration techniques, elaborative interrogation, concrete examples and dual coding have shown promise in improving learning and helping learners understand the material they are learning.
4	Concrete examples	When studying abstract concepts, illustrating them with specific examples.	Learners can imagine the following example to explain childhood amnesia: two siblings, aged nine and four, go to Disney World. Ten years later, the nine-year old remembers this trip, whereas the four-year old does not.	With the topic under study, relate it to a practical or concrete example so that the topic under study can be understood better. This can help the learner with the right approach to identify the concrete examples.	Use more than one concrete example to explain the idea Teachers can help the learner to relate the concept to examples and vice versa.	Parents can discuss with learners about what they have learnt and how it is related to day-to-day life as concrete examples.	Concrete examples help illustrate an abstract idea and make it easier to understand but for some, if they cannot find the relation between the concrete examples and the abstract idea, this can actually impede learning.
5	Dual coding	Combine words with visuals giving learners two pathways by which to retrieve information later.	Learners can sketch the different phases in an attachment styles study, e.g., for secure attachment style: (1) mother in a room with baby, who is exploring toys; (2) mother leaves, baby is a bit upset but not inconsolable and (3) mother is back and baby happily hugs mother.	Learners can combine words and visuals and this gives two ways to understand and remember the topic.	Teachers can have the learners compare pictures in their text books to the related content Then, let the learners describe the content with words or visually represent the discussion/topic. This engages the dual technique of dual coding and the retrieval practice.	It would be good for the parents to do exercises on drawing and knowledge acquired in school to convert concepts into visual representations and vice versa.	The belief behind the proponents of dual coding is, that the learner has two formats to remember the same information. Also, combining pictures with words can be helpful to all learners and not just to those who like pictures. But the other side is that it might lead to cognitive overload if the learning activity requires too much cognitive capacity; this could apply to other learning styles as well and this technique helps the learner to sketch out from the memory.

6	Retrieval practice	Bringing learnt information to mind from long-term memory. Retrieval practice involves bringing information to mind from memory, and this technique is much more effective at promoting long-term learning than the more common technique of re-reading class materials.	When studying attachment styles, learners can practice writing out from memory, of the description of a child's behaviour as described by each style.	Retrieval helps improve learning. This also is a test of the fact that the topic has been understood than a mere re-reading as you can reproduce on recalling and is an effective study technique Learners can create flash cards for retrieval technique.	This can be done through a number of activities to help learners bring the information to mind from memory. This can be in form of low-stake quizzes, or multiple-choice questions, or short answer type questions which also reduce their anxiety compared to high-stake tests.	Parents can help the learner to explain and describe from their memory of what they learnt in school and this is an effective reinforcement of the retrieval technique.	Compared to feel-good factor associated with re-reading, the retrieval practice is difficult. In reality, anything that involves bringing information to mind from memory improves learning, which makes memory both durable and more flexible for future use. The act of retrieval is in itself thought to strengthen the memory. Scaffolding by giving hints and guides is a great way to help increase retrieval success. Retrieval practice promotes meaningful learning. If the goal is long-lasting, durable learning, then retrieval practice is a highly effective learning strategy for many ages and abilities.

(Weinstein, Sumeracki, & Caviglioli, pp. 84-152)

Studies have indicated that more than half of the learners use repeated reading as their number one strategy for studying, though the findings of research in this area indicate otherwise, and so repeated reading is not the best way to study.

Spaced practice and interleaving – though harder, but produce better long-term results. In the late 1800s, German researcher, Hermann Ebbinghaus concluded that, 'With any considerable number of repetitions, a suitable distribution of them over a space of time is decidedly more advantageous than the massing of them at a single time'. The benefits of space practice are dependent on the gap between the study sessions and the final test/examination. Also, spaced reading has better results than re-reading continuously. Spacing is considered to be effective as it is believed to increase the 'storage strength', which is a measure of deep learning (Weinstein, Sumeracki, & Caviglioli, pp. 88-92). The best way is to combine various techniques for effective learning.

Reading, Re-reading and Writing – Which is Better?

Though reading multiple times may make a student feel good, and also consume more time, but it certainly does not improve long-term retention of information, as we are not engaging with the information at a deeper level though but we may become fluent with reading, it certainly does not improve learning in the long run. In fact, reading and writing is better to remember, compared to only re-reading (Weinstein, Sumeracki, & Caviglioli, pp. 23-25).

Handwriting

My experience with handwriting has not been a great one. In school, I had a book on cursive writing, but I am not sure if it helped me with my own handwriting style, which I must admit has not been consistent. But I know of many accomplished people with a clear, uniform and consistent writing style. It is interesting to quote here what Mahatma Gandhi said about writing: '*Let every young man and woman be warned by my example, and understand that good handwriting is a necessary part of education, and that, the children must be taught drawing before writing*. (Pathak, 2016).

Though, as the generation moves digital, I am not sure how much will people write, with dictation and voice commands taking up important tasks, but artistic and natural expressions would still need handwriting. Handwriting engages the brain in reproducing what one is thinking, and hence, it is also a means to decipher one's thinking, speed of thought and expression. So, it is imperative that the schools not only teach writing as an activity, but both as a science and art. Also, for those who have travelled the world and observed people on how they hold the pen/ pencil and how they write, it is interesting to note that there are multiple ways to hold the pen and pencil, and some ways of holding produce a more legible script (this is an area of study and research), but learners must be exposed to various ways of holding a writing instrument to see, try, feel comfortable and practice for themselves to write legibly and proficiently. Also, introducing calligraphy in schools will be an interesting value addition and a step to teach students basics about design. This will go a long way and beyond just improving handwriting skills.

Decorated classrooms do not deliver better stimulus

Studies have shown that children receive enough stimulus for learning in their daily lives even without decorated classrooms and that overly decorated classrooms can negatively impact learning through distraction (Weinstein, Sumeracki, & Caviglioli, p. 35). Though moderate decoration is fine, but going overboard may not work positively.

Caffeine and studies

All of us have relied on some stimulus to keep awake and alert for learning, and tea or coffee is one of the most common stimulant for learners. The research shows that, *in moderation, coffee can increase the speed with which you react and your ability to persevere on a boring, repetitive task. Also, moderate intake of caffeine helps in attention. However, the results of caffeine on memory are mixed* (Weinstein, Sumeracki, & Caviglioli, p. 152). In the later section, I discuss in more detail about the harmful effects of caffeine and the other options. For myself, the entire process of making tea or coffee and then having it, keeps me alert and attentive, but just drinking tea and coffee does not help enough. I believe that the process of making the tea/coffee activates all the activity centres and stimulates the mind to be alert and attentive. Caffeine can give us alertness and keep us awake, but will it help us in focussing on the topic we are learning or trying to understand ? Answer may not be a sure ‘Yes’.

Reward and Studies

For subjects or topics in which the learner is less interested, a small reward (extrinsic motivation) may be desirable, but a disproportionate reward can do harm by decreasing intrinsic motivation (Weinstein, Sumeracki, & Caviglioli, p. 158).

Intrinsic Motivation and Rewards

The teacher can control the situational interest but has no say over the individual interest. Also, it is important to see whether the learner is self-driven and motivated or if rewards and punishment are drivers. If there is a dull task, extrinsic motivation may work, but if there is an intrinsic desire to learn, extrinsic motivation may be detrimental.

Open-book versus Closed-book Examination System

While there are two schools of thought about the benefits of each system, and each comes with its own benefits, but in the end, if one looks at the final result of both the examination systems, both are testing the same! Not much research is available to make a point here about which is a better system, but this may be an area of further research to explore other facets associated with each mode of assessment.

Multitasking

Though the data points are concluding that, it is 'almost impossible' to pay attention to multiple activities at the same time (Weinstein, Sumeracki & Caviglioli, pp. 52-3), which means that either we can pay attention to what we are trying to understand or listen to music, but not both. However, my personal experience is a bit different (as exceptions are always there for every theory, and also, people differ in their abilities and some are differently or/and abundantly blessed). In my family, while I can only focus on one task at a time, my wife and son can read and listen to music at the same time, and according to them, it is not distracting for them. But every learner needs to figure out the best way to give attention, considering their brain's ability to multitask. Also, research indicates that when we switch tasks and go back and forth between tasks, there is a cost of switching between tasks and it decreases efficiency and slows our reaction speed on both the tasks (Weinstein, Sumeracki, & Caviglioli, p. 53).

5

Experiential Learning

'The direction in which education starts a man, will determine his future life,' said Socrates to Adeimantus in Plato's Republic.

Certain new concepts, topics and practices need to be taught as experiential learning – as projects, group works, case studies or even short films. If these are application oriented, valuable, interesting and engaging, and stimulate the thinking cap, the learners will attend, even if attendance is not compulsory, and the evaluation does not happen through a formal examination. So, the below mentioned topics need to be integrated in the curriculum.

Academic Intelligence and Working Intelligence

When we have to move our education system beyond just academics, it is important to first clear our thoughts about what is our education system doing. All it does is to present itself to the learner without giving the learner the chance to present himself/herself to the system, to make a complete individual and to leverage the full potential of the unique individual (learner) who enters the education system. So, I bring forth the thought to first understand the difference between academic intelligence and what I coin as 'working intelligence'. In academic parlance, intelligence is defined as *'the quickness of understanding'* (Oxford University Press, 1988, p. 332).

What we are doing through the education system is all about academic intelligence, which, according to psychology, measures the skills like language, and maths, and these are tested through examinations and determine the intelligence quotient. Academic intelligence is broadly referred to a learner's ability to cope up with the academic environment and benefit from interfacing with the academic environment. It is based on the principle

that the learner who is academically prepared will have strong reading comprehension, writing and study skills, will be able to take effective notes in the class, outline and manage their time in school and will be aware of what is going around; namely the process of education (Zalesne & Nadvorney, 2011).

Here, I bring forth the new intelligence, i.e. 'working intelligence', which is a culmination of various attributes which are of crucial importance in handling the day-to-day life, and it is different from the theoretical intelligence – the academic intelligence. It is like, one cannot learn swimming by reading a book! One can learn the theory of what it takes to swim (academic intelligence), but it will need working intelligence to experience the various steps taught in the theory of how to swim. One may read about various techniques of swimming but when one gets into the pool, lake or river to learn to swim, one may find that the learner can only use a specific technique, and other techniques taught in theory do not work in practice or in the real world (working intelligence). I did my research on this topic of working intelligence and I could not find any material on it, despite going through available literature and all search engines. So, perhaps I am using it for the first time as a theory of working intelligence and to me, the biggest shift in the way we deliver education to the learner of the 21st century is the need to make the 'big shift' from academic intelligence to what I call the 'working intelligence'. This means that all that we teach must be based on experience, experiment or observation, and each and every thing taught must show its relation and relevance to our daily lives in practical applications. Academic intelligence has brought us to a dead end. We need to chart a new direction by moving away from academic intelligence to working intelligence.

Fluid Intelligence and Crystallised Intelligence

Fluid intelligence is the capacity to think logically and solve problems in novel situations, independent of acquired knowledge. Fluid intelligence involves the ability to identify patterns and relationships that underpin novel problems and to extrapolate these findings using logic (Bergland, 2013).

Fluid intelligence refers to the ability to reason and to solve new problems independently of the previously acquired knowledge and is critical for a wide

variety of cognitive tasks and is considered one of the most important factors in learning (Jaeggi, Buschkuehl, & Perrig, 2008).

Crystallised intelligence (world knowledge) is the ability to utilise information, skills, knowledge and experience in a way that could be measured on a standardised test. This intelligence represents the lifetime cerebral knowledge (Bergland, 2013).

The field of fluid intelligence is directly linked to creativity and innovation. It is observed that great creative minds ensure that some form of physical activity is a part of their daily routine. The studies have also shown that the fluid intelligence can be improved by non-academic activities. In fact, neural volume and connectivity of the cerebellum benefit from motor activities like running, biking, swimming, meditation, yoga and art. Studies have shown that excitability of the motor cortex has a direct link with the performance of the working memory. There are examples of thinking linked to activity; like, Albert Einstein thought about the theory of relativity riding his bicycle! Creativity can be at two extremes – be it an aerobic activity, which clears the cobwebs of the mind and gives access to thoughts and insights which are out of bound when we are sedentary and the other extreme is rapid eye movement (REM) sleep, about which I mention in the other section on sleep. Keith Richards got the idea of the song 'Satisfaction' in his sleep, and so, regular exercise and sleep help in enhancing fluid intelligence and can lead to a creative powerhouse (Bergland, 2013).

The crystallised abilities increase throughout young adulthood and middle-age, and then plateau later, with no growth in old age, but fluid intelligence does not substantially decline by then (Hess, Strough, & Lokenhoff, 2015). According to psychologists, the fluid intelligence peaks in early twenties, the decline is slow from 30s to 50s but accelerates from 60s onwards (Rabbitt, 2015). So, the education system needs to maximise the potential of the learner during the years when the fluid intelligence is at its peak.

Debate and Public Speaking

Most of the schools now have a debate competition, and the so-called 'brightest' kids are picked up for the competition to ensure that the class or the school wins the competition. This needs a re-look. We need to ensure that

debate and public speaking is an integral part of the school education and every learner is well-versed to be assertive and can deal with the situations where this ability comes in handy. Also, by just letting learners debate will not help, unless they are given tips on how to do a debate and how to be an effective speaker. Ideally, this session can be created through a video lesson on massive open online course (MOOC) and learners can view it at home or school and participate. This also needs participation from the community, and the local community should organise session on debate and public speaking.

WRITTEN COMMUNICATION

It goes without saying that 'a pen is mightier than a sword', but besides the questions and answers for the lessons taught, learners are not doing much creative writing. Twitter is an interesting development where one needs to express the idea, thought or message in 280 characters, while earlier it was just 140 characters. So, the writing skills taught a decade ago remain important but the new facet of the web tools used for writing are important as well. People use social media indiscriminately by either initiating, commenting or forwarding content, and sometimes, this can cross the boundary of what is lawful. The point I am making here is that learners should know what to write and how to write effectively and also keep in mind the legality of what is written and spread. For this, it might be a good idea to let learners work on a project from grade 8th onwards wherein, they pick up a topic, analyse it and then write a 250–300-word essay describing the chosen topic in their own words and let other learners also share the same in a class. Similarly, the school magazine should have group articles from learners. This is how learners will learn different perspectives come from different people on the same topic, and this will also help the learners to accept others and different opinions. A great way to teach teamwork. There are more ways to build on this, but I leave that for the curriculum design experts and psychologists to work on the modules that take care of inculcating a sense of creative visualisation, expression and ability to accept varied opinions. This should never be given as a homework, as parents end up doing it for kids and it defeats the intent and purpose.

So, instead of homework, group work in class will be a good idea to practice teamwork.

If we look at the Global Education Survey by Varkey Foundation, UK (Joshi, 2018), it is the parent who actually ends up doing the homework for the kids, and no wonder, Indian parents are spending maximum time with their kids' homework.

Country	:	*Hours spent weekly by parents for kids' homework*
India	:	12
Turkey	:	8.7
Singapore	:	7.9
Brazil	:	7.5
Russia	:	7.5
China	:	7.2
South Africa	:	6.8
US	:	6.2
South Korea	:	5.4
Germany	:	5
Spain	:	4.8
Australia	:	4.4
France	:	3.9
UK	:	3.6
Japan	:	2.6

And worse, 74% of the teachers in India are still using homework as a testing tool to assess learners, and just one in four teachers use project-based or experiential learning to assess learners, according to the National Achievement Survey report for classes 3, 5 and 8. This survey had covered both public and private schools. In states like Rajasthan, Himachal Pradesh and Haryana, the teachers majorly use homework as the only tool to assess the learners (Gyanesh, 2019).

Communication and Body Language

Research in this field has revealed that, half of our communication is attributed to body language, and words account for just 50 percent of our communication (Cooper, 2018). So, the learner must be taught the basics of the body language communication and this will go a long way in handling people, situations, responses and decisions, most importantly in negotiation and conflict resolution. Learners should be able to interpret the signals of various body postures and tone. Without understanding the same and using it, communication is incomplete and education system should address the same.

Reading, Listening and Memory

Reading is the new travelling. There is so much available to read and watch on the internet, that we can learn a lot without travelling too much.

It is very important for the learner and the knowledge giver to understand the learner's ability to read, listen and memorise. I have been a student, and I am still a learner. Nowhere in my school, college, or university life anyone assessed me for my ability to read, listen and memorise. If the knowledge givers have no idea of my learning abilities, how can one teach or learn effectively?

There are simple tools available to check the reading speed of a learner and his/her ability to listen and remember. If the knowledge giver does not know in which bandwidth of reading, listening and memory the group of learners in a class are, the knowledge giver will continue to teach at his or her own pace and all will go above the learner's head and the entire time spent will be futile. Moreover, the learners would be most reluctant to come to the class, and in an utmost hurry to exit the class, except for the sake of attendance. So, it may be good to assess learners, and the knowledge giver be made aware of the same, and blended learning and teaching techniques can be used, instead of segregating the learners. Also, it is important that the learners are taught the basics on how to read, listen and memorise. Today, we deliver lectures, right from kindergarten to post-graduation, but we never enlighten the learner on what it takes to read, listen and memorise. This must be done before, or as one enters the preparatory level.

Music, Learning a New Language and Sports

If we look at the role of music, new language, sports and other activities that can keep us sharp (Brenden, Wealth of Information & Poverty of Attention, 2015), then we will realise the role played by such activities;

- Learning a new language or music: such an activity requires complete engagement of a section of the brain – 'nucleus basalis'. This part of the brain helps us to focus.
- Walking is also helpful in the flow of the oxygen to the brain and keeping the billions of neurons in good shape.

- *There have been efforts to relate musical intelligence to other cognitive domains, and research speculates that musical and spatial capacities may be closely allied in human cognition. Scientists have gathered evidence that adults who listen to classical music show a transient superiority on spatial tasks requiring them to rotate objects or geometric figures, in their imagination. Studies show that young children who study a keyboard instrument perform better than various control groups on tasks requiring spatial – temporal operations* (Gardner, 1999, p. 86).

Why do I bring out the relation between music, sports – and education is because, it applies to the learners, teachers and parents. Everyone must realise the importance of these skills and the associated skills like mathematics and music, science and artistic works, because the general attitude of the teachers, parents and the learners is – why waste time on music, sports and arts and better invest time in solving few more problems in maths or physics. At the end of the day, investments in these subjects will yield good dividends in the form of marks and the resultant job. It is equally important to invest time in music and arts (depending on the talent and interest the learner has) to ensure that the learner delivers to his/her maximum potential, with interest in the associated skills, such as mathematics or science. Some of the greatest brains like Leonardo Da Vinci have mastered and excelled in both arts and science at the same time, and these knowledge segments are complementary and enhance the versatility of the brain. Ignoring one could cost another and that is perhaps an area of further research for neuropsychologists and educationists. It is also important to mention that in 2006, physicists had associated Van Gogh's paintings with the mathematical formula for turbulence in liquids, whereas the paintings dates back to 1930s. Van Gogh's turbulence in the sky was almost an identical match to the turbulence in liquids, and the researchers were amazed to find such a good relationship. One of the researchers stated, 'Art sometimes precedes scientific analysis' and the relationship can go the other way around, and even the scientists can use art to understand mathematics. Famous physicist Richard Feynman revolutionised his field in the 1940s, when he used a simple way to diagram quantum effects (Grandin & Panek, 2014, p. 145). So, the learners must give due importance to music, arts and sports which will help them focus on their academics.

Sleep, Memory, Learning and Brain Development

A ruffled mind makes a restless pillow – Charlotte Bronte

Generally, sleep is about getting 'rest', to start again, and it is a common experience to hear elders at home and even teachers commenting that, 'work hard, sleep less. You can sleep later in life.' But this is not how our body clock is tuned to work. In my earlier years, I used to study all night and then, when I got into job, I used to get up at 3.30 am and start reading and sending emails. But sometime, around 2005–06, I decided to follow a personally defined principle – 'a few more hours in bed, and a few more years in life'. And when I researched on this important topic, I came to understand that sleep is much more important! In fact, if you are not having adequate sleep, you are doing an irreparable loss to both your mind and body, which will directly impact your present and future. As a learner, it is important to understand the importance of sleep and what role it plays. Thanks to researchers like Jean-Jacques d' Ortous de Mairan, Dr. Lewis Terman, Dr. Ronald Wilson, Professor Nathaniel Kleitman, Bruce Richardson, Jenkins and Dallenbach, Irwin Feinberg, Robert Stickgold and Matthew Walker, who have made remarkable contributions in connecting the dots and making the research meaningful. Thanks to many such researchers, now, we do have an in-depth understanding of the science behind sleep, or the lack of it.

Types of Sleep; REM and Non-REM Sleep

We need to understand sleep a little better to have the best. Sleep is of two basic types: rapid eye movement (REM) sleep and non-rapid eye movement (NREM) sleep, with three different stages. Typically, sleep starts with a NREM sleep. In stage one, we sleep lightly and can be awakened easily by disturbance. During the first stage of the sleep, our eyes move slowly and muscles relax, heart and breathing rates begin to slow. Then, the sleep enters stage two NREM sleep, which is characterised by slower brain waves, with occasional bursts of rapid waves. We typically spend half the night in this stage.

When we transition to stage three NREM sleep, our brain becomes even slower, and the brain produces slow waves almost exclusively. The stage

three is a very deep stage of sleep during which it is difficult to wake up. Deep sleep is considered to be 'restorative' stage of the sleep which is necessary for feeling well-rested and energetic during the day.

During the REM sleep, our eyes move rapidly below the eyelids in different directions and the breathing becomes more rapid, irregular and shallow, and the heart rate and blood pressure increases. Dreaming happens in this phase – the REM sleep. This is the phase when our arm and leg muscles are temporarily paralysed so that we do not move during the dream (U.S. Department of Health and Human Services, 2011, pp. 5-6). We typically enter the REM sleep in about 60–90 minutes after falling asleep. Post that, the sleep stages repeat themselves continuously. As we sleep, the REM sleep time becomes longer, while time spent in stage three NREM, sleep becomes shorter. By the time we wake up, nearly all our sleep time has been spent in stage one and two of NREM sleep and in REM sleep. If REM sleep is severely disrupted during one night, REM sleep time will be typically longer than normal in subsequent nights, until we catch up.

Overall, almost one-half of our total sleep time is spent in stage two NREM sleep and about one-fifth each in deep sleep (stage three NREM sleep) and REM sleep (U.S. Department of Health and Human Services, 2011, p. 6).

Types of Sleep		
Non-REM Sleep		***REM Sleep***
Stage one	Light sleep: easily awakened; muscles relax with occasional twitches; eye movements are slow	Usually occurs first, about 90 minutes, after you fall asleep; longer, deeper periods occur during the second-half of the night; cycles along with the NREM stages throughout the night • Eyes move rapidly behind closed eyelids • Breathing, heart rate, and blood pressure are irregular • Dreaming occurs • Arm and leg muscles are temporarily paralysed
Stage two	Eye movements stop; slower brain waves, with occasional bursts of rapid brain waves	
Stage three	Occurs soon after you fall sleep and mostly in the first half of the night. Deep sleep; difficult to awaken; large slow brain waves; heart and respiratory rates are slow and muscles are relaxed	
(U.S. Department of Health and Human Services, 2011, p. 5)		

Sleeping detoxifies the brain. According to a study by University of Rochester, the brain cells 'glia' dilates during sleep and provides way for the

removal of the toxins. Sleep also strengthens the neurons (Brenden, Wealth of Information & Poverty of Attention, 2015).

On the other hand, an abnormality in sleep can disrupt hormone levels, endocrine functions and metabolic functions. Those who work in night shift have health-related issues that can also result in shorter lifespans (Ducharame, 2018). Also, there have been instances of people who have been awake for unusually long hours to have microsleep (this lasts for a few seconds with eyelids partially or fully closed), and this is a major cause of accidents, as it leads to momentary lapse in concentration (Walker, 2018, p. 52).

The sleep pattern depends on the individual body types. I realised quite late that this was affecting my health and as mentioned earlier, started to apply the personal philosophy of 'a few more hours in bed and a few more years in life'. Every learner should be made aware of the importance of sleep and the repercussions of the lack of it. Learners of all ages fall in two categories: Night owls, who go to bed well past midnight and wake up late and the morning larks, who sleep early and wake up early. Everyone has a unique pattern and makeup when it comes to sleep. During my graduation days, I used to study from 10.00 pm to 5.00 am. Sleep from 5.00 am to 7.00 or 8.00 am, and then go and attend classes. Sleep for another hour or two in the evening, and then get back to study at 10.00 pm. I even skipped the evening nap often.

Sleep patterns are specific to individuals. In fact, most people have monophasic sleep (that is, they have just one spell of sleep, while others are polyphasic, i.e. they sleep multiple times in a day). But some sleep patterns are bizarre and aberrations, more than a norm like: Winston Churchill used to sleep twice – two hours each, every day, and claimed that his two-hour nap at 5:00 pm allowed him to get one and a half day's worth of work done every day. Legend, Leonardo Da Vinci, slept 20 minutes every four hours (Marin, 2016).

It has been experimented that if learners are asked to stay awake all night or sleep all night, the learners who stay up all night remember less of what they learnt the previous day! This makes us arrive at a conclusion that the learners who are deprived of sleep, hurt their learnings (Weinstein, Sumeracki & Caviglioli, p. 13). In a study of teen learners, whose school timing was moved ahead and thereby resulted in their sleeping 43 minutes extra, the average scholastic assessment test (SAT) scores of the top performing-learners improved from 605 to 761. For the same learners, for maths, the SAT

scores increased from an average of 683 to 739, after increased sleep. The life trajectories can change with such increased scores (Walker, 2018, pp. 311-2).

Sleep is important for learning, and sleep-deprived learners can become vulnerable to health problems like weight gain or increased chances of illness and cognitive impairments. Having adequate sleep enhances the understanding of information and problem-solving (Weinstein, Sumeracki & Caviglioli, p. 148).

It is important to delve deeper into this topic of sleep, scientifically.

Sleeping less than six or seven hours at night severely impacts our immune system, doubles the risk of cancer, increases chances of having Alzheimer's disease, disrupts the blood sugar levels to predispose us to becoming diabetic and increases likelihood of blocking our coronary arteries leading to cardiovascular diseases, stroke and congestive heart failure.

Also, it is advisable to sleep about 7–9 hours a day for optimum performance. Based on what I now know of sleep and how it impacts us, I would strongly recommend educational institutions at every level to start not before 9:00 or 10:00 am. This would be helpful from the environment and traffic perspective as well. Most of the offices would start between 8:00 am and 9:00 am and if educational institutions start at 10:00 am or so, we can avoid peak-hour traffic, both on public transport and on the road, to ensure that the timings do not clash between office and educational institutions. Most importantly, learners and office goers get adequate time to sleep well (Walker, 2018, p. 3).

Let us look at the recommendations for the hours of sleep based on age from well-reputed organisations

Age Group	*Recommended amount of Sleep*	*Organisation*	*Reference*
3–5 years	About 11–12 hours at night, plus 1–2 hours afternoon nap	Mayo Clinic	(Olson, 2019)
6–13 years	10–13 hours	Mayo Clinic	(Olson, 2019)
14–17 years	8–10 hours	Mayo Clinic	(Olson, 2019)
Adults	7–9 hours	Mayo Clinic	(Olson, 2019)
Preschool (3–5 years)	10–13 hours per 24 hours including naps	Centers for Disease Control and Prevention (CDC), USA	(CDC, 2017)
School age (6–12 years)	9–12 hours per 24 hours	Centers for Disease Control and Prevention (CDC), USA	(CDC, 2017)
Preschoolers (3–5 years)	10–13 hours	National Sleep Foundation, USA	(National Sleep Foundation, 2015)
School-age children (6–13 years)	9–11 hours	National Sleep Foundation, USA	(National Sleep Foundation, 2015)
Teenagers (14–17 years)	8–10 hours	National Sleep Foundation, USA	(National Sleep Foundation, 2015)
Younger adults (18–25 years)	7–9 hours	National Sleep Foundation, USA	(National Sleep Foundation, 2015)
Adults (26–64 years)	7–9 hours	National Sleep Foundation, USA	(National Sleep Foundation, 2015)
Older adults (65+ years)	7–8 hours	National Sleep Foundation, USA	(National Sleep Foundation, 2015)
New borns	16–18 hours	U.S. Department of Health and Human Services	(U.S. Department of Health and Human Services, 2011, p. 19)
Preschool (3–5 Years)	11–12 hours	U.S. Department of Health and Human Services	(U.S. Department of Health and Human Services, 2011, p. 19)
School-aged Children and Adolescents	10 hours	U.S. Department of Health and Human Services	(U.S. Department of Health and Human Services, 2011, p. 19)

Adults	7–9 hours	U.S. Department of Health and Human Services	(U.S. Department of Health and Human Services, 2011, p. 19)
4 months – 12 months	12–16 hours	American Academy of Pediatrics (AAP)	(American Academy of Pediatrics, 2016)
Children (1–2 years)	11–14 hours	American Academy of Pediatrics (AAP)	(American Academy of Pediatrics, 2016)
Children (3–5 years)	10–13 hours	American Academy of Pediatrics (AAP)	(American Academy of Pediatrics, 2016)
Children (6–12 years)	9–12 hours	American Academy of Pediatrics (AAP)	(American Academy of Pediatrics, 2016)
Teenagers (13–18 years)	8–10 hours	American Academy of Pediatrics (AAP)	(American Academy of Pediatrics, 2016)

* AAP recommends that all screens be turned off 30 minutes before bedtime and that TV, computers and other screens not be allowed in children's bedroom. (American Academy of Pediatrics, 2016)

It is important to understand that NREM dominates our early sleep which is followed by REM sleep dominating in the morning. So, if one sleeps 8 hours and forgoes two hours of morning sleep, it is not a 25% loss of sleep, as our brain desires most of the REM sleep in the last leg of our sleep, i.e. early morning. So if we lose 2 hours of early morning sleep, we are actually losing 60–90% of all our REM sleep even though we are just losing 25% of our total sleep time (Walker, 2018, p. 46). With sleep, we clear the accumulated adenosine (a chemical which accumulates for every minute we are awake till we sleep), so we are ready to face the day with vigour and sharp brain function (Walker, 2018, p. 33). And so, sleep is an important biological function, which if not taken adequately, hampers our functioning.

Since sleeping the entire duration is important, we must move our school timing from mid-morning to late morning.

Our brain consists of about 100 billion neurons, and about 20,000 neurons constitute the suprachiasmatic nucleus, which controls many of our activities, including our focus and being awake or sleep. For the diurnal (active during the day) species, the suprachiasmatic nucleus activates many brain and body mechanisms during daylight hours. It is seen that most of the Olympic records are broken early afternoon, as that is the time when the circadian rhythm is at its peak (Walker, 2018, pp. 14-19). This clearly indicates the time when we have the maximum focus and alertness. This can be tied to learners grasping what is being taught or learnt.

Most importantly, we need to understand how sleep impacts us and our body.

According to Irwin Feinberg, 'deep sleep may be a driving force for brain maturation, not the other way around'.

In early years of life, REM sleep stimulates growth of neural pathways which is important for developing the brain (Walker, 2018, p. 79)**,** and deprivation of any type of sleep (REM or NREM) will cause brain impairment (Walker, 2018, p. 108).

Sleep rejuvenates the brain and enhances the capacity for learning. Brain needs sleep to auto-update our memory based on the events of the prior day, weed out information which is not necessary (so, helps in forgetting what we need to) and also, NREM sleep carries memory (recent experience) and moves them from a short-term storage site to a long-term storage site, so that the short-term storage region, the hippocampus, does not run out of its storage capacity or overwrites one memory with another (*a mishap termed as interference forgetting*), and then it is transferred through a file storage mechanism to a long-term and a bigger storage capacity secure vault – the cortex (Walker, 2018, p. 109). NREM sleep does the reflection of storing and strengthening, and REM sleep acts as an integrator of connecting all the past experiences (entire database of experience in our brain) with new experiences. So, reflection and integration as a result of NREM and REM sleep help in building and enhancing innovative insights, creativity and problem-solving abilities (Walker, 2018, p. 52). So, if I conclude that creativity is powered by sleep, it would be correct.

Many a time, we forget something and when we wake up the next day, it immediately comes to our mind. This shows two things: one, that sleep is important and second, how brain has worked during sleep. The science behind this is simple – our brain works during our sleep to connect the vast data repository and link it up with the recent tasks/memory, and this is the unique function which fosters impressive problem-solving abilities. If we go by some of the examples of discoveries as a result of sleep, it would be right to state that, 'informational alchemy conjured by REM-sleep dreaming has led to some of the greatest feats of transformational thinking in the history of human race' (Walker, 2018, p. 132).

For learners of any age, it is important to remember that a full-night sleep is important for enhanced learning ability, and sleep is akin to clicking the 'save' button on the newly created files (Walker, 2018, p. 112)**.** For having a

textbook memory, the early-night sleep (deep NREM sleep) is a key contributor, when compared to the late-night REM-rich sleep, and experiments have shown that more the deep NREM sleep, the more information the individual remembered the next day (Walker, 2018, pp. 113-4). Experiments in groups of learners have revealed that sleep-deprived learners have a 40 percent deficit in remembering new facts (Walker, 2018, p. 154). Also, lack of sleep leads to aggression, bullying and other behavioural issues in children, including addiction and overeating (leading to obesity). Besides, Attention Deficit Disorder (ADD), Alzheimer's and cancer are related to sleep deprivation (Walker, 2018, pp. 148-69).

Sleep is a wonder drug, and like a garage and a mechanic for brain, where brain is finetuned, repaired and made fit to run again – fully serviced.

Caffeine and Power Nap

I know some great personalities in different fields who do take a power nap and trust me, they are alert, healthy and focussed in their work. Needless to mention, they are at the top in their field of work.

The people whom I have personally known practice the following for nap:

- A must-have: They usually do not miss it in their daily routine
- Usually nap after lunch for 20–60 minutes
- Nap around 2.30–3.00 pm
- Silence: No calls or disturbance in a closed room

Experiments prove that those who take nap during the day have a decent 20 percent learning advantage over those who did not take the nap (Walker, 2018, p. 110), and even a short, 20-minute nap during the day can boost memory consolidation as long as there is enough NREM sleep (Walker, 2018, p. 115). Even NASA scientists have identified that naps as short as 26 minutes led to a 34 percent increase in task performance and helped to achieve a 50 percent increase in overall alertness among astronauts (Walker, 2018, p. 305).

One of the world's top provider of medical information online, WebMD (Soong, 2011) points that, if we need to recharge, instead of caffeine, a power nap will boost the memory, cognitive skills and energy level. Well, for learners, I advise them not to do so in school or college, unless it is a break! However, do consider this as an important part of daily schedule. Well, I

would not advice to have a power nap as a substitute for sleep deprivation but as an add-on to your normal sleep. It is advised that this power nap be around 20 minutes. According to WebMD (Soong, 2011), research shows that longer the nap, better the memory and creativity. Further, it adds, napping for 30–60 minutes is good for decision-making skills and REM sleep, and plays an important role in making new connections in the brain and helps in solving creative problems. Also, if we have the option of short-naps and caffeine, the decision should be a no-brainer, as caffeine can reduce memory performance, so one may feel wired, but can tend to make mistakes.

In fact, caffeine (present in coffee, some teas, dark chocolate, energy drinks and some icecreams, etc.) is not a food supplement but a psychotropic stimulant - A stimulant drug, which is also addictive, and which is widely abused in terms of intake. In fact, if we look at the occurrence of sleep, there are three factors at work – (a) after dusk, the release of melatonin from the pineal gland. This melatonin signals the brain that it is time to sleep; (b) another factor is the circadian rhythm and then (c) it is the sleep pressure, chemical adenosine which starts building up in the brain for every minute we are awake and more the adenosine, more the desire to sleep. Caffeine blocks the adenosine receptors and helps us fight sleep by fighting adenosine. It acts as a masking agent and blocks the sleep signal which is communicated by adenosine to the brain. Also, half-life of caffeine is between 5 and 7 hours. So, even after 5–7 hours of taking coffee, half of it is still active and circulating through the brain tissue. Also, when considering decaffeinated coffee, people must keep in mind that it is not caffeine-free but has 15–30 percent of the normal caffeine (Walker, 2018, pp. 26-9). Also, those who resort to alcohol should keep in mind that alcohol is the most powerful suppressor of REM sleep (Walker, 2018, p. 82)**,** and we know the impact of deprived REM sleep.

Napping on a regular basis may help reduce stress and even help reduce the risk of heart disease. Mednick (Soong, 2011) advises the following with regards to napping:

- Consistency: Prime napping time is in the middle of the day between 1:00–3:00 pm. It is advisable to keep a regular schedule for napping
- Make it quick: It is advised that one sets an alarm for 30 minutes or less
- Dark: Nap in absence of light. Either switch off your lights or wear an eye mask

- Warmth: Cover yourself with a blanket as the body temperature drops as we snooze

So, between a stimulant and a nap, the choice is clear and so are the benefits.

Sports

Inclusion of sports in mainstream education is important and goes much beyond 'all work and no play makes Jack a dull boy'. In fact, sports is in itself education, and not just an extracurricular activity, as is a norm in the current education system.

Sports help learners to develop the following:

1. Stamina
2. Alertness
3. Discipline
4. Cognitive functions and ability to take quick decisions
5. Team spirit/teamwork
6. Time management
7. An ability to handle wins and defeat
8. Fitness

Besides the above mentioned benefits of sports (physical activity), based on massive review of more than 850 studies conducted by researchers in kinesiology and paediatrics on the effects of physical activity on school children, it is recommended that the learners should do one hour (or more) of moderate to vigorous physical activity every day, and this brings a positive influence on memory, concentration and classroom behaviour (Robinson, 2018). In younger and healthy adults, more physical activity increases the overall sleep time, more importantly, the deep NREM sleep. This, in turn, has a positive impact on our fitness and energy (Walker, 2018, pp. 293-4).

Social Skills

In the IT age, social interactions and dynamics are changing. We spend more time communicating with people through devices than face to face, and so, the formalisation of social skills is critical in today's world.

Social skills are the ability to influence and persuade people. People with high social skills possess the following competencies:

- *They are able to deal with conflicts in an assertive and straightforward manner.*
- *They practice open communication and are receptive to both praise and criticism.*
- *People with high social skills can inspire others to pursue a shared goal or vision* (Cooper, 2018).

Role of Friend Circle

When it comes to grooming talent or providing conducive environment, we need to learn from what Stephen Hawking wrote in his book, 'Brief Answers to the Big Questions' (Hawking, 2018). He was not a very good student and he could barely score more than halfway up in his class. Also, his work was untidy and handwriting was not very good. It was his friends whom he talked about everything and this led to his dream about the career path he took. So, parents have to ensure that their kids have good friends and they work and discuss together, besides paying attention to hobbies or other extracurricular activities.

With competition heating up and becoming more cut-throat in every walk of life, social skills will not only help in navigating the churn, but also help stay balanced and confident in handling the complex environment.

Cognitive Skills

Cognition is defined as the mental action or process of acquiring knowledge and understanding through thought, experience and the senses. Though I have tried to cover major aspects of developing cognitive skills like taking to learn a new instrument or language, physical activity, adequate sleep, meditation, breaking from the routine and solving puzzles, sudoku, mental games, etc., few daily habits which can help improve the cognitive functions (Begland,

2014), is the ‘Brain workout’, which can also arrest the cognitive decline. These include:

- Physical activity: The science behind this is that, certain hormones which increase as a result of exercise help to boost memory and also protect the brain against degeneration. Scientists believe that during an endurance exercise, Irisin is produced which has a neuroprotective effect.
- Activities that are demanding on the brain-like learning new skills, help the brain to remain sharp as one ages. Also, getting to undertake something unfamiliar and mentally challenging provides mental and social stimulation.

Curiosity and Creativity:

- A study in Michigan State concluded that childhood participation in arts and crafts led to innovation, patents and increased the odds of being an entrepreneur. The researchers found that entrepreneurs or patent holders received about eight times more exposure to arts as children than the general public. Further, studies found that sustained exposure to such activities in adult life will lead to more likelihood of being an entrepreneur, patent holder or a person with published articles.
- Music is also known to increase the brain volume and strengthens the communication within different areas of the brain. Learning music before the age of seven is more helpful to how the brain interprets, and integrates a wide range of sensory information. Further, research at the Harvard Medical School has pointed to the role of music training as a tool in education and also its role in treating a range of learning disabilities.
- Reading, writing and other brain-stimulating activities at any age help in preserving memory. Neuroscientists believe that reading a novel can enhance connectivity and improve the brain function.
- Social connectivity is important as feeling lonely can lead to cognitive decline and so, if the learners get engaged in social work, like devoting a few hours a month to a social cause or meeting people, it will help develop cognitive abilities.
- Meditation and yoga are now accepted as a global phenomenon and these are not only ancient, but time-tested practices for boosting cognitive functions.

- Sleep as described in earlier section is also critical to cognitive functions and sleep deprivation reduces the grey matter and affects working memory and executive function of the brain adversely.

For boosting brain power and staying sharp, these three activities are helpful

- Learn a new language or a new musical instrument: It is a fact that as we age, our brain cells die and the brain shrinks. So, we need to engage in an activity which can be mentally taxing, like learning a new language or a music instrument, as this requires the full engagement of a section of the brain, the 'nucleus basalis'. The role of this part of the brain is to help us focus on tasks.
- Walk: A regular walk, besides keeping us healthy, can help keep the brain active and healthy as well. Walking helps to regulate the flow of oxygen to brain, thus keeping the neurons healthy, and walking can help us reduce the chances of getting cognitive illness like dementia by 60%.
- Sleep: Sleeping is a good way to 'detox' the brain. According to a study by the University of Rochester, the brain cell 'glia' dilates during sleep and paves way for toxins to get eliminated. Besides, sleep is instrumental in strengthening the newly formed neuron connections in the brain (Brenden, Wealth of Information & Poverty of Attention, 2015).
- I would add to the above, the practice of 'seat time', when you sit silently without any thoughts – just relaxed. This is a great way to unwind your mind or sometimes reflect back and introspect dispassionately.

New IQ (NIQ) – Imagination Quotient

Exposure – Experience – Imagination

Imagination is more important than knowledge—Albert Einstein

'Imagination' is defined in the dictionary as, 'the mental faculty of forming images of objects not present to senses; creative faculty of mind' (Oxford University Press, 1988). With all the knowledge, experience and expertise one has, the final test is your imagination! Though each one of us

knows that this 'power of imagination' is an invaluable asset, but we do not know how to nurture and enhance it. The education system's key contribution is to develop and nurture the power of imagination. Like all human performance parameters, this parameter of imagination (imagination quotient) can also be measured, and though it is in early stages, but the work is underway and the team at the Imagination Institute at the Penn's Centre for Positive Psychology is working on it, and this (imagination quotient) is intended to predict competitive advantage (Llewellyn, 2014).

To me, this NIQ (imagination quotient) is much more valuable than the other IQ (intelligence quotient). It is believed that, IQ contributes about 20 percent to the factors that contribute to success (Goleman, 2009), and if I were to put it in order of importance, I would put it as: imagination quotient, spiritual quotient, emotional quotient and intelligence quotient.

Though we need more research in measuring this NIQ (New IQ), but it is without doubt that education system's key contribution should be enhancement of NIQ, which will play an important role in survival of humanity and its progress.

Throughout this book, I have, under various sections, put forth ideas to enhance curiosity, creativity and the ability to think futuristic, and I do hope that finally such activities, when made an integral part of the education system, will enhance the imagination quotient.

Intelligence Quotient (IQ), Emotional Intelligence (EI), Emotional Quotient (EQ)

Intelligence quotient is generally defined as the ratio of one's mental age to one's chronological age, with the ratio being multiplied by hundred (Gardner, 1999, p. 12). But in today's fast-paced world, this is not enough. We need emotional intelligence as much as we need intelligence. It is worth considering that people with high IQ have not necessarily done well outside the educational institutes, and those with academically average or below-average IQ have turned out to be the richest and most powerful alumni. In fact, EQ is the missing link in the understanding to the finding that 70% of the time, people with an average IQ outperform those with the highest IQ. The connection between top performers and high EQ is so strong that 90% of top

performers have high EQ (Bradberry, 2019). We need to consider Sternberg's idea of 'practical intelligence' and also add emotions, morality, creativity and leadership in education (Gardner, 1999, pp. 23-24).

Emotional intelligence and emotional quotient are used interchangeably and broadly mean the same.

'Emotional Intelligence or Emotional Quotient', (both represent the same idea), is a type of intelligence that refers to an individual's ability to recognise and manage or control their own and other people's emotions. It is a simple and straightforward concept that comprises of two main components:

- *Identifying or recognising emotions, intentions, desires and goals in yourself and other people.*
- *Managing these emotions and actions to accomplish the most positive outcome for everyone involved.*

(Cooper, 2018)

It is an accepted fact that IQ is not just good enough, and EQ or EI have a key role in the success of people. This is one area which is not addressed in the school education, currently. If the learner knows what is emotional intelligence or emotional quotient, they can develop and build upon it; as though IQ is inherited, emotional intelligence or emotional quotient can be nurtured and built upon. This is critical for success in life and is of immense value in dealing with people and situations in professional and personal life.

Experts point that IQ contributes to about 10–25 percent in our success, and the rest is determined by various factors, including our ability to manage our and other people's emotion. According to a research by Dr. Travis Bradberry, 90 percent of the top-performing workers in an organisation have high emotional intelligence. People with high emotional intelligence earn about USD 29,000 higher than people with low emotional intelligence in the same work profile. People with high EQ have high productivity, efficiency and earn more (Cooper, 2018). It is worthwhile to note here that REM sleep is a contributor to enhancing EQ (Walker, 2018, p. 75).

Now, there are tests available which can assess an individual for emotional intelligence and emotional quotient, and learners should be made aware of the same to build upon them.

It is believed that, EQ & IQ, both complement each other to enhance the chances of success. A person with an average intelligence and highly evolved emotional intelligence has a greater chance of success (Cooper, 2018).

There are various models of emotional intelligence like; the emotional intelligence ability model, mixed model emotional intelligence, emotional intelligence trait model. Also there are various tests to check the EQ, and my experience is that once you know your level of EQ, you can build upon it. So, it is recommended that one takes a test on EQ and works to build upon it, if needed. The field of emotional intelligence is fairly established and there are tests available, to find out one's level of emotional intelligence, like:

- ***Multifactor Emotional Intelligence Scale (MEIS)*** – This test will help you understand how well you identify and understand emotions
- ***Reuven Bar-On's EQ-1*** – This test analyses your skills on how to succeed under stress and demands of your surrounding
- ***Seligman Attributional Style Questionnaire*** – This test measures your levels of optimism and pessimism

(Palmer, 2015)

For a learner, it is important to remember a few things about emotions and responses:

- Emotions are neural hormones, which are released in response to our perceptions, and they direct us to a specific action. So, there is no such classification as a bad or good emotion.
- The body needs around six seconds to absorb chemicals which can alter the emotions (Cooper, 2018), and so, this reaction time must be kept in mind before an outburst.
- The basic step to developing higher emotional intelligence is to stop judging and curbing our emotions (Cooper, 2018).
- Our ability to delay gratification is an important factor in the choices we make (decision-making). This has a critical role in success in our lives and has been proven by the famous "marshmallow test" in the 1960s (Cooper, 2018).
- Writing a journal and analysing the thoughts behind action could be helpful in developing higher EQ.

People with high emotional quotient, seek feedback, accept conflicting view-points, and don't become victims of emotions or take criticism personally, or get into blame game when confronting odd situations or failures, but use all the feedback and criticism to introspect and bring about positive change (Cooper, 2018).

EQ is an essential skill, which has tremendous applications in daily professional and personal lives, in managing our family, our office, our work situations and even our ability to comprehend and take decisions, and finally, make things happen to achieve the desired goals.

In the age where automation and artificial intelligence will hit jobs, people with high emotional intelligence (emotional quotient) will have an edge over any Artificial Intelligence (AI)/Machine Learning (ML) product and service, and perhaps will save their jobs. This I see as a major differentiator in today's world. Also, for dealing with the deluge of social media, and its reactions, one needs to have high emotional forbearance levels to withstand adverse comments and contrary views, without losing one's temper or cool. So according to me, a high emotional quotient will lead to high emotional forbearance level, and this is one of the important competences which must be taught and nurtured all throughout, during schooling years and age. IQ is hereditary and also, machines are becoming intelligent, but we are still far away from developing emotionally intelligent machines. Humans with high EQ will command a premium and will be indispensable in a world driven by AI and ML. I am sure that AI one day will surpass HI (Human Intelligence), but not HEQ (Human Emotional Quotient), and so, we need to make EQ an integral part of education in a structured manner.

Spiritual Quotient

The science of measuring our intelligence started with measuring IQ, then the science of measuring our emotions came with EQ and then came the science of measuring our spiritual intelligence; Spiritual Quotient (SQ), which is going beyond our cognitive and emotional skills. It is about defining our vision and value to humanity. It is about responsibility, humility and happiness (Howell, 2019). This is important for stress management. Stress is one of the vices of the materialistic world. SQ is about knowing our mortality, connecting with the inner self and finding a purpose and the value of life to humanity and society. Long ago, Abraham Maslow had pointed through his theory of 'hierarchy of needs' that as the nations and their populations attain affluence, their hunger for spirituality increases. Also, SQ increases the power of intuition (Hattangadi, 2018) and is considered as important as IQ. Education system should not just limit to IQ or EQ, but also must focus on

SQ for creativity, broader canvas thinking happiness and relevance to society. This is an area which needs more research on its application-oriented teaching and will go a long way in creating individuals who are more humane and responsible because, whereas IQ and EQ can help us in knowing what we can be, but SQ helps us to understand who we are. This connect is very important for laying a strong foundation for everything we undertake, else we see mostly what people refer to the midlife crisis around the age of forty. If spiritual quotient/intelligence is taught in schooling years, this crisis may be averted and people will stay relevant to the needs of the society and have meaningful goals which take care of the balance between the material wealth and spiritual wealth, which is of utmost importance for contentment with achievement. The 'discovery break', I mention ahead as a separate topic in this book, will be a good way to enhance our spiritual quotient, besides meditation, yoga, reading and interaction with elders and the learned.

Social Quotient: Social Intelligence – Societal Impact – Individual Social Responsibility

Social intelligence is our ability to build relations and figure out our way through social environments. It helps increase social-emotional intelligence manifold, adopt and adapt, and be assertive and not aggressive (Cooper, 2018). If the learner is made aware of the social intelligence, societal impact and individual social responsibility through a 30-minute module, the learner of today is smart enough to pick a project and deliver during his/her 'academic break'. This will make the learner more sensitive towards broader societal issues which are critical for the harmonious living and development of a cohesive and prosperous society.

Team-Based Learning, Working and Leadership

Ability to carry everyone along, collaborate, adjust/accommodate others and deliver on the goals, is a key skill to acquire during early school years. There

are various ways to do this. One is group work in the classroom (our current lecture and theatre style seating need to change to group seating, so that, learners work in a group, besides other design changes), other is the music group, sports group, etc., and then, it is the assignment which requires people to work in groups outside the classroom settings or even co-authoring an article in the school magazine. Teamwork is important for the learner to become empathetic to others, and to help and become accommodative to the team's strengths and weaknesses. Also, finally, a learner acquires the ability to lead a diverse team in future professional role or collaborate with others in work. Future of the world is collaboration and not just competition, and even in handling competition, one needs to collaborate to succeed. There are various tools available and more need to be developed to ensure that the team-based learning identifies goals likely to develop the skill, basic rules and table manners and etiquette – for interaction, empathy, listening, accommodating, accepting diversity and how to conduct a meeting.

These skills will be crucial for success, as the learner steps into professional life – be it an entrepreneur, professional or in service sector, and all these competences should be acquired during schooling years and age.

Critical Thinking and Problem-Solving

Critical thinking and problem-solving skills are an important skill to have and these are very much required for negotiation and conflict resolution. There are many ways this can be taught as a structured module. But an ancient Indian game of chess comes in as a perfect fit to teach this. Chess is an ancient game which originated in India. Playing chess as a game is mentioned in internationally acclaimed research, journals and books. According to Plass, Moreno, & Brunken (2010), the game of chess requires the most sophisticated of human cognitive processes. It is a game of problem-solving and thought. So, our education system must leverage and make sure that chess, as a game, is taught in schools from grade 8^{th} if not earlier, so that the learners can develop cognitive skills and enhance it.

Negotiation and Conflict Resolution Skills

Next to critical thinking and problem-solving is negotiation and conflict resolution. This is an important skill to have to navigate and survive in the complex world. When we start our day, we start negotiating; who makes tea – breakfast, to who drives to school – work, or what to do in the evening, to multiple negotiations outside home about the cab driver, getting the seat in the train and finally, at work, where without negotiation and conflict resolution skills, either you become an agenda or you drive an agenda, either you lead or get cornered, either you get recognised or you get penalised, either you get an increment or a transfer, either you are an achiever or a frustrated soul. This skill is about learning a few basics, and I would highly recommend that people read books on it or are taught through a structured course, project or a group exercise on negotiation. This is an important skill to have as much as good oral and written communication skill. Education system should teach the learner about 'cognitive tuning', which is a key trait required to influence people by becoming more like them, in behaviour and to agree with people on most of what they think, feel and appreciate. This behaviour allows people to be on the same frequency and helps them to relate to each other. This is called cognitive tuning (Damon, 2017), and a must-have quality for anyone in today's world. Cognitive tuning is the key communication tool for negotiation and conflict resolution.

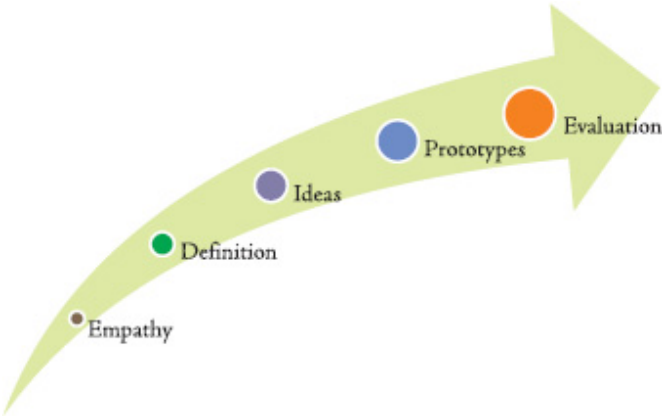
Design Thinking

The world is passing through an interesting phase at all times. We are a part of an evolving process, which is a sort of continuous churning, where one problem gets solved, another emerges. The learners in every age have to be competent enough to find solution to the existing and even future challenges, and one key competence needed is 'design thinking'. Not only design thinking is a way to address the challenges, but its key role lies in reducing the chances of failure (Center, 2015), making the learner understand the importance of accepting failures as a path to success (a great example of Thomas Edison failing 300 times in his prototype till he succeeded in inventing the light bulb) (Tonhauser, 2015). Moreover, in my view, one of the essential qualities of a learner is to give up preconceived notions, and design thinking takes off the blinkers of preconceived notions.

Education in itself requires design thinking and this is one area where design thinking has been applied to a great extent (Center, 2015). According to the world's foremost and revered design thinker, Tim Brown; 'Design thinking taps into capacities we all have but that are overlooked by more conventional problem-solving practices' (Brown T., 2009).

Design thinking model has a clear pathway which includes two sides – the problem side and the solution side (Tonhauser, 2015) and is further comprised of:

- Understanding, observing and empathising (getting in the trenches, in the shoes of the people to understand their perspective);
- Definition (the problem statement should clearly identify the need gap);
- Ideas (imagination holds the key and to get as many ideas as possible to narrow down later);
- Prototypes (envisioning a solution and making the first cut, raw form which continues to undergo iteration); and
- Evaluation or testing (getting the feedback on the prototype and other associated factors and testing the final outcome) (Center, 2015) (Tonhauser, 2015).



These things should be clear to learners when they study design thinking. I am sure this field is evolving and will have more than just this model, but it is important that the knowledge giver keeps updating, innovating and sharing the latest with the learner – not only what is available in books (theory), but what is acquired due to projects undertaken in real life with local examples.

Strategy and Tactics

This is a world of competition and collaboration, and our children and even we have to be really good at strategy and tactics. It is not just about being in business or being a manager that one needs to use strategy and tactics for. Even if one is a learner, sportsperson, politician, social worker, activist, lawyer, doctor, engineer or a teacher, for that matter any profession and for every project, one cannot undermine the role of having a planned strategy in the success of the endeavour. It is important that this be taught as a 'project work' in class, and more importantly in group setting, asking them for role plays while doing the project. As mentioned earlier, under the section on critical thinking and problem-solving, chess as a game is a great way to get the people to understand the importance of foresight and strategy.

Entrepreneurship

The best way to teach entrepreneurship is to let the learners aged 14 and above enrol into the 'Earn while you learn' or 'Apprenticeship' program. Under this program, the learner can do the course and also get hands-on training. Once the learner experiences the taste of working and making money, it is likely that a few might drop out of the four-walled campus and pursue a career in setting up an enterprise. If not, the learner will do part-time studies and earn as well.

Futuristic Mindset – Foresight Approach and Methodology

If I were to state important qualities of a learner post the schooling age which will not just be relevant, but a prerequisite and an invaluable asset for the foreseeable future, I would say, a high emotional quotient, a futurist mindset, design thinking, negotiation and problem solving. Else, I would consider a learner a mediocre, and the learner should keep this in mind, that the cost of being a mediocre is low but the price one pays is disproportionately high, and the beauty of this statement is that it can be understood by many but the

benefit lies in acting on it. For that, the school system, and more importantly the education system as a whole, has to make the learner prepared with various approaches like the foresight approach. I learnt about it being a part of the think tank that was advising the NHS, UK. It was insightful on how we can look at a structured approach to plan the future. Richard Slaughter defined foresight as, 'a universal human capacity which allows people to think ahead and consider, model, create and respond to, future eventualities' (Slaughter, Futures Thinking for Social Foresight: Glossary of Futures Terms*, 2005). Foresight is a structured approach towards looking at the future, and the foresight methodologies are used by individuals, corporations and governments (Kilzer, 2012).

Foresight can range from 5–100 years or even more. As a student, I planned for 10 years and when in the corporate world, I did the same and now, I do for 20 years or more when I write policies for the government or with the global organisations, and multilateral bodies. One can use 'forecasting' – people who look at the current scenario and plan for the future or 'backcasting' technique – people who envision the future first and then work backwards (Kilzer, 2012). For learners of today, foresight techniques are a must-have, and not only these should be taught as a module and practised as a project work or as a team, but each learner must have his or her own individual foresight project in life.

Stress Buster

We all need to find an activity which helps to vent out our stress, frustration or helps us offload from the daily grind – the routine, and recharge or reboot ourselves to get the excitement back for studies or work. Even if you like it, you may get tired of solving the same, lengthy hard problem in maths or science and would need a break. Everyone is unique, so this stress buster will be unique to everyone. For some, making coffee or tea is a stress buster; for some, yoga, meditation, listening to or singing music and for some a physical activity or writing a poem. For me, my stress buster is making tea/coffee, ironing clothes or washing clothes, taking a few kilometres of walk and listening to music. A hobby can also be a great stress buster, like, gardening, solving quizzes or playing sudoku, drawing or even social media updates. Any activity which you can do for 15–30 minutes, or may be one hour, and

feel destressed. For me, finding the stress buster is as important as a job. Also, you cannot enjoy your studies if you cannot vent out your stress and recharge.

HOBBY

The dictionary meaning of hobby is 'an activity done regularly in one's leisure time for pleasure'. Hobby to me appears to be the best way to destress and it is a much needed break. Given the proliferation of social media addiction, who has leisure time today ? Social media is eating all the spare time we have, and we will have to define limits of how much time we allocate to social media. I allocate between 15–30 minutes, depending on the updates. But it is still strongly advised to have a hobby. It is about passion and so, we love to spend our 'leftover' time in activities which are unique to us and help us unwind. A few advantages of having a hobby as an integral part of life are (Columbia College, Calgary, 2018):

- Boosts confidence: This increases the confidence when one becomes good or skilled at something.
- Stress buster: Hobby helps to unwind and it is a stress buster.
- Socialise: Hobby may give one an opportunity (depends on the hobby) to socialise with others and meet new people and increase the circle of your friends.
- Creativity: Since hobbies are not very structured and they are about our spare time, it gives us the freedom to try new things and become more creative which goes on to become an asset in professional life ahead.

According to *Psychology Today* by Dr. Jamie L. Kurtz (Kurtz, 2015), hobbies help:

- Structure the time and help us free up more time by encouraging us to become more efficient.
- Promotes flow: We can feel it when we are lost in activities like sports, arts, project or any other challenging and absorbing activity. This is what is attributed to 'experiencing flow'. We become immersed in it and time flies.
- Hobbies make people interesting: They create a talking point, start conversations/stories and inspire others, as well make people interested in you, or the other way around.

For me, writing started as a hobby and finally, I see it becoming my professional activity. So, hobbies can move from being spare-time activities to full-time profession. It is important that the learner of today understands that social media is not a hobby and we certainly need one!

Gaming and Puzzles

Though it will be wrong to generalise whether gaming is less demanding or more on the brain and so also the puzzles, and whether they have negative effects on children, but we need to use these gaming and puzzles creatively, in furthering the mental capabilities in a scientific manner. The proliferation of mobiles makes us sedentary and it is being said that, 'sitting is the new smoking'! But, given the access to games and puzzles, it may be one way of engaging the brain and even relieving stress. Though, easy games or puzzles are less demanding on brain and may not have noticeable benefits to an ageing mind and brain (Begland, 2014), and hence, appropriate curriculum linked to various mental capabilities could be designed to leverage the potential of gaming. I had once asked my son about his gaming habit (he plays about 30 minutes a day), and his logic was sound – that the games he plays require a strategy and these games help him understand and develop a strategic mindset which might be useful in his future. A few years back, on a trip to London, I had a chance to go to a meeting with the legendary Sir Muir Gray, First Chief Knowledge Officer of NHS, UK. He was working on games to help doctors become better administrators. It is important to quote here that in 2011, an online video puzzle game, 'Foldit', solved the mystery of the crystal structure of a particular monomeric retroviral protease. This structure (configuration) had baffled the scientists for a long time and the solution was significant enough to be published in a scientific journal, and the best part was that, those who solved the problem for the scientists were actually not biochemists, but were pattern thinkers (Grandin & Panek, 2014, p. 147). In India, giving preschoolers mathematics-based games generated enduring improvements in their intuitive abilities (World Bank, 2019, p. 51).

So, if gaming and puzzles are used for such demanding activities, it can boost the cognitive functions of the brain and is not a waste of time as long as one follows discipline with the self-defined limits and does not let it become an addiction. Further, gaming can play an important role in training and

research, besides others. Also, according to a recent study, digital games beat mindfulness apps in work-related stress management (Collins, Cox, Wilcock, & Jones, 2019).

In the US, schools have started preparing learners for being professional gamers, and competitive video gaming has created a new market – 'eSports', and universities like New York University and the University of California are offering scholarships for eSports, and it is now a legitimate course in eight states in the US (Jimenez, 2019). If these eSports are taught with an objective like developing a strategy or tactics, it can be really useful as a module. Besides making it a module in education, countries like the UK and the US, are offering full-time bachelor's and master's courses in gaming (eSports), considering that eSports players are paid as much as the traditional professional sports players (The Times of India, 2019).

MINDFULNESS

Mindfulness means paying attention in a particular way; on purpose, in the present moment, and nonjudgmentally. – Jon Kabat-Zinn (1994)

According to American Psychological Association, mindfulness is defined, *'as a moment-to-moment awareness of one's experience without judgement. In this sense, mindfulness is a state not a trait. While it might be promoted by certain practices or activities such as meditation, it is not equivalent to or synonymous with them'*. (American Psychological Association, 2012)

According to the authors at the American Psychological Association (Davis & Hayes, 2012), there are multiple ways to achieve mindfulness, like yoga, tai chi and qigong. Most of the literature has focussed on mindfulness, which is developed through mindfulness meditation – the practices related to self-regulation, with focus on training, attention and awareness in order to activate mental processes, help to exercise greater voluntary control, and result in general mental well-being and development of specific capacities like calmness, clarity and concentration. Also, the research on mindfulness has identified the following benefits:

- Reduced rumination and fewer symptoms of depression, in addition to better working memory capacity and sustained attention

- Stress reduction decreases anxiety
- Boosts working memory
- Leads to better performance on attention – focus
- Reduces emotional reactivity
- Leads to greater cognitive flexibility
- Better relationship satisfaction

(Davis & Hayes, 2012)

Mindfulness experiments in schools have shown significant improvement in teacher-related social and emotional competence – attention and concentration (A & Reichl, 2010).

Given the benefits of mindfulness, it is imperative that learners should undergo tailored modules early on in the preparatory phase. Once they understand and practice it, it will go a long way to make them better learners, not just at school, but later in life as well.

INNOVATION

I have served as an advisor where I made 'innovation' as my USP (Unique Selling Preposition). For this, I have been among the highest paid professionals at my level in the industries which I served. I was keenly interested in innovation, so pursued a master's degree in Innovation and Change Management from the UK. After doing that course, I have understood one thing clearly that innovation needs a clear understanding and a cultural shift. Also, in today's world where we have so many challenges, we need to find innovative solutions to make this world a better place. Anything we can touch has to be innovated and transformed. We will need innovation not just to thrive, but innovation is the basic skill needed to survive in this VUCA (Volatile, Uncertain, Complex, Ambiguous) world. Innovation commands a premium. Innovation is not prescriptive, that is, we cannot issue a circular or a government order for a school or a university to become innovative. It needs a culture, a mindset for being innovative, and this is what the learner must imbibe during his/her foundation and higher learning stage. There is a need to develop a few modules on innovation, which can be taught as a MOOC (massive open online course) and the learner can accumulate credit points for doing the online course.

Also, the most important point for people framing, deciding, implementing and imparting education is that, if the learners are put to routine tasks and schedules on a regular basis, the mind will think routine and there will be no out-of-the-box thinking or innovation. For the learners to become innovative, they need to be a part of the education system which is flexible, and which ensures that the learner understands, acknowledges, initiates and works on breakthrough solutions and not just incremental changes or solutions. For this, the learners will need to train their minds in flexibility and be large canvas thinkers. Also, the culture of the education system needs a radical shift. Authoritative culture is anti-innovation and so I strongly recommend relooking the ancient authoritative Guru–Shishya (teacher-student) relation to be transformed into Guru–Mitra-Shishya (friendly facilitator–student) relationship. There is a difference between learning and teaching. Learning is a two-way process where the knowledge giver and knowledge seeker are at par or on equal footing. Else, it is just teaching and hence, it is time to move to the Guru–Mitra-Shishya model.

Our schools have to give freedom to learners to ask any question, no matter how trivial it may appear, and the facilitator of knowledge seeker (teacher of today) must encourage, energise and explain to the learner in a friendly manner. In my view, it is better to be stupid in school than be stupid in life, and so, every learner must ask questions which come to one's mind. Let me share an example here. A few months back, I visited a reputed institute where the learners were majorly doctors, who were being trained as hospital administrators or in public health, and after my lecture, I let learners ask questions. One learner stood up and asked a question where she talked about the US healthcare system and praised it. Immediately, the director of the institute standing next to me scolded her, 'Do you know what you are asking and to whom? He is an expert on global health systems and for sure, US is not the number one system. Please do your homework before asking such questions'. I was shocked at the director rebuking the learner for asking a question, and had to cut short the director. I appreciated the learner for asking the question, and told her to keep this spirit of asking question alive and told the director not to scold learners for asking questions. This is exactly what they have come here for. In such an authoritarian culture, will innovation ever happen? If the culture of education system does not change, the learner will not be innovative and the nation can never have breakthrough ideas. Starting with, can the learner call the teacher with first name? If you think we can do it, you have achieved the first 50% objective of bringing innovation to the

education system. Let us understand one thing – that knowledge transfer is always between equals – one who wants to transfer and one who is seeking it. Once we create artificial barriers, knowledge transfer becomes a distant goal. Also, in the review of evidence, two noted psychologists indicate that, 'the teacher gains more than the learner in the process of teaching' (Robert B & Patricia R, 1997) (Grant, 2016). So, we have a reason why teachers must not consider themselves on the higher pedestal while doing the knowledge transfer.

Also, we must rethink on the everyday school timing and lecture pattern and timing. May be, we can keep the school timing and class timing different on different days, weeks or months. Like, one day may have 2 periods and the other days 4, 6 or 10. We have to break from the tradition and routine to make the learner innovative. Also, one or two days a week, there can be site visits or non-lecture teaching. Think beyond what we do today to innovate.

Innovation, over time, should be embedded in the entire method of sharing knowledge so that it is no more a separate course.

Quality of Life

Early on, the learners must be taught how to plan, how to prioritise and focus on tasks, what matters in life and how much is enough – this ties to the financial planning, solitude, mindfulness, ability to accept failures and setbacks, besides other things mentioned in different sections of the book. All these and many other factors are keys to ensuring quality of life, which is the key for healthy and happy living, and should be the ultimate goal, i.e. outcome of a good education system. We are so lost in life's routine that we forget the old adage, 'It is not the years in life which matters, it is the life in years'. Learners need to have at least one module every six months on quality of life and what matters.

Sustainable Consumption and Sustainable Development

Sustainable development has been spoken for too long and not sustainable consumption, but almost three decades ago, my guru, Dr. Murli Manohar Joshi, a physicist turned politician, founder of the ruling party and former Union Cabinet Minister, spoke about it. We have been discussing and debating on sustainable consumption and sustainable development for more than a decade. Now, it is in the UN SDGs. (UNDP, 2019). Today, we have a threefold challenge: on one side, we are growing beyond the sustainable limits for this planet; second, despite limited resources, instead of adding, we are wasting resources; and third, we are polluting the planet and making it inhabitable. Learners, early on, must be shown short films on the issue of sustainable consumption and its relation to sustainable development and how each one can make a big difference.

Solitude – Seat Time, Self-awareness and Introspection

We are living in a hyperconnected world. Learners and professionals are so preoccupied with the virtual world that, solitude is missing and loneliness abounds! This is a big challenge for everyone in the society. Just imagine: if we spend two hours a day on social media, it is actually 2 hours per day x 365 days = 730 hours = 30.41 days. So, we are spending about a month every year in the virtual world (mobile, internet, etc.) and some people are spending 4 hours or more, which means that they are spending two months a year on social media only. We need to be mindful of spending time with ourselves, introspect and rewind. Merely reading, training and keeping busy will not make us productive. We need to keep our ‘seat time’, where we spend time for meditation, and cutting off from the distractions. This is something the education system should embed in learners through the ‘silence period’. If we inculcate this habit in learners early on, they will realise the significance of solitude and introspection, which is crucial for a learner.

Major Religions, Leading Philosophers and Their Message

The world is passing through a tough phase, where religion, instead of uniting – is dividing, instead of spreading peace – is creating unrest, instead of creating understanding – is creating differences. As we advance and grow, we are losing the basic principles of humanity and progress. All religions were found centuries ago, and they were found on some basic principles. Learners need to be taught in brief the basic ideology and principles of every major religion and leading philosophers, from class eighth till tenth, not more than 10 modules of about 30 minutes, each spread over two years. And we never know, if the younger generation after reading may figure out a new religion with the changing times. But a module on world religion and philosophy will be quite enlightening for learners and may help in bringing better understanding, acceptability, tolerance and mutual respect.

Navigating Life and Facing Hardships/Challenges

It is time that the ministry which looks after education engages life coaches and develops modules on all aspects of challenges one can face in life and how to handle them. Today, people get upset at every small thing and end up living in the extremes – having anger, hatred or depression and when they are not able to cope up, they even end their life. Learners during their schooling years and age must learn to face hardships, setbacks and accept failures and learn how to move on positively, with learnings from such episodic circumstances. There are some very interesting examples in history that can be taught as life lessons. We all know of King Harsha of 7^{th} century. He used to hold an assembly every five years and give away all his belongings, even his clothing (except horses, elephants and military-related which was necessary for security and law and order in the state) and this is documented by Chinese Pilgrim, Hiuen Tsang. During one of the assemblies, when all was given away, he had to beg garments from his sister – Rajyasri – to put on. Similarly, more than 2300 years ago, Emperor Ashoka, after the war of Kalinga, realised that war only led to death and destruction, and gave up war and spent his life spreading the message of peace. It is important to see how as a statesman, an interesting reformer, Mustafa Kemal Pasha ‘Ataturk’ of Turkey (First President of Turkey) transformed Turkey, modernised its legal and education system, changed the way of life and led to the creation of

modern Turkey. There are many such varied examples from across the world in history which have a clear message on all facets of life, and these must be shared as short films which interest the learner and also effectively pass on the message.

Life lessons and living principles need to be taught in preparatory phase, and such modules could be in the form of videos as MOOC or short films shown in school/library. The whole idea behind these modules is to enable the learner to be prepared to face hardships which come in the way and learn how not to fret over everything, acquire the understanding and ability to let go off things, and value principles, relations and life. Some of the topics/modules can be in the form of video lectures, where learners login and viewing will earn them credits. This portion of the curriculum should not just be during the limited school time (hours), but if such videos are shown in school, the learners can spend half an hour to discuss and debate on them and realise the relevance and application for themselves.

Discovery Break

Experience is the father of wisdom and memory the mother – An old proverb

Today, learners are too much immersed in books and the daily cycle of school – books – homework – tuitions – sleep – school. They need to move away from the grind, unwind on a regular basis, or take a break between school and college, take to real-life lessons which is the real personal enrichment and out of the school boundary experience. This is what I call the 'discovery break'. Every learner must go for a discovery break at least once (more the better), and it can range from a fortnight to one year. If you are taking one break, it could be of a longer duration, and if you are planning to take multiple breaks, it could be for shorter durations. However, it has to be a planned adventure, as to where and for how long are you headed. Lessons learnt and experiences gained will come handy lifelong. This is the teaching via experience and of real value in taking a step towards independent thinking and facing the real world, and there is no substitute for it.

It is likely that the learner may decide to earn to pay for their 'discovery break' or work with an NGO, and it not only teaches independence and self-reliance but also gives exposure to new culture. May be, learn a new language if one is travelling to a different state, region or a country. It can throw open a

myriad of possibilities for the learner, besides a 'new life experience', than being on the academic churn for the decade. It can be fun, but certainly, discovery break cannot be by sitting at home. This break will lead to a difference in personality and the transformation of the learner. Harvard College has been supporting this for the past three decades for incoming freshman to take a gap year (Grose, 2010). Princeton has started recommending that learners should take a break before joining college (Haigler & Nelson, 2012).

Organised programs like the 'gap year' is increasingly finding acceptance in the US (Shellenbarger, 2010).

This must be encouraged for every learner – right from the competence level one. In fact, in America, there are organisations and events for people taking the gap year. Also, there is a Gap Year Association and they host conferences on this topic (Gap Year Association, 2019). Ninety per cent learners who took the gap year enrolled back in college. Burnout from competitive pressures and a desire to find out more about themselves are two top reasons for taking the gap year as per the survey, and according to a study of 2502 learners in Australia, published in the *Journal of Educational Psychology*, this break is linked to higher motivation in college, and for some learners (outside this study), it has led to better grades. (Shellenbarger, 2010). Gap year benefits the learners by boosting confidence, increasing focus and discipline and helps bridging the gap between formal education and the real world. It helps learners in taking responsibility for a host of issues during the experience of the gap year like, financial planning, handling routine chores and helps them to handle pressure and unexpected situations, in managing time and leading to an increase in sense of personal responsibility and independence (Haigler & Nelson, 2012). The number of gap year seekers is growing in the US at 15% per year (Haigler & Nelson, 2012). To me, this discovery break will make us relevant to the societal realities and get us acclimatised to the realities, which will help in preparing for real life and realising our full potential.

Access to education does not mean success in education, unless it is supplemented by real-life experience, which the discovery break can offer.

We all have to open our mind towards the discovery breaks, no matter whatever nomenclature one assigns to it. Also, institutions should allow learners to take the discovery break and should have well-defined policy for the same and the NGOs, corporates and universities should develop guidance

and an ecosystem to support the discovery break. Also, the learners should get credit for taking and reporting the lessons learned from the discovery break, and the parents could be allowed tax rebate for spending on the discovery break.

Financial Planning with Post-Retirement Planning

Today, most people suffer later in life due to poor financial planning. If they knew about the basics of planning, they could lead a happier and a better managed time after retirement. More so, when average lifespan is increasing. It is important that learners must be taught financial planning as a module in school. It is not a chapter or a course but a group project work – module of say two 30 minutes sessions with a well-defined framework to sensitise them about various facets of financial planning, so that people understand the importance of saving and post-retirement planning. Financial planning is a must-have module in school.

Prioritisation and Focus

Handling stress, deadlines and unwarranted disasters

Basically, modules mentioned above will help the learners handle stress, and when they learn the value of time and time management, prioritisation and focus, they will be able to meet deadlines and avoid or handle the unwarranted situation and failures. The reason I covered this under a separate header is that, learners have to be well-equipped on each of the qualities and traits when they step out of their schooling years. There could be more things to address, and I am sure that the people involved in curriculum development will do a wider consultation about the issues and incorporate the same. This could be taught as a 30-minute module in grade eight or nine.

Recommended Films to Watch

Movies are a good way to learn, and it may not be a full 2-hour movie, but could be a short documentary film. Movies sometimes are a very powerful medium to give a message which cannot happen through a classroom lecture. I am not putting forth the message each movie conveys but leave it to the person watching to infer the message the movie has. A few of the movies are real-life movies and they left an indelible mark on me, and most importantly, I wish I had seen them early on! Here is a list and it can be built upon further:

- The Greatest Debaters
- Hidden Figures
- Gandhi
- Dangal
- Mission Mangal
- Life of Pi
- Unbroken
- Lincoln
- The Dark Knight Trilogy
- Bruce Almighty
- Click
- Yes Man
- UP
- The Bucket List
- The Lion King
- Lagaan
- The Pursuit of Happyness
- The Secret
- Pay It Forward
- Me Again
- A Thousand Words
- Rise of the Guardians
- Like Stars on Earth
- August Rush
- A Little Princess

- The Ultimate Gift
- The Ramen Girl
- Fireproof
- The Intouchables
- Grace of Monaco
- The Angriest Man in Brooklyn
- 12 Years a Slave
- Apollo 13
- Gorillas in the Mist
- Into the Wild
- Lucy
- Limitless
- The Giver
- The Secret Life of Walter Mitty

Recommended Shows to Watch

I strongly recommend learners of all ages to watch TED talks. These talks are short, typically 18 minutes or less, so, as a learner, one does not have to invest a lot of time. TED stands for 'Technology, Entertainment and Design', and TED talks are now almost on every topic and have great view points and ideas. The earlier one gets exposed to the same, the better! Watch here https://www.ted.com.

MOOCs

Massive open online courses (MOOCs) are an important tool. While you may be in any part of the world, you can enrol at some of the best universities for an online course through MOOCs like Coursera, edX, Udacity, etc. Most of the courses are free, and these courses cover almost every field – topic – sector – right from writing, speaking, to astronomy. It is in the best interest of

learners of all ages and professions to enrol at least in one course every two years, if not every year.

The Sophia Project

The Sophia Project is founded by college educators and is an online collection of original articles, primary source texts, and commentaries in the field of philosophy, religion and ethics http://www.sophia-project.org.

Newspapers, Books to Read

It goes without saying that leaders are readers! The earlier you pick this habit, the more you will benefit. Based on data from OECD, the percentage of frequent readers increases with every additional level of education and the relationship between frequency of reading and educational attainment remains strong in the employed population (OECD, 2019, p. 121). *Reading books in everyday life for pleasure or empowerment is a matter of choice, and education may be a catalyst that enhances the motivation to read; while conversely, frequent reading may arise educational aspirations*, according to an OECD report (OECD, 2019, p. 123). Every school should have a well-equipped library, and every community must invest in setting up a circulating library. Above all, every country's Ministry of Education must set up a digital library of books and other resource material, which can be borrowed or read by learners online or on their devices. We need to inculcate the habit of reading. In 2017, I had a chance to visit Medellin, Colombia, and during the tour of the city, I was informed by my host that Medellin was once the most dangerous city to live in, but then it set up public libraries at metro stations where people could borrow books and return them at their convenience, and this reading habit brought in a massive change in the people, and no wonder, Medellin beat Tel Aviv and New York to become the most innovative city in the world. So, setting up a network of libraries is a must-have at every touchpoint of a learner – be it a handheld device, home, building complex, community, etc. I am not going to recommend a book here specifically, but it is advisable that people read diverse topics to ensure that they are broadly

aware of diverse topics and views, both. People who wish to stay ahead of time must read at least a newspaper a day. I read three newspapers every day.

'You are the books you read, the films you watch, the music you listen to, the people you meet, the dreams you have, the conversations you engage in. You are what you take from these' – Jac Vanek

Special Needs and Mass Customisation

All are not born equal. Some learners may have different talents and such learners cannot be left behind and ignored. Though people suggest that learners be segregated based on their level and taught separately, I strongly believe that segregation creates a mental barrier for a learner who is put in a section or grade which is for slow or impaired learners. In fact, blended teaching techniques be used for all, so that everyone benefits. Some learners may require extra classes which could be taken care of under special needs.

Competence

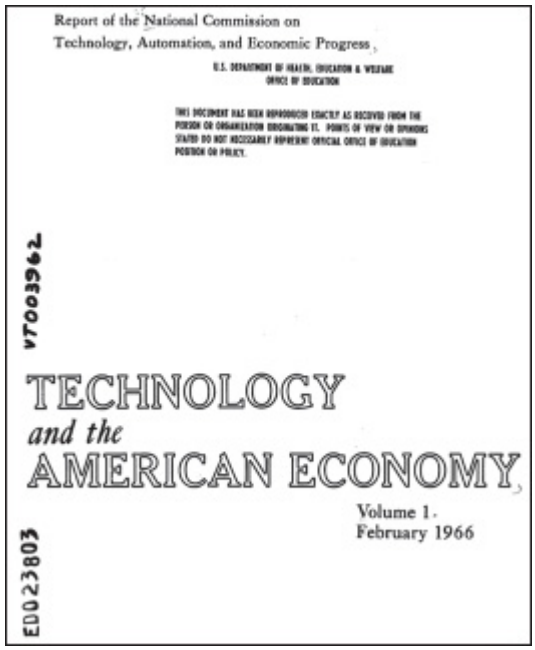
We can see from the demographics and the emerging job roles that, going forward, the things are not going to be the same. There will be chaos and the only thing that can salvage the situation is the education and skills development system that is prepared to handle the transition which every country needs for transforming its population.

So, how do we judge what competence or capability one acquires when one passes grade tenth, grade twelfth, graduation, post-graduation, doctorate and post-doctoral research? If we defined it, then it will be easier to grant people, with educational qualifications for their informal education/prior learning. If we do not know what each level delivers, how do we assess an individual and also, assess the impact of the levels of education on an individual. This needs more research. Eg: If a farmer's son or daughter becomes an expert in his field, based on his practical knowledge and skills, the child should be allowed to graduate with a degree in the field based on competency assessment test for that grade. Why bombard everyone with the same curiculum!

6

Things to Ponder for the Future of Education

Let us also see how countries like the USA have been ahead of time. More than half a century ago (in 1966), they commissioned the report on technology and automation (US Department of Health, 1966). It is important for every policy maker to understand that America was talking about automation half a century before it actually started, so they drive the rules of the game and the ecosystem which matures. It is time to learn from the US.



The current education system even teaches science as history, which is something we need to change, if we have to create a futuristic mindset. Let us look at the Moore's law, Knowledge Doubling Curve, and ask ourselves,

did we do a disservice to our education system by ignoring to teach our learners about these laws? There are many more such topics which we need to incorporate in our curriculum to make the learners understand how to reimagine the future and create it.

Moore's Law

Gordon Moore was the co-founder of Intel and he said more than half century ago, in 1965, that, 'The number of transistors incorporated in a chip will approximately double every 24 months' (Intel, 2019). This translates into the fact that the power of computing will double every two years, and also, lead to the miniaturisation of technology. When I read this, I was taken aback that, why did we not teach this to our learners, when this existed more than half a century ago? More so, when the world and our daily professional and personal lives are increasingly driven by technology!

Knowledge Doubling Curve

According to Buckminster Fuller's 'Knowledge Doubling Curve', (Schilling, Knowledge Doubling Every 12 Months, Soon to be Every 12 hours, 2013), till the 19th century, human knowledge doubled every hundred years. By mid-nineteenth century, the knowledge was doubling every 25 years. By 2000, our knowledge was doubling every year, and now, our knowledge doubles every day (Sandle, Knowledge Doubles almost every day, and it's set to increase, 2018), and with IOT (Internet of Things), the knowledge will double every 12 hours (Schilling, Knowledge Doubling Every 12 Months, Soon to be Every 12 hours, 2013). This was postulated by Buckminster Fuller almost four decades ago, in 1982. We should have at least given a reference to these topics in our education to give a sense of what is in store for future and then, learners at every age would have imbibed one important thing – that the world is going to change faster than we can comprehend and so, we need to keep ourselves updated every day!

So, just imagine! Our education curriculum changes after a few years in an age when the computing power more than doubles every two years and

knowledge doubles every 12 hours! In fact, our education curriculum, if we had understood the Moore's law and Buckminster Fuller's knowledge doubling curve, should have been live. So all our schools should have been teaching students that Jupiter is no more a planet with highest number of moons, but it is Saturn, which has 82 and Jupiter has only 79 natural satellites (moons), a fact which came to light on 7 October 2019 (Rincton, 2019). Also, just two weeks after this news, we learnt about Google's Quantum Supremacy experiment (Martinis, 2019), where the world came to know of the latest computing speed of doing a computation in 200 seconds (or less than four minutes), what would take the world's fastest computer to do in ten thousand years.

World is changing fast and so is our knowledge about the world, but the educa-tion system still needs to catchup with the developments and prepare us for the future. This has been reconfirmed by the global survey on education, mentioned at the start of this book, wherein three fourth of the respondents from 113 coun-tries opined that the current education system does not prepare the students for the future, and an overwhelming 92% called for radical reforms in education.

If we do not teach the Moore's law and the Knowledge Doubling Curve and do not reform our education system now, then we must certainly enlighten our learners of today (no matter if they are in school or university) about the Peter's principle, which states, 'In a Hierarchy, Every Employee Tends to Rise to His Level of Incompetence' (Wagner, 2018).

We need to think like a futurist on how the world should be like in 2100, and then plan our policies. Education must always be about co-creating our future, proactively and productively.

7

Model Futuristic Education Policy for GenNext (FEPG)

*I*n the next two decades, the world will undergo a major change, and our generation and the GenNext will have to be prepared to handle the challenges which are beyond comprehension at this point in time. So, the education system needs to make them capable of handling the unforeseen, and unimaginable challenges, and convert them into opportunities. This needs a new mindset – a new operating system will run the world. We are still stuck and overly focussed on teaching Newton, Einstein, Pythagoras and Shakespeare, but we never taught the students about the Moore's law of the 'doubling of the computing speed' every two years (Gregersen, 2019) and Buckminster Fuller's 'knowledge doubling curve' (Schilling, Industry Tap Into News, 2013) (Sandle, Knowledge doubles almost every day, and it's set to increase, 2018), according to which, the rate at which knowledge is doubling has reduced from 100 years in 1900 to one year in 2000, and now, it is likely to double every 12 hours. The pace at which the world is changing is astounding, and the education system is still teaching science like history. It is time for re-doing our education system. Radical change or transformation alone would not be enough. We need to rewrite tovhe framework of our education system. Our education system should make the learners of today prepared for the future and hence, the Futuristic Education Policy for GenNext should not be about incremental change or a slight shift. It is about drastic change, and a radical shift in our approach to education. It calls for going back to the drawing board and rewriting the framework of education.

Having covered various aspects of why education needs massive reforms, and what these reforms need to cover, I thought that I must also draft Futuristic Education Policy for GenNext, based on the needs and demands of the changing and dynamic world of the future and which every

country needs (in this case, India) and also, the same template can be used by any nation wanting to reform their education system based on the evolving needs which are revolutionary. And I am hopeful that the future education policies will not be written by human, but by AI!

8

Preamble

Our country has had two National Education Policies so far; the first one in 1968 and the second in 1986, with a revision to the 1986 policy in 1992. India has made great strides in education, but a long path lies ahead. Since the last policy, the world and India have gone through a dramatic change.

In 1991, the country embraced globalisation and liberalised the economy. In the last quarter of the century, we have passed through a churn which has impacted every stratum of the society and every sector. Information and communication technology (ICT) has emerged as a new frontier in bringing a paradigm shift.

These massive changes are denominated by enormous changes in the population – from 83 crores in 1991 to 132 crores in 2017, i.e. 59 percent increase in the overall population of the country. Though the increase in the population is 59 percent, the aspirations of the population have increased manifold.

The education system of the country must ensure that the potential of 70 crore youth population is maximised, leading to a prosperous economy, and it should also address the challenges arising out of the changing dependency ratio and socio-economic disparities, to make it an inclusive society. The world confronts increasingly uncertain forces of change, but the youth of the country must be confident of livelihood and employment. Every single child must be assured of the capacities and skills that would build the foundation for a good, productive and fulfilling life. For achieving this, education will play a pivotal role. A reformed education system will bring a revolution in country's human development.

Every single young person in the country must have the opportunity to receive an education that equips her/him with the knowledge, skills, attitude and values that would make him/her, a vital link in this transformation of the country.

Education policy has to ensure that the country is prepared for the future – expand the horizons of thinking and transform every challenge into an opportunity – education, not limited to academics – leads to holistic development of the individual and contributes to the prosperity of the nation, while retaining the traditional values.

It should signal a shift from

- Input to outcome oriented
- Teaching to learning
- Rote learning to knowledge transfer
- Theory to application oriented
- Mastery of content to mastery of competence
- Literacy to functional literacy
- Mediocrity to meritocracy

When all this is implemented in form and spirit, curiosity will end in delight, and not frustration. This, to me, is the ultimate goal of an education system.

The population of India is expected to reach as 152 crore in 2030. Today, more than 54 percent of India's total population is below 25 years of age. The average age of the population in India is estimated to be 29 years. The labour force is expected to increase by 32%. In order to reap the demographic dividend which is expected to last for the next 25 years, it is essential that the youth in the country are equipped with civic spirit, along with employable skills and knowledge. For this, we need revolutionary change in our entire education system.

India has to accord a high priority to the task of fostering quality education and improving learning outcomes. This will also be in conformity with the thrusts of SDG 4.

Futuristic Education Policy for GenNext (FEPG) recognises all three dimensions of – organisational revival, structural reform and people centric development, that respond to global forces – as essential for accelerating the development process in general, and educational development in particular.

FEPG focuses on ways to ensure that human capital, the most vital form of capital that would fuel the necessary transformation, is secured and

strengthened.

India is at the cusp of transformation to new India. The FEPG should become an enabler for new India through bold and transformational changes in the education system of the country. We have glaring systemic gaps in the education system. Education has lost its purpose and direction as large segments of the education sector in India face a serious crisis of credibility in terms of the quality of education imparted and the employability of graduates, and hence, it is not just a moment of truth, but a call to action.

9

Guiding Principles of fepg

Overall Goal

The vision is to develop young citizens, who would ensure a just, equitable, humane, vibrant and learning society. The strategy is to leverage country's demographic profile and help realise and maximise it's potential. The policy endeavours to expand the scope of education in keeping with the futuristic demands, eliminate social and regional disparities in educational access and lay greater emphasis on improving the quality and relevance of education at all levels.

The guiding principles & recommendations of the policy are drawn from global developments, opportunities and challenges of the future,various education policies as well as other national policies, and international experiences and experiments. The principles guiding the FEPG should include the following:

Strengthen Access

The FEPG shall focus on ensuring that all children and adolescents in the age group of 4–18 are enabled to realise their right to free and compulsory education, with all of them achieving expected learning outcomes (knowledge, capacities, skills, attitudes and values) defined for different levels of education.

Ensuring equitable access to tertiary/higher education by expanding the availability of higher education institutions, including technical and professional education institutions, as well as through alternative learning modes such as open and distance learning modes, including on-line and blended approaches, constitute an important thrust of FEPG.

Ensure Affordability

The FEPG aims to ensure that every learner in the education system may be able to afford and have access to programmes of study as per the learner's interest, ability and occupational choice.

Enhance Equity, Inclusiveness and Gender Equality

The FEPG lays greater emphasis on equity and inclusion, making educational practice consistent with social justice and equity within the framework of the Constitution, ensuring that classrooms offer all learners equal access and equal opportunity to achieve desired outcomes. One of the major thrusts of the FEPG is to ensure that opportunities for quality education are available for, and accessible to, all segments of the society. Educational opportunity must serve the needs of all the citizens, but particularly that of the disadvantaged, affording them opportunities to escape economic and social exclusion. The policy aims to address all forms of disparities and inequalities in – participation in education, teaching – learning process and learning outcomes. Appropriate programmatic responses be evolved for making educational programmes more inclusive and responsive to the learning needs of children and young people from disadvantaged population groups, particularly learners with special needs and children and youth with various forms of disabilities, and ensuring that all enrolled pupils are supported to enable them to achieve the expected learning outcomes.

Achieve Quality and Excellence

The policy recognises that the quality of educational provision needs to be dramatically enhanced and improved, to reach levels of educational and learning outcomes consistent with the best, and for that, we must aim to build a level which does not exist anywhere in the world. The efforts in this context should span the entire range of educational aspects and dimensions.

Education is Public Interest

Education is a matter of public interest and a shared societal endeavour. As the major duty bearer, the State has a critical role in policy formulation and in setting and regulating standards and norms that lead to quality education that is affordable and accessible, irrespective of the provider (Public, NGO or Private).

The Need for a Massive Organisational Reform

This policy aims for a shift in the focus of policy action from command and control to facilitation, evaluation and impartial enforcement – for making radical change in the system and to be agile to accept the evolving concepts and incorporate them before it is too late. This requires a thorough change in the structure and process of organisations in education – both the institutions of provision and those of regulation, across public and private sector.

Enhancing Accountability

As a part of the initiatives to enhance accountability across the education system, all educational institutions, their governance and management structures be reoriented towards outcomes. A credible system of measuring learning outcomes and other aspects of educational institutions be put in place, to help assess the performance of individual educational institutions and the education system as a whole.

Flexibility in Approaches

In order to ensure participation in education of marginalised and excluded groups, education systems should devise strategies and programmatic

interventions to respond flexibly, keeping in view the circumstances and needs of diverse groups of learners. Within the broad national policy and curriculum frameworks, innovations and flexible approaches should be encouraged in matters of curricula and pedagogical approaches in order to respond to the diversity of learner groups, regional and social contexts and various forms of institutions that characterise the educational sector. The scope of education should be broadened to facilitate various pathways to learning, depending on learners' choice and potential and, in relation with skills required for the work. Appropriate mechanism be put in place for ensuring recognition and certification of learning outcomes acquired by learners through different modes of learning, including open and distance learning modes and on the job or prior learning. The possibility of examination on demand and modular certification is needed to facilitate exit and re-entry of learners into the education system, according to their convenience and their field of work.

AUTONOMY

The regulatory bodies should ensure enhanced effectiveness and efficiency. Educational institutions and public systems, including those engaged in regulation, be reformed, with educational institutions being granted curricular and administrative autonomy, yet be made accountable to measurable outcomes.

10

Approaches

Learning-centric Approach

Futuristic Education Policy for GenNext envisages an application-oriented learning-centric approach to education. The policy seeks to institutionalise teaching – learning processes, which would allow learners to voice their thoughts, generate curiosity, ask questions and think beyond the routine. Diversity in the classroom is an asset to learning and this be a major thrust area for reforming education.

Learning goals/outcomes relating to each of these learning domains be formulated for all levels of education to facilitate effective curriculum planning and delivery. The idea of cognitive overload, mental load, multiple intelligence, thinking patterns, etc., mentioned in the earlier sections of the book be kept in mind while designing curriculum and delivery.

Outcome-oriented Approach

The Futuristic Education Policy for GenNext promotes an outcome-oriented education system, but the outcome-oriented approach must not, in any way, make us short-term oriented, narrowly focused or in dissonance with the basic aims and nature of education.

Holistic Approach to Education

The approach to planning and implementation of educational programs be characterised by a holistic view of educational development, with greater linkages, and integration between early childhood education, foundational

education, secondary education, skill-based programmes, including technical and vocational education and training, and adult education. The entire education system be reoriented to promote holistic development of learners by improving learning outcomes relating to all curricular areas, including sports and games, arts and music, academics, and ensuring that all children and youth receive an education that helps realise their potential to its fullest. A holistic approach to education enables every learner achieve his/her full potential, and is critical to achieving the desired social transformation and national development. It is about the cognitive, social, physical, emotional, intellectual and ethical-moral development of each individual. And with that, the development of just, equitable, humane and sustainable society.

STUDY OF COUNTRY'S KNOWLEDGE SYSTEMS

Every country is a land of knowledge, traditions, practices and skills that have value for contemporary and posterior times. Our younger generation needs to be made aware of this knowledge as they are the inheritors of this knowledge base. Learning about any culture, particularly one's own culture, helps build pride and self-esteem, which are essential attitudes for building the self-confidence of a resurgent nation. The aim of learning of a country's knowledge systems is four-fold:

(i) integration and nurturing of time-tested values;

(ii) connecting to the origin and development of thought in respective disciplines – highlighting concepts and major achievements, while engaging the learners with a sense of exploration and discovery;

(iii) bringing youngsters in contact with the worldview, and helping them appreciate the influential potential of such a worldview; and

(iv) undertaking a pluralistic, investigative and experiential approach towards learning.

The initiatives to promote the study of country's knowledge systems should also include: integrating brief references, concepts, etc., from Indic sources with related topics at foundation and preparatory education levels; encouraging institutions to offer in-depth courses of varying intensity as electives at various levels from grade 11 to post-graduate level and emphasising the provision of Indic references with proper evidences on all available topics.

TRANSFORMATIVE EDUCATION REFORM

Futuristic Education Policy for GenNext be transformative. It seeks to create an education system that would transform the lives of individuals, communities and societies, and respond to the aspirations of all children, youths and adults. The fact that many of the goals set by the earlier national policies on education have not been achieved, brings into focus the fact that, a 'business as usual' will not ensure quality education and lifelong learning opportunities for all. The transformative aspects of the education reform needed during the next three to five years make it imperative that changes are brought about in all aspects of education without compromise.

11

Governance and Administration—Complete Overhaul

*T*he Futuristic Education Policy for GenNext recognises the need for major reforms in governance and regulation as the starting point for the transformation of the education system. The governance that is being referred to, is about bringing in proactiveness, transparency, efficiency and accountability at every level in the education system, across public and private sector. Governance reforms should address decision-making at the highest levels, transforming the regulatory framework and regulatory authorities and transforming every institution involved in the delivery of education – from foundational schools till higher education and research.

At the highest level, the policy recommends that the Ministry of Education, and of Culture and Skills Development be merged, which will de-silo the approach to look at education sector across the continuum. Also, it is time to put a dozen first generation achievers in every field on the advisory committee of the ministry, which meets once every six months, and the decision of this advisory committee be binding on the secretary for implementation.

The current international classification (OECD, 2018, p. 19) mentioned below needs to change.

Classification of Levels of Education

The classification of levels of education is based on the International Standard Classification of Education (ISCED). ISCED is an instrument for compiling statistics on education internationally. ISCED-97 was recently revised, and the new International Standard Classification of Education (ISCED 2011) was formally adopted in November 2011 and is

now the basis of the levels presented in this publication, with the exception of tables showing data from the Survey of Adult Skills (PIAAC), which uses the previous ISCED-97 Classification.

In some indicators, intermediate programmes are also used. These correspond to recognised qualifications from an ISCED 2011 level programme which is not considered as sufficient for ISCED 2011 completion and is classified at a lower ISCED 2011 level.

The table below lists the ISCED 2011 levels used in the publication (OECD/ Eurostat/UNESCO Institute for Statistics, 2015[3]).

TABLE 11.1: ISCED 2011

01	Early childhood educational development
02	Pre-primary education
1	Primary education
2	Lower secondary education
3	Upper secondary education
4	Post-secondary non-tertiary education
5	Short-cycle tertiary education
6	Bachelor's or equivalent level
7	Master's or equivalent level
8	Doctoral or equivalent level

Early Childhood Education

Refers to early childhood programmes that have an intentional education component and aim to develop cognitive, physical and socio-emotional skills necessary for participation in school and society. Programmes at this level are often differentiated by age.

Primary Education

Designed to provide a sound basic education in reading, writing and mathematics and a basic understanding of some other subjects. Entry age: between 5 and 7. Typical duration: 6 years.

Lower Secondary Education

Completes provision of basic education, usually in a more subject-oriented way with more specialist teachers. Programmes may differ by orientation, general or vocational, though this is less common than at upper secondary level. Entry follows completion of primary education and typical duration is 3 years. In some countries, the end of this level marks the end of compulsory education.

Upper Secondary Education

Stronger specialisation than at lower secondary level. Programmes offered are differentiated by orientation: general or vocational. Typical duration is 3 years.

Post-secondary Non-tertiary Education

Serves to broaden rather than deepen the knowledge, skills and competencies gained in upper secondary level. Programmes may be designed to increase options for participants in the labour market, for further studies at tertiary level, or both. Usually, programmes at this level are vocationally oriented.

Short-cycle Tertiary Education

Serves to deepen the knowledge developed at previous levels by imparting new techniques, concepts and ideas not generally covered in upper secondary education.

Bachelor's or Equivalent Level

Designed to provide participants with intermediate academic and/or professional knowledge, skills and competencies, leading to a first degree or equivalent qualification. Typical duration: 3–4 years full-time study.

Master's or Equivalent Level

Stronger specialisation and more complex content than bachelor's level. Designed to provide participants with advanced academic and/or professional knowledge. May have a substantial research component.

Doctoral or Equivalent Level

Designed to lead to an advanced research qualification. Programmes at this level are devoted to advanced study and original research, and exist in both academic and professional fields.

We now need to move to a new functional nomenclature:

Reframing Levels of School Education

We need to change the nomenclature to reflect what it delivers, that is, it has to be functional.

Foundation (Preschool to Class V): Early Childhood Education be renamed **Foundation level –** for Age 3 to 10: This is important in overall development of the child and in laying a solid foundation for the future of the child (the nomenclature is functional) – must give the learner the ability to think, reason, and ask questions.

Preparatory (Class VI–VIII): Age 11 to 14 – Prepares learner for higher education – clearing concepts and fundamentals.

Competency level 1 (Class IX–XII): Age 15 to 18 – This will help the learner to learn a vocation so that s/he can fend for him/herself or be an entrepreneur, and will be sufficiently equipped to get into a professional course or higher education for the university-level specialised courses. Post this level, the learner achieves the basic level of competence to make a living and be prepared to understand subjects more deeply.

School Level Reforms

- Nomenclature of education should be functional to make it outcome-oriented.
- Given the overall expansion of schools and enrolments, it is necessary to consolidate and merge existing stand-alone schools into composite schools, while not compromising on local needs, equity and safety concerns. We need to consider multiple approaches, and

one of them is to look at the need of composite schools for geographical and economic viability, which would leverage the strengths of complementing and optimising the schools and their resources, while addressing the issues of affordability, accessibility and equity, by pooling – through development of Educational Hubs for Resource Sharing and deriving consolidation synergy. This could be experimented and scaled in a phased manner.

University Level Reforms

- University governance structure needs a systemic change and a cultural shift that transcends the political interventions and pressure, and hence, it is recommended that, the existing governing body and composition of the members be replaced by a Board of Governors, with Chancellor or President as the Chairperson of the Board/Executive Council. Government can be represented on the Boards, along with representation by faculty, learners, parents, alumni and community representatives. Alumni, learners and community should be major representations in the management board or executive council, which takes decision on key issues, and lobbying in any form should make it a disqualification for a member. Selection of the key members of the highest decision-making body must be decided by the institution, internally based on well-defined framework and guidelines. There is a need to reorient the management structures by bringing community management structures into the schools/universities, both in the public and private institutions.
- The tenure of the board and the terms of reference be clearly articulated so that the board ensures the achievement of the annual academic and non-academic goals.
- Selection of the heads and key resources of the institutions – Chancellors/ VC/Presidents of the University should be drawn from the list of National/ State Repository of Educationists, maintained and updated by the central or a state level body or by a designated authority, with a clearly defined criterion for empanelment.

- With digital technologies coming up, it might be worth considering setting up of only virtual universities, which are asset light, and they could conduct offline contact classes in any shared or temporary facility as and when needed.
- There is a need for a robust and comprehensive learner feedback system. There is a need to assess and evaluate infrastructure, organisation, leadership/governance and so on by the learners on regular intervals, and the inputs from this feedback should also form the basis of assessment and improvement in governance. Schools should device a school development plan relevant to their stakeholders and state-of-the-need, drawn from a collective exercise, based on the needs and opinions of the learners, community, parents, teachers, government representatives and other concerned stakeholders and the same be uploaded on the institutions website every year before the start of the new calendar year.
- Academic calendar should be announced at least 60 days before the start of the new academic year. The academic calendar needs to take all local conditions into account. Any deviation in academic calendar should be viewed as non-performance and failure in governance.
- Rules and regulations should make way for the institutions to be more autonomous in deciding their budget formulations and allocations, without compromising on the accountability of these institutions.

Regulation: School Education

School education is regulated by the local government which tends to focus selectively on regulating the private sector, rather than on ensuring quality education in government schools. There is an inherent conflict between the role of the state government as a regulator and as a service provider. In the latter role, the state governments run schools, oversee the recruitment of teachers and their career progression, prescribe curriculum, pedagogy and assessment norms and provide funding. As a regulator, they enforce safety and quality standards for all schools, provide permissions to the private sector to start new schools and fix the fees in private schools.

State governments should create a proactive and robust regulatory mechanism to ensure that there is a framework in place for ensuring a level playing field for public as well as private schools by assessing all schools for learning outcomes.

Some aspects of school education that need to be regulated include: norms for the ratio of usable toilets to learners, working water taps to learners and teachers to learners. The regulatory mechanism needs to be lean, agile and responsive to the emerging needs and feedbacks from the stakeholders, but in no manner the regulatory system should bring in the inspector raj or lead to onerous paperwork for the faculty or institutions administration.

Enforcement of regulation in schools should be stringent, relying on self-reporting and declaration – self-regulation, supported by a vigilance cell and spot checks. The role of enforcement agencies should be to make surprise visits and spot checks. Penalties for defaults should act as a deterrent and help for timely corrective steps.

Since the education sector is growing, there is a need to have a mechanism for grievance redressal through education tribunals and vigilance cells attached to the regulator, who have the authority to ensure compliance.

Regulation: Higher Education

A new regulatory framework for higher education that is minimal, transparent, proactive and responsive, be put in place. Its functioning should rely more on self- regulation and empowerment, coupled with vigilance against transgressions, and these systemic changes should lead to building trust. The mandates of all the existing regulatory agencies and of the professional councils – should be reviewed and re-oriented to keep pace with the needs of creating an accountable and an outcome-driven system, which should be reviewed for performance. The responsibilities of each regulatory agency be clearly delineated, overlaps in jurisdiction avoided, and formal mechanisms for coordination between one or more of them specified, as needed.

Such regulatory bodies should be run by Committees or Boards, consisting of some of the finest minds and these may not necessarily be into academics and/or research in the country. So, it might be worth a try to get the best global brains – be it futurists, technocrats, professionals, corporate honchos, teachers, politicians, columnists, authors, sportspersons, etc., to ensure that there is not just a purely academic approach. Each luminary on the board should bring a specific skill set and a new thinking for the institutions, preparing it for the future. One thing that should be kept in mind while appointing such a person is that, the person should have the widest exposure in his/her field or domain.

Professional education system should be the goal, so:

All the academic decisions, such as permissions to start new courses, determine curriculum or select appropriate pedagogy and assessment norms should vest with the academic institutions to ensure greater autonomy and encourage innovation in the education system.

The entire regulatory framework be reviewed carefully every five years to ensure that the education system is moving continuously towards better quality. This review be undertaken by the Standing Education Commission or a body duly appointed for this purpose and the report be made public within a stipulated time.

Regulation should not only focus on outcomes, but it should also address the issue of having guidelines in place for the common minimum requirements at all institutions – board structure, student–faculty ratios, faculty qualifications, resource deployment for learning and physical infrastructure, peer review and performance systems, oversight processes, etc. Technology be used extensively to assist institutions in meeting reporting norms, which ideally should be integrated with all admin processes which are automated. So, sitting in the village or national capital, I can look up for any institutions enrolment, attendance, financial performance and academic and Intellectual Property (IP) outcomes; besides their local, regional, national and international rankings and the status of their alumni. I do not see a reason why people should be spending weeks compiling reports every quarter to be sent to the education directorate.

Care be taken to ensure that the regulatory system does not become cumbersome for the educational institutions. Full details of the reformed

regulatory framework should be detailed and provided in the implementation framework document of the FEPG.

Non-compliant institutions be handled stringently, and blacklisted if necessary. Appropriate legal backing be given to regulators, so that they can blacklist, and weed out degree granting institutions that are repeat offenders.

Permissions to create new institutions be simplified considerably into a single-window and time-bound clearance mechanism. However, in the light of the extreme fragmentation of our educational institutions, applications for new institutions be auto-approved as, finally, it is the outcome we are assessing, for their continuity. So, fakes and substandard institutions will automatically filter off. Every government must mandate that there is a national repository of all educational institutions – right from pre-nursery to universities. This will help gauge the exact existing infrastructure and the future needs.

12

Teachers and Academic Leaders—The Torch Bearers

The Mediocre teacher tells

The good teacher explains

The superior teacher demonstrates

The great teacher inspires

—William Arthur Ward

*A*fter governance and regulation, the next important topic is the issue of human resources. Given that the link between the knowledge and the seeker is the teacher, the role of teacher is pivotal in creating a robust education system that can meet the challenges of twenty-first century. Education as a sector is undergoing major changes in terms of the emerging fields of computational sciences, integrating technology in the learning process and delivery of education and moving from theoretical to application-oriented curriculums and experiential learning. Also, if the education system is not able to catch up with the emerging trends and changes, the opportunities of tomorrow will become challenging. The size of our population will have a multiplier effect on the challenges, making them insurmountable to address. The emergence of new areas like big data, machine learning, artificial intelligence, robotics, virtual and augmented reality are being seen as a major threat to job creation, but if the education system prepares the population in the field of coding, quantum computing, big data, AI, VR, AR and machine learning, we will end up creating more jobs than we will lose in the digital era.

- If teachers are not tuned to the needs of time, the investment in education will not yield the desired outcome. Hence, the policy recommends investment in HR at all levels.

- Teaching is a noble profession, but in the last few decades, it has lost its sheen. Hence the policy stresses upon the need to bring back the dignity and respect that is attached to this noble profession. Besides reorienting teacher development, we need to expose teachers to managerial and administrative skills, so that they can take up leadership roles.
- Teacher's primary role is that of a behavioural therapist first, motivator next, and last is to instil curiosity in the learner. All this comes naturally, if you have a passion to work for a better world, to shape the future leaders who will run this planet. We need to develop a selection criteria for picking up the best of the best, and not just 'degree holders'. We must be open to a paradigm, where merely the degrees do not decide who can teach!
- Futuristic Education Policy for GenNext believes that the need is to forecast the requirement of teachers and allied professionals like: counsellors, psychologists and administrators, and to create the training capabilities needed for the gaps in human resources. Once the gaps are identified, we need to create the infrastructure to develop professionals to bridge these gaps.
- Futuristic Education Policy for GenNext recommends extensive use of technology for teaching and assessment of learners, training pre-service, as well as in-service teachers.
- Entry mechanism of teachers, their training and assessment should be done keeping the goal for quality of teachers in mind. Let us not forget that the quality of teachers today is directly proportional to the quality of students yesterday.
- Futuristic Education Policy for GenNext recommends designing curriculum and defining professional standards for teachers, and the need of assessing them for the same. In fact, it would make sense to have all standards as 'live standards', which keep getting revised with the needs of time.
- Teachers be recruited to specific schools and should not be transferred frequently. Teacher transfers cause many problems, not only for young children but also in ensuring ownership and continuity in schools and colleges.

- Teacher vacancies be filled up on a regular basis. Special emphasis is needed to ensure that the underserved populations in rural and remote areas are not deprived of quality education due to lack of trained teachers at all levels. Special incentive scheme be devised for teachers willing to serve rural/ remote areas and also, back up for tele-education be put in place.
- An appropriately designed tenure track system be brought in for school/ college and university teachers, over a period of time. Granting of tenure will be left to the internal mechanisms of the respective institutions where the teachers are working, based on predefined criteria which can be evaluated by a system and does not require human intervention, as the future systems have to be based on objective criteria and meritocracy (based on performance and not on appeasement or subservience).
- Exceptional candidates can be given tenure ahead of the time as a recognition of merit. The mechanism for tenure at each institution be accredited to ensure fairness. The management of the institutions should make use of the tenure track period to mentor new teachers actively, by their senior colleagues at the institution. No school, college or university, either in the public sector or the private sector, be allowed to employ a teacher on short-term contract basis. All contracts should be annual, unless for a temporary vacancy, and all assessments be done based on objectively defined criteria driven by a systemic process – technologically administered.

Principals and Heads of Institutions

Principals and heads of education institutions be appointed only on merit-basis through an appropriately designed selection process. Such heads be outstanding leaders and merely seniority should not be a criteria for appointment. It be based on outstanding performance, enabling even a fresher with few years of teaching experience being able to lead a school or a university. All heads of organisation – be it a primary school or a large university, be provided with orientation training before they take up their positions. They should have a fixed tenure of three to five years.

Service Conditions and Career Development Paths of Teachers

- Service conditions of teachers be de-linked from the general administrative cadres of the state and central governments, so that their service conditions can be made conducive to the critical role they have in improving the quality of education.
- School teachers not be engaged in any tasks that are not related to teaching and evaluating students, such as other duties outside the scope of school work. The intent is to ensure that teachers do not have to be absent from class and that disruptions in the academic calendar are a thing of the past.
- All academic administrative positions in the education infrastructure of district, region, state and at the centre, be reserved for teachers who would like to get into administration, by way of their career development paths. They be entitled to receive training for this purpose.
- Teachers be entitled for sabbatical leave which will give them an opportunity to invest in themselves. School, college and university teachers can use this period for self-directed training or working at other institutions or even in NGO's or in the industry for exposure, learning or/and income.
- The process for self-development by attending workshops, training, conferences not just be made hassle free but also compulsory, and the permission from the competent authority not to take more than a fortnight for approval. In fact, all district-level school officials to ensure that the new findings in the field of education are not just disseminated but also discussed and debated in an annual conference of academicians and with other stakeholders. Nationally, a digital platform should be created for this purpose which will lead to professional updation and development. Participation in this activity also be counted as a criteria when it comes to evaluation of a teacher's performance.
- Futuristic Education Policy for GenNext strongly recommends that every state, district charts a career path for its human resources, so

that it can attract the best talent. The policy envisions that an entry level teacher (a primary school teacher in a village), based on his/her academic and professional accomplishments, be able to rise up to be the President, the Vice Chancellor of a university, or Secretary of Education; this should serve as a motivation for teachers to deliver their best for improving the education system in the places they serve, with an opportunity to grow laterally to the highest office in the field of education. Also, this will kill the bureaucracy that stifles the education sector. Career bureaucrats never be appointed at any level in education sector. It be the exclusive domain of people with passion and experience in education.

- The Career Advancement Scheme and the Academic Performance Index (API) have not proven to be satisfactory methods of evaluating teachers. Performance evaluation of teachers be done on the basis of learning outcomes achieved by the subjects (learners), learner-feedback, research, teaching techniques, performance of learners with special needs, innovations applied and training undergone, with an inbuilt peer review and comparison system which captures objective criteria and eliminates individual influence and bias.
- Futuristic Education Policy for GenNext believes that the infrastructure for in-service training of teachers at all levels be strengthened considerably and this be administered by members from academia, who have taken to administrative paths.
- In-service training for college and university teachers be done through Faculty Development Centres (FDCs), which could be a mix of online and offline courses. The FDCs should work with careful planning regarding the requirements of in-service training to meet the future needs of education.
- Futuristic Education Policy for GenNext recommends recognition and reward for outstanding academicians at all levels (Preschool till higher education). The reward should not just be a token but must be substantial, based on outstanding achievements in the delivery of education and research. Such rewards would encourage the entire teaching community to achieve the best in education.
- It is time that the country institutes an award for outstanding researcher and/or teacher, which be given to outstanding work in

every field of academics. Be it science, social science, arts or literature. The award should carry a substantial prize besides the citation. Someone who makes a path-breaking contribution to education, science research and development should get the award.

Human Resource Planning

As a general rule, manpower planning will involve planning for not just the intake and output from educational institutions, but also for the trainers who will be needed in each area.

- Manpower planning be done by the central government, as well as by state governments, to assess state-wise, district-wise and subject-wise requirements of teachers, and to cover training of untrained teachers within a specified time frame. Contractual teachers be phased out gradually by absorbing the eligible teachers against sanctioned positions.
- A Central Educational Statistics Agency (CESA) be established as the central data collection, compilation and consolidation agency, with high quality statistical expertise and management information system, which could be used for predictive analysis, manpower planning and future course corrections. CESA should also develop solutions for geo tagging of education institutions on various parameters such as, infrastructure available, new constructions and upgradation.
- In vocational education, extensive data gathering and planning need to be done to match demand and supply of trained workers with different skills, with projections on how much educational institutions can contribute to training them. Also, the very outlook of what constitutes vocational education needs a redefinition – we need to add tooling, robotics, machine learning, etc.
- Educational institutions be able to attract students through the selection of vocations they offer. The offerings can be different in different schools, depending on availability of tutors locally, and students can move across schools to have access to the training that they are looking for. A subset of secondary and senior secondary schools could be made residential.

- Vocational education in schools will only succeed if enough tutors can be found to offer the training that students are looking for. An implementation plan is needed for introducing vocational education from the preparatory school, keeping in mind the safety and capability of the students to pick up the skills imparted. The plan must cover the areas of training that can be taken up (especially for youth working in the informal sector) based on data, in rural and urban contexts, and a plan for training and appointing teachers (perhaps shared), among other things.
- In medical education, the responsibility for manpower planning, design of curricula and standard setting needs to be done by a body, which is conversant with the demographics of the country, so that the production of paramedics, allied health professionals, biotechnologists, data scientists and doctors is planned keeping in mind the needs of the country's population and problems. Convergence of the efforts of the Ministry of Health and Family Welfare and Ministry of Education is recommended to ensure that the education system is geared to meet the needs of the nation with regards to qualified and expert manpower in the field of health and healthcare.

Teacher Education

School Teachers

A Bachelor's degree be the minimum qualification for entry into the teaching profession. Aspiring teachers can either take up teaching course which could be a mix of online and offline modules, supplemented by on-the-job training or apprenticeship for various specialisations. This should not apply to lateral entry of teachers who are accomplished individuals or professionals in their field or domain, who wish to join as a faculty.

- The topics covered earlier in the book on cognitive overload, mental load, thinking patterns, multiple intelligence, learning skills, blended teaching techniques be made an integral part of teacher training.

Teaching should no more be a monologue and this major change in teacher training be incorporated in the teacher training modules.

- A careful and comprehensive manpower planning exercise be undertaken once every five years, at the centre as well as in the states, to match the supply and demand of teachers and teacher educators.
- Special efforts be made for teacher preparation, in areas which are neglected today. These include art, performing arts and music education, vocational education, physical education and education for children with special needs, to name a few. All teachers also be trained to identify children with learning difficulties, mental health issues, etc., and on how to deal with these issues in school.
- Teacher trainees be taught by strictly using Cooperative and Collaborative Learning Strategies in their respective classes. If Collaboration and Communication are the two important skills the twenty-first century learners should have, the teacher educators must use the strategies which enhance these skills.
- Evaluation and assessment not be that of 'memory', but of higher order objectives. In fact, keyword-based evaluation must be discontinued, wherever practised. Stress on written tests at the end of the semester be replaced by other tools of assessment (e.g., projects, rubrics, portfolio, concept maps, etc.), and continuous assessment be the norm, but it must be in a manner that does not increase the stress levels in children.

Teacher Educators

- Becoming a teacher educator should be seen as an acknowledgement of excellence and should be one of the key career paths that teachers have.
- College Teachers: Teachers in colleges whose minimum qualification is a Master's degree in the subjects they would like to teach, do not receive any pre-service training at present. In the absence of any preparation, these teachers are unfamiliar with learning outcomes, different pedagogies, techniques for assessment, integration of technology, etc., and have also not thought sufficiently about the

goals of providing higher education to young adults and the complexities involved therein. Pre-service training of teachers in higher education be introduced at the earliest possible and through a mix of online and offline modules.

13

Financing

Financing of education has to consider a very important aspect which is, utilisation of fund and absorptive capacity of the system, centred on outcome-based approach, rather than input-based approach. The Futuristic Education Policy for GenNext advocates a progressive increase to ten percent of the GDP on education sector, which is a total of public and private investment. The reason for progressive increase is:

(a) due to the fact that the policy has recommended bold and transformative reforms at all levels, and these reforms will be subject to an independent impact assessment audit and post that, corrective steps will be taken; and

(b) economic progress or GDP growth that will also give government more flexibility to invest on education. However, every country must give education as much priority as it gives to infrastructure and defence. Investments in education should be need-based. I am of the view, that progressive increase in the education budget as per the priority areas of investment mentioned in the table ahead, will be a good starting point. A mere increase in GDP, without identifying the specific areas of investment and return, will not do much good, and hence, this requires careful and minute planning which be detailed in the implementation framework.

- The policy recognises the need of a framework (for infrastructure and outcomes), to ensure a level playing field between private and public sector which is based on local needs and resources. Private institutions be allowed to complement public institutions, but not to capitalise on the public sector's, inadequacy. The long-term goal of financing education will be to address the issue of affordability, quality, equity and to strengthen the public-sector institutions and

enable them to compete with world-class institutions, based on outcomes and research.

- The government expenditure be prioritised based on the need arising from time to time and be based on the performance (contribution/outcomes) of the institutions and states.
- The policy recommends developing the State & District Education Index to ensure that nationally, all states, compete and develop by setting new benchmarks. The resource allocation for national programs be based on the performance indicators of the states, with the aim to incentivise the performers and assist the rest to catch up.
- For a country like India, after identification of populated states, e.g. the six states of Bihar, Uttar Pradesh, Rajasthan, Madhya Pradesh, Jharkhand and Chhattisgarh, which account for 42% of India's population and 56% of annual population increase, the education policy recommends a study of these states to address any specific needs that are critical with regards to education, and if needed, a special mission mode program with a sunset clause be designed to address the special needs of these states and 100 most backward districts which need to do heavy lifting of education sector. Every country has to look at focus district/regions with major backwardness and size of population, as a few populous regions, if not prioritised, can pull back the national indices.
- Control mechanism (checks and balances) and audit (impact assessment) be introduced – right from the bottom (where funds are spent) to ensure efficient and effective utilisation of funds for achieving the intended goals/outcomes. This will ensure transparency and avoid leakages. In this regard, an appropriate mechanism and technology be deployed to ensure transparency, timely allocation and flow of funds and information sharing, with bottom-up approach. Timely and appropriate communication and coordination mechanism be put in place among the institutions at the centre, state, district and sub-district levels with regard to planning, monitoring and utilisation of funds as per plan.

PRIORITY FOR FUNDING

Type of Education	*Priority for Funding*
ECCE	Ensuring universal access to quality ECCE services with equity and inclusion: • Developing a program/guideline for the first thousand days of a child, cutting across parenting, health and educational needs. This program needs convergence with various associated ministries • Recruitment of qualified trainers, resource persons and teachers and their salaries • Activity and play materials and other required materials and facilities • Appropriate school meals program (SMP), hygiene and safety
Foundation level	• Addressing teacher shortages – recruitment of teachers • Improving the quality of in-service teachers • Developing, and maintaining functional quality infrastructure (including single-sex toilets), drinking water, learning resources like classrooms, laboratories, libraries and computer labs and medical help • Ensuring hygiene and safety • Career guidance • Inclusion – infrastructure facilities and teaching and learning aids for specially abled learners • Facilitating overall development of the learners through in-house arrangements or tie-ups or direct financial aid/ subsidies to learners: extra-curricular activities, cultural activities, sports, yoga, life skills and other activities related to creativity and innovation
Preparatory Level	• Addressing teacher shortages – recruitment of teachers • Improving the quality of in-service teachers • Developing, functioning and maintaining quality infrastructure (including single-sex toilets) and learning resources like classrooms, laboratories, computer labs, libraries and ICT • SMP (school meal program) and hygiene and safety • Inclusion – facilities and aids for challenged learners • Resources and support for vocational training • Provision of career guidance • Facilitating overall development of the learners through in-house arrangements or tie-ups or direct financial aid/subsidies to students, yoga, extra-curricular activities, cultural activities, sports, life skills and other activities related to creativity and innovation • Study tours and exchange visits can be dovetailed with the programs of the Ministry of Youth Affairs and Sports
Composite Schools	• Creation of composite schools: quality infrastructure (including hostels), learning resources and facilities for challenged students • Transportation facility/allowance

	• Ensuring SMP facility and hygiene and safety • Provision of skill development and vocational training • Facilitating overall development of the learners through in-house arrangements for yoga, extra-curricular activities, cultural activities, sports and other activities related to creativity and innovation
Higher Education	• Addressing faculty shortages – recruitment of faculty members • Provision of pre-service training and prospective faculty • Professional development: allocation for training, conferences, continuous learning, workshops, etc. • Improving the quality of in-service training faculty members • Developing and maintaining quality infrastructure and learning resources like classrooms, laboratories, libraries and ICT • Allocation for skill development, employability and entrepreneurship development (can be linked to funding from alumni, industry, etc.) • Dedicated funds for research and innovation fund (incubation support, etc.)
Teacher Education	• Addressing teacher shortages – recruitment of teachers • Developing, functioning and maintaining quality of learning resources like classrooms, libraries and ICT
Technical Education	• Developing and maintaining quality infrastructure and learning resources like laboratories, libraries and ICT • Skill development, employability and entrepreneurship (can be linked to funding from alumni, industry, etc.) • Research and innovation fund (incubation support, etc.)
Public Library	• National Public Library Network across the country on PPP model
MSC Clubs	• Mathematics, science and computer clubs be started in all districts and scaled up to village level over the next 5 years

Public Funding

- There is a need to increase public investment in education and this can be increased at 15–20% per year to ensure that quality education leads to faster GDP growth and it pays back in return.
- Special drive be undertaken to improve the quality of regional universities ensuring adequate funding and incentivising them. The funding to the regional universities should at least be at par with the central universities.

- Mandatory financial audit, cost audit, assets and resources utilisation audit and academic audit from appropriate bodies be introduced at higher education institutions to ensure accountability and efficient use of resources. Further, guidelines be issued for compulsory disclosure of such audit reports in the website of the institutions.
- Educational Development Bank (EDB) be established to act as a re-financing body, to fund various educational activities at low interest rate like: loans to needy learners, loans to trusts to start new schools and colleges and for quality improvements of those institutes.

Scholarship and Fellowship

- Scholarships and fellowships be provided to support the poor, talented and meritorious learners.
- National Fellowship Fund, primarily designed to support the tuition fees, learning materials and living expenses for learners, be created. The scholarships from this fund must be made available to learners belonging to the economically weaker sections, on the basis of merit. To this end, a separate national talent scholarship scheme, covering all subject areas, for meritorious learners of all categories, selected through a national-level examination after grade ten, be introduced.

Philanthropy/CSR

- There is a need to harness funds from non-public sources viz: CSR and Public – Private Partnerships, to fund existing public institutions. It is imperative to facilitate or provide supportive regulatory environment for private sector, to invest and establish institutions of excellence.
- The large pool of philanthropic capital available to fund education be promoted through supportive regulatory systems and income tax exemption to the extent of 100%, on all endowments and contributions made to schools, universities, colleges and other educational institutes by individuals, including alumni and organisations.

- Financial contribution from industries – CSR funds to the public institutions be promoted. Otherwise, non-financial support in terms of training to teachers and learners, technology-related services, etc., which will save the cost for the public educational institutions, be incentivised and encouraged. Public–Private Partnership model be encouraged in professional courses with a suitable framework.

Education Loan

- The government motto should be that, no learner be refused education for unavailability of educational loan or scholarships. Educational loan be made available to needy, poor and meritorious learners. The tenure for repayment and collateral be suitably relaxed. The interest rate on loans be highly subsidised. The government to take suitable measures in coordination with state governments to provide credit guarantee for education loan based on their employment conditions and parent's economic conditions. Appropriate measures be initiated to minimise defaults in educational loans. Aadhar and Pan numbers of the learner and parents be linked.

Those who can Afford must Pay and for the Rest, it must be Free

- For any country, it is imperative to think on why the wealthy should not pay for the not-so-wealthy? Those who can afford to pay should be made to pay, and at higher cost, and the rest should have it as a co-pay or free at every level, depending on the level of income. The public universities and colleges should be allowed to fix the fee on cost recovery plus model. Grading fee based on household income can be implemented for annual threshold household income group. The government should finance or provide scholarship to the extent of 50% to 100% for meritorious learners (based on criteria for cut-off) and 100% for learners from the lower-income group and marginalised sections.
- Fee charged by the private institutions be based on the actual unit cost and must be fully justified on the grounds of the cost and quality of

education for outcomes.

Revenue Generation

- A suitable framework, and guidelines be developed for educational institutions to use efficiently the available facilities like laboratories, auditoriums, computer labs, etc., to generate revenue for the institutions. The institutions be allowed to give their unutilised land on lease for education and other purposes, as long as it does not affect the teaching schedules and the academic calendar.

Cost Savings (Prioritising Expenditure and Cost Minimisation)

- Appropriate measures be initiated to cut unnecessary and wasteful expenditures in universities and colleges. For example, cost can be saved by constructing university and college buildings vertically instead of horizontally, resource sharing wherever possible, etc. Maintenance/revenue grants be linked to cost saving measures adopted by the institutions, cost audit report and revenue generation efforts by the institutions. Development/capital grants also be linked to financial audit, asset utilisation audit and academic audit.
- It is time to consider setting up digital universities which are virtual and asset light. The contact classes can be held at shared or rented locations. This is relevant to most of the courses and must be attempted to provide education to people living in far-flung areas and also working-class people who wish to enrol in lifelong learning.
- CA/ICWA/CS model of education be adopted for courses wherever possible. This will save huge investment on infrastructure development, faculty cost and other recurring cost, etc. (at the same time it makes the courses more applied, improves self-learning and develops skills among the students).
- Consolidation of schools and colleges be initiated through Development of Educational Hubs for Resource Sharing and deriving

consolidation synergy. This be initiated on priority and be implemented in phased manner.

- It would be appropriate to have standards and guidelines for quality ratings of educational institutions which are based on outcomes, and these outcomes are tied to funding for performance. Those who deliver outstanding results should get exceptional grants. It will lead to a culture of meritocracy in education at all levels.

14

Curriculum, Pedagogy and Assessment—Agile and Outcome Driven

For educational reforms to take place, there needs to be transformation in delivery of education, but at the core of this reform will be content. Given the reference earlier on cognitive overload, mental load, thinking patterns, the curriculum – pedagogy and assessment reforms have to incorporate them end to end. The current curriculum is heavy on content but light on how to learn (the latter skill is increasingly crucial). Hence the country, despite once being the leader in education, has slipped (in terms of output) in the global rankings. Therefore, the policy gives a high priority to the design and review of curriculum, pedagogy and assessment to ensure that it is responsive to the needs of the time. It is time for the educational system to ensure not just academic literacy (academic intelligence), but functional literacy (working intelligence). The very purpose, process and outcome of education is to develop the ability to think and reason and ask the right questions. The present emphasis on abstract concepts and facts be reduced, and focus be changed from theoretical teaching to an experiential learning mechanism, which is based on discovery approach with participative learning, which includes application/project-based/experiential learning, rather than rote memory. Also, we need to bring in new subjects like coding, design thinking, emotional intelligence, astronomy, etc., where the learner starts thinking on enormous and endless possibilities for the future. Teaching must help learners connect subjects to learner's everyday experiences (e.g., Science in daily life, mathematics and commerce from a financial planning perspective, civics from a student's parliament perspective and to create knowledge about civil and criminal laws applicable in day-to-day living for a citizen). Key goals include: reducing

the load of books, focussing on IQ and EQ both in the development of the child, reorienting the definition and designing of the classroom to focus on teamwork and group exercises, rather than make it a monologue between the teacher and the learners. Also, the compulsory attendance should include team and field projects, exchange visits and study tours.

The school education is about grooming a good human being as leaders and agents of transformation, by equipping them with values, attitudes and skills such as empathy, optimism, courage, respect for all, dignity of labour, resilience, personal and professional integrity, leadership and self-regulation.

The Futuristic Education Policy for GenNext (FEPG) makes the following recommendations:

School Education

- Preschool to Class V: There is enough evidence that early childhood education should be more focused on developing cognitive and socio-effective skills. These are particularly relevant to today's knowledge-based society and include developing thinking and reasoning, which can only be achieved by experiential learning (observation, experimentation, practice and study tours). Children at this age should not be burdened with books, and rote learning aimed at examinations. Childhood should not be traded-off with the burden of rote learning and homework, and learning should be enjoyable.
- Homework should not be given because learner should be given enough time for self-learning. This will also encourage teachers to ensure that learners understand subjects in school and this should also be effective to contain the menace of coaching institutions.
- Working with the local governments, the policy should strive for a uniform national curriculum in science, mathematics, civics and ICT. For all other subjects (including language, history and geography), states must be free to design region-specific curricula.
- Learner must be provided with opportunities to spend 25% of their time in school (2 out of 8 periods) daily for:
  - physical education and mental well-being (including games, yoga and meditation).

- creativity (including artistic creativity, design thinking and innovation).
- personality development, etiquette, time management and articulation (including debates and public speaking).

This is the time, when one such period can be used for various modules as mentioned in earlier sections:

- Schools be given flexibility in transacting curricula, e.g., in choosing teaching materials (including textbooks) and in choosing pedagogy (e.g., blended learning or making use of local knowledge and culture), provided these choices contribute towards achieving better learning outcomes and adhere to the annual teaching calendar.
- Given the ground reality that learners are at different levels of understanding and competence and have varied interests, the policy envisions the starting of new combination of subjects which fits the need, based on multiple intelligence of the learner. This change should be reviewed, and if it yields desired outcomes, it should be extended to every level in education. Also, there should be flexibility of choosing subjects based on multiple intelligence mentioned above, and this calls for first, a radical change in policymaker's understanding, thinking and acceptance of the fact that all learners should not be taught the same subjects. Also, blended learning and teaching be made an integral part of the education reform.
- Remedial learning: Schools should identify learners with learning disabilities (in consultation with psychological counsellors) and provide them with additional resources for remedial learning (including due consideration to their disabilities while evaluating assessments), while maintaining their privacy and dignity.
- Create awareness of known learning disabilities, processes for identifying learner with such disabilities and (if possible) catering to their needs within the regular school environment.
- Vocational education and management tools: Starting from grade eight, learners be given vocational education after assessing various aspects of the learners in terms of aptitude, safety, etc., through scientifically designed psychometric analysis. This will help all learners to understand the dignity of labour and respect for various

professions. The choice of vocational education (focused on preparing learner for livelihood) be compulsory as part of the formal curriculum. This should give learners in-depth exposure to areas such as agriculture, electronics, tooling, local trades and crafts, management, etc. The areas of emphasis not be uniform – they must be identified by careful planning (e.g., at the district level), and schools must be provided adequate infrastructure and learning resources to deliver rigorous vocational education in these areas. Imparting lessons in management education will go a long way in fostering entrepreneurship.

- Learners must be taught life-skills as a part of the core curriculum like: basic health, self-defence, road safety, negotiation, critical thinking, strategy, financial literacy, etc., as mentioned in earlier sections of the book. Also, states must consider to make home science as a compulsory subject for both boys and girls in the preparatory phase.
- Learners from grade eight onwards should be exposed to career options to enable them to find their inclinations as early as possible. A dedicated cell for the same be initiated in every school.
- All-year-round performance of learners (assessed via formative assessments) is a more reliable indicator of learner's competence. Hence, in a phased manner, the weightage for formative assessments should be gradually increased as confidence in the validity and maturity of these techniques increases.
- Formative assessment cannot be effective, unless the learner-teacher ratio (LTR) is sufficiently low. The education system must recognise the importance of an adequate pupil–teacher ratio; however, ICT-based tools and the emerging teaching tools and techniques should be factored in to arrive at a more appropriate LTR. Also, LTR should be calculated and reported for every school.
- Anything taught to the learners should have an objective, i.e. what is the chapter's objective, what are the common misconceptions and which assignments related to the chapter will help the learner to understand it completely and how will it help in future.
- The transparency in evaluating high-stakes examinations be increased – answer books be returned to learners, and question-wise scores be

made available to learners after results are announced.

- To improve trust in summative assessments, the assessment framework must clearly state the objectives of assessments and the methodology for creating assessments, and this framework must be reviewed and revised periodically.
- Schools must be encouraged to start research wing to document innovations and best practices.
- Most importantly, the relationship between the teacher and the learner should enrich the tradition of Guru–Shishya parampara and reorient it into Guru–Mitra-Shishya parampara, so that the environment is of friendship and respect and not of fear, between the knowledge seeker and the knowledge giver. Knowledge sharing always happens on an equal level and it cannot transpire if there is an atmosphere of fear in the name of respect.

HIGHER EDUCATION AND RESEARCH

Higher education can help a country meet its stated objectives in the 21st century and will play a pivotal role in ensuring that the country becomes self-sufficient and prosperous. It is time to make higher education flexible and agile, without compromising on quality. Artificial barriers to higher education in teaching and learning, including age-related barriers, be removed. It is time for the education system to recognise that, the public higher education system needs to be strengthened and scaled up to make it at par with the best in the world. Higher education has a few primary objectives:

- To create specialised human resources for various sectors. The policy recommends a closer working with the industry so that the throughput of the higher education system can be leveraged by industry for socio-economic development and progress.
- To create researchers and thinkers who will lead to knowledge creation, which can make the country a global thought leader in various domains.

- To ensure that curriculum, pedagogy, and assessment in higher education remains current and relevant to the needs of the country. The agencies tasked with specifying curricula (e.g., autonomous institutions) must also revise their curricula (including learning outcomes), pedagogy and assessment, periodically (e.g., need based or every 3–5 years in this fast-evolving world of AI and ML). The policy should further task accreditation agencies with assessing adherence to these standards, along with output, while evaluating institutions. Fast evolving domains like computational science be revised more frequently, based on needs. The policy recommends that the academia should work hand in hand with the related industries to ensure that the curriculum is based on the needs of the industry and is application oriented, and the same applies to research and doctorate courses.
- Higher education institutions should be incentivised (through accreditation mechanisms) to offer learners greatest flexibility and mobility. A few important examples of such flexibility and mobility are:
  - Offering learners the opportunity to self-learn at their pace (e.g., via MOOCs) and assess their learning via traditional institutional assessment mechanisms (exams, labs, viva-voce, etc.).
  - Offering learners the opportunity to take courses in a variety of disciplines, including vocational courses, and kill the rigidity in the education system. Why should a student be forced to take botany, zoology and chemistry or history, economics and political science? Their should be a variety of subjects across disciplines and students should be free to choose any three subjects based on their abilities and preferences. Also, the subject offerings have to change, based on the evolving needs of time. Why not take innovation as a subject or design thinking plus industrial chemistry, cheminformatics/micro-biology/AI-robotics/ Intellectual property rights (IPR) in place or BZC (botany, zoology and chemistry) and PCM (physics, chemistry and mathematics). Similarly, International trade, geographical indicators and tourism instead of BA (history, economics and political science). So, we must give up our old approach and

design newer courses with applied and futuristic combinations. Also, since all courses come with an entrance test, so why limit and restrict the learner? If I have done a graduation in arts and wish to pursue an MSc, I must be allowed to change streams and enroll at every entry point in the education system, as long as I clear the entrance test for that level. If I am a non-science stream student in grade 10, the system must give the flexibility to allow me to learn science, going forward. Time to give up our ancestral rigidity and handicapped thinking.

- Time-limits for completing degrees be relaxed to allow learners to take breaks in between their studies, thereby offering students at accredited institutions multiple opportunities to exit with a nationally recognised transcript of credits they have earned, and multiple opportunities to re-enter higher education (perhaps in a different accredited institution), so that earned credits in the previous program can count towards completion of the newer program.
- It is time that learners are encouraged to take 'Discovery breaks' in their studies – ranging from few weeks to one year. During this break, the learner is free to do an activity of their choice and should report about the lessons learned through experience, and get back into the education system to complete the remainder studies, or to change his or her stream of studies, which be based totally on credits earned on a particular unit learned. This will be a crucial exercise in learners' life and will give the learner the ability to adventure and learn the real-life lessons early on and help them to chart the future course of life. We must not forget that real life lessons are much more valuable than the classroom teaching and the earlier one takes them, the better. Ideally, this 'Discovery break' should be after competence level 1, when the learner is mature enough to take a call on what he or she needs for future. This will also be about exposure on the realities of the surrounding and how the world is shaping up. It's about personal enrichment and going beyond academics, which education should be all about. In fact, I would let a school or college give credit for the 'Discovery break'. It can throw up myriad possibilities for the learner.

- The policy recommends the creation of a Credit bank or means to link the credits with a national identity number, to ensure mobility of credits in institutions.
- It is time to offer the learner multiple streams of courses (e.g., sector-wise, research-oriented, employability-oriented, and entrepreneurial), where appropriate.

Lifelong Learning and Functional Literacy

- We must remember that the brain's ability to learn lessens with age. Also, neuroscientists are suggesting that the adult brain's ability to learn is significantly dependent on how much it is used. Also, adult learning programs are more successful when they are directly linked to job opportunities (World Bank, 2019, pp. 83-84).
- It is time to task a suitable agency with creating a revised curriculum for functional literacy. The curriculum should include digital literacy and financial literacy. Mechanisms for delivering the curriculum at scale should encourage community engagement with mentorship/apprenticeship models (under principles such as "each-one-teach-one"), more so, with regards to women.
- Lifelong learning must be inculcated and encouraged for two reasons: First, it expands our horizons of thinking and broadens our thinking process. Second, the changing scenario requires everyone to re-orient themselves in response to these changes on a periodic basis.
- The policy recommends to engage with communities in setting up public libraries to encourage and inculcate reading habits. These libraries also be linked with National Digital Library (NDL).
- We should encourage literature in local and vernacular language, and recognise and reward people to translate content into these languages.

Teacher Education

A suitable agency be tasked with specifying an outcome-based curriculum, pedagogy and assessment processes for teacher education, and revising it every three years, based on both experience and advancement in educational theory, keeping in mind the ideas mentioned under multiple intelligence, thinking patterns, cognitive overload and mental load and what is mentioned in the section on 'Education – What works and What doesn't'. Well, it might be a good idea that all the frameworks be made 'live', so that whenever a development happens, it is incorporated and the stakeholders are informed in this hyper-connected world.

Teachers to receive training in:

- Facilitating in-class dialogue and other participative practices, while maintaining an environment that is physically, emotionally and intellectually safe. Pedagogy and assessment for teacher training be based on these participative practices.
- Understanding learning outcomes and experimenting with a variety of pedagogical techniques and teaching materials to help learners (including those with learning disabilities) attain them.
- Identifying academically at-risk learners, using suitable diagnostic assessments and conducting remedial classes.
- Best-practices in designing and evaluating formative and summative assessments (including projects and portfolios), that adhere to stated learner's knowledge, skills and competence outcomes and present a holistic picture of each learner's overall competence.

Open and Distance Learning (ODL)

With the advent of network technologies like 4G/5G and even futuristic technologies, coupled with the proliferation of gadgets, it presents a great opportunity for a country like India to use technologies for ODL. This can be a main pathway for in-service training, and catering to the needs of specially-abled, imparting of vocational training, skill and knowledge upgradation and lifelong learning.

A suitable national agency should work with states to develop a common framework for open school education. Pedagogy and assessment

strategies adopted by these open schools will differ substantially from conventional institutions, but they will target the same learning outcomes that have been designed (and will continue to be refined) for conventional schools, to ensure academic equivalence of the degrees awarded through this distance learning mode.

Institutions with ODL programs should explicitly try to attract learners who have dropped out of the formal education system, including girls/women, minorities, and learners with physical and/or cognitive disabilities. It should aim to address the large demand for vocational education in both the organised and unorganised sectors.

Institutions with ODL programs should conduct and publish research (in collaboration with external researchers, where necessary) on evidence-based strategies, to improve pedagogy, the attainment of learning outcomes, and the effectiveness of ODL programs in attracting learners who have dropped out of the formal education system.

A well-functioning Open and Distance Learning (ODL) system should play a key role in catering to the growing number of learners enrolled in higher education, and in supporting lifelong learning. Hence, a single facilitation agency be created for ODL in higher education. This agency should establish a system of credit or link with the credit bank or national identity number to ensure transfer of credits earned through ODL and traditional means of learning.

A quality assurance mechanism for accreditation of all universities/institutions offering ODL/MOOCs be put in place to ensure quality, promote innovation and reshape and modernise the ODL/MOOCs courses and programs.

In view of the massive expected demand in re-skilling working professionals (including teachers), regulations should encourage ODL programs that focus on creating high-quality certificate courses, in consultation with industries/other employers. The regulations should also encourage these certificate courses to be offered to professionals abroad.

Higher Education

Greater opportunities must be given to learners seeking entry to higher education, and there is a need to eliminate the burden of multiple entrance examinations (each assessing similar competencies) and the associated "coaching culture". Hence, a National Competence Assessment Agency (NCAA) be created which should provide on-demand assessment of learner's competence in all school subjects. These be computer-based adaptive tests to assess learner's competence as accurately as possible. Entry to higher education institutions be based primarily on applicant competence in specified NCAA subject assessments, but some weightage (e.g., 25%) also be given for school-based assessments (e.g., portfolios and projects). Learners be permitted to appear for any NCAA assessment; regardless of age, prior educational qualifications, or prior appearances for the same test. Also, it is time to consider social service as one of the weightage criteria and qualification for admission.

Agencies tasked with specifying curricula for higher education (e.g., autonomous institutions) be tasked with revising their curricula (including learning outcomes), pedagogy and assessment processes periodically (e.g., every five years). Accreditation agencies be tasked with assessing adherence to these standards while evaluating institutions.

Higher education institutions be incentivised (through accreditation mechanisms) to offer learners greatest flexibility. A few important examples of such flexibility are:

- Offering learners opportunities to self-learn (e.g., via MOOCs) and assess their learning via traditional institutional assessment mechanisms (exams, labs, viva-voce, etc.).
- Offering learners opportunities to take courses in a variety of disciplines (including vocational courses), including study in partner institutions.

15

Language Culture and Value Education

Language Education

Language is a medium of expression of the individual, of the society and its collective culture in continuity, in addition to being a tool for communication. I have travelled to about forty countries and have seen that the common thread amongst all relatively developed countries is, that they work in their local language. Take the example of Japan, France, Poland, Russia, UK, China, etc. Furthermore, research has established that education is most effective in one's native tongue as can be noted in many successful countries. Therefore, the educational policy emphasises the need to promote and strengthen the study of a common language or a pool of languages, keeping in mind the valuable diversity. Our future generations must be equipped to access and benefit from the richness of these language repositories. With this backdrop, the following is/are recommended:

Language/Medium of Instruction and Communication:

- All states and UTs, should provide education in schools, up to the age of 10 (foundation school), in mother tongue or regional language of their choice as the medium of instruction.

Languages in Education:

- Now, coding is the most sought-after language and has deep impact on intelligence, thinking, application oriented mind and output, and so, this must be taught in all schools at age of 12 years or earlier if acceptable and possible, given the resources available. Coding has profound effect on students to become prepared for the future, and this is a 'must-have language' to learn besides the native and a foreign language. So, when it comes to three language formula, it

should have; (1) Regional/local language (2) Coding (3) Foreign language.

- Mother tongue/regional language should be the first language to be introduced from grade I.
- Language learning be multi-mode and multi-dimensional in nature. Learners be taught to enjoy language as a living and dynamic expression of human experiences, aspirations and creativity, by equipping them with all the four skills of language learning, including; listening, speaking, reading and writing. All possible effective media and modes of language learning and teaching, including; Library, mass-media, art, music, theatre, folk traditions, etc., be used.
- Schools be free to decide on the selection and implementation of the languages with adequate weightage in terms of teaching hours, assessment, etc., to be given to all the three languages. Also, if possible, given the resources available, learners be offered a choice of languages in which they can learn.
- Schools and higher education institutions to encourage and support the study of Knowledge Resource Languages, Classical Languages, and Foreign Languages, wherever there is an interest.
- Higher Education Institutions/Universities be encouraged to take active role in promoting teaching and learning in regional languages/mother tongue at Graduate and Post-graduate levels. They be encouraged to take up producing and translating of text books and reading/resource materials and teaching aids. This will lead to research in new areas as we will not have to copy and expand the research mentioned in English. This doesn't mean we should be anti-English, but local language should be our first priority. We can take a cue from Russia (CIS), Germany and China to see how much they have progressed, teaching and educating in their mother tongue. We aim to catch up with them, but don't wish to follow the system that took them there. So, it is time to give this a serious try.

CULTURE AND EDUCATION

Culture and Value education go hand in hand. While values are of universal nature, culture offers unique space, context and insights in identifying and inculcating such values in younger generation. Every country has a rich cultural heritage, which is of immense value in the current times. The culture, expressed in forms of art, music, dance, folk tradition, practices, sculpting, craftsmanship, skills, etc., must be passed on to the future generation as they are the rightful inheritors of such invaluable assets. Further, exposure to these knowledge, skills and practices would complement their academic performance as well. Hence, the following initiatives be considered:

- Introduction to music, painting, creative writing and other arts be included in Teacher Education to enable teachers to engage children creatively and effectively.
- This must be a part of the school activity calendar so that the learner enjoys the learning of the art and performs it with interest.
- Whilst it is important to know one's past and culture, but it should not become a burden to the learner. Every country must consider teaching about certain rulers, certain periods and actions that changed the course of human history, and should not be strict about the exact dates associated with them, but about their impact. It is time to filter every curriculum design in a manner that the education imparted to the learner is cognizant, not just of the mental overload, but also of the total cognitive overload.

Value Education

Furthermore, with the proliferation of media and unrestricted access to information through digital sources, the children are vulnerable to undesirable influences that may have adverse consequences on their individual development, family values, social relationships and their successful professional life. School learning should aim at inculcating the values such as co-operation and mutual regard, honesty and integrity, hard work, team spirit, discipline and social responsibility, and respect for all – including people, animal and nature, among others. These values are an integral part of our cultural heritage and we must do our best to uphold and enshrine them. The following framework tied to the stages of an

individual's cognitive and moral development, is being presented in this context. Also, while it is good to teach the learner, but the best way to learn is to see people practising. So, in this particular area, I would recommend that parents and teachers practice in real life and demonstrate what they want their children to imbibe. In the case of culture and values, upbringing has a major role and home is the first school where the kids learn the basics.

- **Foundational Values (Universal Values):** A set of universal values that should be the bedrock of all other values should be imparted during the formative years – between 6 years and 8 years.
- **Values for developing Character, Strength and Personality (Family and Personal Values):** Formative family values leading to security and strength, focusing the age group between 8+ years and 12 years.
- **Values for Societal Living (Social and National Values):** Values that highlight mutual interdependent nature of human society, nation and the world, along with environment, etc., to be the focus at this stage for the age group between 12+ years and 15 years.
- **Values for Professional Life and Growth (Professional Values):** Qualities required to sustain and grow in professional life could be the focus from the age of 15 years onwards or grade 10. Various topics have been mentioned in the earlier sections and these can be taught as 30-minute modules. The best way would be role play or a group and team exercise or a short film or a real life practice or an offsite visit. In my view, play and role play are the best methods of knowledge transfer. The method of delivery would vary and depend on the topic.
- **Values for Self-Actualisation (Spiritual Values):** Values that help individual to grow and overcome the limiting aspects and appreciate life in its fullness could be the focus from the teen years.

With this framework in background, the following are recommended:

1. With regards to instruction of values, both direct (dedicated sessions) and indirect methods (overall ambience of learning) be employed to permeate the contents of languages, history, geography and other social sciences.

2. Value education be provided in the cultural context of a country and its heritage. Learner be introduced to festivals, practices, customs, traditions, food and dress habits related to them, and their significance in relationship with nature and season change. Role play is an impactful way to learn and remember.
3. Value education be correlated with all religious traditions and teachings. Further, learners be introduced to important religious and spiritual traditions of the world. And this can be done through short films.
4. Accounts of lives of great spiritual leaders across religions be included in discussions, along with their teachings.
5. Innovative reflective practices be taught to enable learners to develop self-awareness and to connect to the deeper and stable aspect of their personality.

Equity and Inclusiveness (Including Girls and Women)

The policy recommends to progressively universalise the Right to Education for secondary school education and skills education, starting with girls and marginalised sections of the society, for an effective equity driven mandate.

- Regions with low enrolments of girls and women be identified by analysing district-level data. Greater flexi-fund flows be made available to such districts to boost the enrolment of girls and women, and to conduct remedial classes for enrolled female learners who are at-risk of dropping out. Enrolment of girls and women (particularly in higher secondary and higher education) be further promoted by offering financial assistance (including subsidised residential facilities or transport subsidies), self-defence training, child care, multiple ways to re-enter the formal education system (including ODL), etc.
- All educational institutions to conduct awareness sessions on gender sensitisation to break stereotyped gender roles, and on legal

protections and entitlements for girls and women and the mechanisms available for the redressal of their problems.

- To address the gender imbalance among school teachers (especially in some rural areas), alternate pathways for female teacher recruitment be developed (e.g., special programmes for girls after grade VIII onwards that train them to become teachers in local schools).
- There is a need to examine the challenges of access to learners from the tribal community (especially the nomadic sections) and children of migrant labourers, with regard to access to higher education.
- Make the current norms for school access flexible to meet local needs and demographic change, without compromising on equity. Rationalise establishment of new schools based on population, geographical terrain and safety of the learners. This must be done keeping in view the focus towards *achieving higher access* through expansion, by consolidation and better utilisation of the existing infrastructure, upgradation of the infrastructure as and where necessary, and creation of new institutions, primarily to meet the objective of regional equity.
- Provide safe and nutritious school meal, health support, safe drinking water and a clean environment for all children, in every institution. It is time to consider the scheme to provide two meals a day (breakfast and lunch) in a phased manner in schools.
- Opportunities in sports for girls be promoted, and educational institutions should strive to provide female sports instructors.
- A mission mode approach be adopted to make educational institutions hygienic and safe for girls and women by introducing functional girls' and women's toilets, crèche facilities, and credible mechanisms to address gender discrimination and sexual harassment/intimidation of girls and young women.
- The education system should provide opportunities for admission of women who drop out from education as a result of marriage and other socio-economic constraints.
- Considering significant progress in terms of number of schemes/ programmes to empower the marginalised communities, the issues

related to inclusion is still a challenge. There is a need to harness the efficacy of these schemes/programmes to be disseminated to the beneficiaries by engaging in nation-wide campaign on creating awareness on regular intervals.

- Create a 'single window' system for disbursing scholarship/fellowship to learners pursuing education. Such a system enables ease of access to information, while ensuring vast choice for learners to choose appropriate scholarship/fellowship. The schedule of enlisting, and awarding scholarship/ fellowship should be in sync with the academic calendar to ensure that the beneficiaries do not face hardships due to delayed payments.
- Educational institutions must be sensitive to the needs of physically and visually challenged learners. Institutions must prioritise infrastructure facilities (both in terms of requisite technologies/software and disable-friendly structures) that are most critical to the overall learning environment for the physically and visually challenged stakeholders.
- The policy considers learning disability as a critical barrier to successful completion of education amongst most of the learners. Education institutions must ensure appropriate infrastructure facilities like ICT tools to overcome such disabilities limiting the aspiring minds of the country. To this end, schools and higher education institutions must work with the Rehabilitation Council in addressing such issues scientifically and comprehensively. There is an interesting example of Walgreens. In 2007, it opened a distribution centre in Anderson, South Carolina and decided to hire 40% specially-abled workforce, including those with autism. These employees work alongside their normal peers and this centre is 20 percent more efficient than Walgreen's other centres. (Grandin & Panek, 2014, p. 200). It makes sense to become an inclusive society and enhance efficiency as well.
- Equity and inclusiveness within schools and higher educational institutions must be measured or given more weightage during accreditation, ranking or self-evaluation processes.
- A new system with Remedial/bridge course for drop outs is the need of the hour. Most of the drop outs are due to failure in the annual

examination. The policy envisages bridge courses in several languages, followed by preparatory examinations, for the students of all grades, with assistance from state schools – A system that facilitates drop-outs to enter into the mainstream education and motivates them to pursue higher education or seek employment or vocational training. Also, the new system to have inbuilt mechanisms so that the shortfalls in learners competency could be assessed on a regular basis and corrective actions taken immediately, rather than failing a learner at the fag end of the year in one 2-3 hour question and answer type examination, which puts the learner at a disadvantage and the learner loses a year by failing in the annual examination. We need to do away with this current annual examination system which makes a student lose one year due to a faulty assessment process.

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Quality

Accreditation to Mandatory Disclosure of Outcomes

Accreditation has failed to ensure the quality of educational institutions and has become an inspection process, where the institutional resources are mostly busy filling various formats for the inspection team to arrive and assess. With tools of technology available and hardware and software becoming cheaper day by day, it is time to digitise and network all academic, administrative and financial functions of the educational institutions – be it government or private, be it primary or an international university – in a phased manner. Right from attendance of learners and faculty, to fees, to results – all be uploaded digitally and hence, there can be a comparative dashboard of which institute stands where. To me, accreditations have failed to serve any purpose.

A Central Bureau of Educational Intelligence (or another name) with high quality expertise in statistical analysis and management information systems be set up and a Centre of Excellence for Universities in every zone or region be formed to provide the requisite focus for monitoring and uplifting the quality of education.

The main objective of such a facilitation body would be to provide a fair and transparent policy environment which promotes affordable, equitable and quality education in private domain as well. This will ensure that there is a level playing field for private and public sector, but the thrust be to strengthen the public sector, considering that the major proportion of population still cannot afford the expensive education provided by the private sector. The intention is to ensure that education is treated as a public good and has an effective monitoring and facilitation mechanism.

- It is time that the regional government sits together to define the framework of Standards and Evaluation for all types of schools, a self-evaluation tool positioning learner at the centre, and considering the school as a unit of evaluation.
- The aim be to promote the quality of higher education by investing in infrastructure facilities, like classrooms, laboratories, and libraries – to create a conducive learning environment for the learner.
- Institutions should evolve assessment of faculty-members on parameters, including peer-review and learner evaluation/feedback, for quality of teaching and learning.
- Autonomy of institutions is the cornerstone for ensuring quality of education. Substantial autonomy among educational institutions must be encouraged through reforms in the existing affiliation system. Respective state governments must encourage and facilitate transition of affiliated colleges to seek autonomy.
- State Councils of Higher Education be mandated to monitor periodically the academic standards of universities and colleges.
- There is a need to evolve state-wide rating/ranking framework, in addition to the National Ranking framework, to assess and evaluate higher education institutions in the country. Such an exercise must be conducted on a yearly basis.
- The quality of faculty is the most critical factor responsible for the overall quality and excellence in school and higher education. It is a matter of grave concern that a large number of faculty positions remain perennially vacant due to either non-availability of suitably qualified persons or due to procedural restrictions/fund constraints in state universities/colleges.
- In order to ensure that expansion drive in higher education is sustained, initiatives be taken to attract and retain the best talents as faculty resources, by creating conducive working ambience and by making teaching and research a lucrative career destination, through continuous central assistance. It is time that we institute a ‘revolving door policy’ and ‘lateral entry’ for the faculty. This will ensure that the teachers spend time in the industry and come back to academics or concurrently do both. Also, distinguished achievers in their

respective field should be given lateral entry as a faculty at senior levels, so that the learners can gain from their experience and knowledge.

Norm-based funding, with incentives for activities that promote excellence in public-funded higher education institutions be introduced. All public-funded institutions to prepare perspective plans with specific milestones and timelines, so as to ensure autonomy with financial and administrative accountability.

Evolve a quality support system by restructuring of the administrative structures in the states, enabling the separation of:

- Administrative functions (teacher recruitment and deployment, personnel management, planning, financial management, court cases, etc.).
- Academic monitoring function (academic support, including the monitoring of learning and teacher support).
- Managing ancillary functions (including program management, dealing with IT support providers, testing support, infrastructure support).

One of the things that will push Governments to invest more in education and health is a comparative ranking of regional governments on investment and outcome. Else, there is no political incentive to invest in education. This ties down to state, regional and district level of indicators to ensure that the quality of education improves at all level and the national aggregates don’t conceal the regional weakness.

We are living in a world of real time data and technology and so, technology must be deployed across functions to have the data on which action can be taken.

17

Empowerment of Learners

Learners are to be groomed as future citizens of the country and the world at large. In order to enable them as the active agents of any desirable positive change in the society, they need to be trained and equipped with necessary set of values, attitudes and skills, which include; empathy, optimism, courage, respect for all, sensibility to other's needs, willingness and resourcefulness to help others, social responsibility, dignity of labour, team play, personal and professional integrity, resilience, discipline and self-regulation, leadership, etc. One of the best ways of developing these attitudes and skills is through practical learning experience. A paramilitary training and other suitable exposure and experience like working with NGOs in rural, semi-urban environment offers effective method and opportunities to cater to these needs. Hence, schools/institutions should consider to facilitate offering of such a training to learners from grade 11th. Learners can have a choice of opting amongst multiple such programme according to their choice. Such training will allow the learners to imbibe, through practical means, awareness of fundamental duties laid down by the constitution. Further, it will also help them to connect to their society/community much better, allowing them to appreciate the contributions of the society in their growth, and at the same time, sensitise them to make positive contributions towards the betterment of the society.

Learner's Representation in Decision-making Processes

Learners are central to the education process as they are the primary stakeholders. Unfortunately, they are not involved in any decision-making process concerned with them and their future. Hence, Schools/Higher

Education Institutions/ Managements/Universities, etc., are expected to create appropriate structures and systems facilitating the involvement of learners and alumni, and their opinion in the decision-making process. This also allows them to take ownership in the entire process and enables them to contribute meaningfully towards their own development.

Learner (Student) Services Guarantee

In order to bring in more accountability, efficiency and commitment to quality educational processes centred around learners, the Governments must ensure the provision of certain services to learners, which may include provision of learning resources, publication of exam results in time, timely announcement and adherence to academic calendar.

18

Creativity and Innovation

Nurturing creativity and innovation among the learners and teachers in schools and colleges be taken up through 'Innovation Gurukula' (Centres) with a comprehensive model which covers sourcing, funding, training, certification, expert advice, patent service, IPR, placement linkage, entrepreneurship, awards/ incentives/fellowships and profiling of innovations. This be established in each Composite School or Educational Hub or Clusters and Universities. It can be created under a central nodal agency and members from industries, professional bodies, premier research and higher education institutions and NGOs could mentor such centres.

Learners willing to pursue their passion in creative activities be encouraged by giving credit points in evaluation. They should also be facilitated with multiple entry and exit and re-entry options at every level in the education system.

Necessary framework be developed for assessing learner's capability through a variety of methods which will also reflect creative and innovative thinking of the students.

Hackathon, festivals and competitions be organised to encourage new ideas, innovations, and entrepreneurial culture among the students.

19

Information and Communication Technology (ICT)

The Need for ICT in Education and its Scope

Information and Communication Technology (ICT) is a critical sector in the economy. It has impacted all other economic sectors and it attracts some of the brightest minds in the country. Thus, there is an immediate need to integrate ICT into all aspects of education. Education must be an important platform for, and a contributor to the Digital Campaign to transform the country into a digitally empowered society and knowledge economy. Further, in view of rapid technological developments in Big Data, Artificial Intelligence, Augmented Reality, Virtual Reality and Machine Learning, that are likely to have disruptive influences on jobs, it is incumbent on the education system to prepare learners for these challenges. There is tremendous scope to integrate ICT in teacher development, within the curriculum, in tools for curriculum delivery, for assessment of the knowledge givers and knowledge seekers (learners), and for bringing transparency, accountability and efficiency in administrative and governance processes. ICT provides an opportunity to engage with the private sector across training, testing and assessment. Although ICT was introduced as a school subject in the 1980s, and computer facilities have been created in schools, but decades have passed and it has not yet become an integral part of the teaching-learning process.

ICT for Teacher Development

Teachers who are competent in the use of ICT are key to the successful implementation of ICT in education. Technology be used extensively in pre-service and in-service teacher development and teacher assessment processes.

Teachers be trained in the use of ICT-based tools to enhance teaching-learning processes, and in incorporating e-content (including MOOCs) in classrooms, using appropriate pedagogies, in designing and evaluating appropriate assessments, in using ICT-based tools to assist children with special needs, and be given hands-on training to address common problems related to connectivity, and maintenance of ICT equipment and its safe operation.

There is an increasing proliferation of computing devices amongst the teaching community. Hence, it is imperative to provide connectivity and access to locate high-quality educational resources online and incorporate these into their pedagogy.

ICT based tools be used for Assessment of teachers' competence and further improvement.

Curriculum

Trained teachers and the necessary digital infrastructure (including hardware, software, electricity, connectivity and support for equipment maintenance) be provided to all schools in a phased manner. To leverage this infrastructure:

- An appropriate curriculum, learning outcomes and hands-on assessments (using available digital infrastructure) be developed to ensure digital literacy.
- An appropriate curriculum and learning outcome for developing *computational thinking* (a fundamental skill in the digital age, which includes algorithmic thinking and critical reasoning) also be created and integrated into the existing curriculum.
- These curricula be revised on a yearly basis, given the pace of development in ICT.
- Coding is a unique tool. Coding be introduced from preparatory school onwards as a subject and the policy recommends creation of

skilled resources in coding to meet the needs of schools.

- ICT-based tools be used to assist children with special needs and for remedial learning.
- The power of ICT to personalise how e-resources are presented (by evaluating individual learner levels in real time) is not being used as effectively as it could. These adaptive ICT solutions can also be used for assessing the learners understanding and teacher competence. (including remedial learning as part of formative assessment), so that remedial steps may be taken proactively and timely.
- Assessment of teachers: Teaching is a dynamic profession that requires teachers to upgrade, learn and unlearn with time. Just like learners are assessed, teachers should also undergo an ICT-based training and assessment on a periodic basis. This will also ensure the quality and dynamism of the teaching profession.

Based on preparatory school, children should undergo psychometric analysis (mediated through ICT-based assessments) to help them choose their careers. Country-centric psychometric tools need to be developed for the same.

Curriculum Delivery

There are existing e-resources for education, available in multiple Indian languages. However, there is a need to comprehensively and periodically review the quality and content of these resources, and revise them as necessary. A mechanism for obtaining user feedback must be in-built into these resources, and this feedback must be considered during the review process.

Competency Assessment

The purpose is to check the knowledge/competence acquired by the learner. If the learner wants to pursue higher education, this learning should provide a pathway. It is time to move away from the question and answer-based assessment. Ideally, the assessment or examination should be holistic: one-third question and answer based, one-third project based and one-third

practical, demonstration and experience-based; spread over a period of time, so that the learner acquires a competence for a specific outcome which can be tested periodically and practically so that the annual assessment and failure be done away with. If the learner is being taught mathematics, it may be worth getting the learner to form a group and do trading involving the topic of study, or like setting a company role play if they are studying commerce or, doing an experiment on gravity if they are learning gravity. For some topics, where practicals are not possible, they can draw mind maps, or do question and answers or there are multiple ways to assess such topics. But mere question and answer in a two to three hour examination just adds to the stress, and is not fair to evaluate every learner, as some learners suffer from examination phobia, and panic at the thought of appearing in exams, and fail to reproduce answers at the right moment and so fare poorly in examinations, though they may understand the subject they are being assessed for. Why should a learner be failed in an annual examination? If there is a periodic assessment, timely intervention can lead to course correction in a weekly, fortnightly and monthly assessment rather than wasting an entire year by failing a learner in a year-end exam. This needs to change. So, it is the system that fails them in the assessment of their competence, which means that the system is faulty and needs to be radically changed. It is time that the researchers and planners develop a unique methodology to evaluate a learner outside of the question and answer-based examination system. This will also bring application-oriented approach to teaching. Also, time to do away with the stress of appearing in multiple exams for testing the same competencies. Hence, it would be ideal that, there should be one assessment at the school level which is done by the National Competence Assessment Agency, and which gives learner multiple (at least 3) opportunities, giving them the flexibility for assessment. Anyone can appear for any exam at any time around the year based on one's preparedness, or another and better alternative to try, is to spread the evaluation to mix of practical, project work and oral and written tests spread over a year so that the learner is not overly burdened for a quarterly, half yearly and an annual examination. More emphasis should be given to practical and application part and not let someone know that he/she failed at the end of the year.

Administration

Deploying ICT will result in improving the efficiency of manual processes related to educational planning and management, admissions, attendance, monitoring, examinations, certification, facility management, etc.

Knowledge Management

- All educational content (textbooks, reference books, etc.) should be available in digital formats. We must synergise and converge all existing projects in this domain into a national repository.
- National Digital Library – repository for all levels – Schools, higher education and research should be built upon.
- ICT should act as an enabler for lifelong learning.
- Disseminating research and best practices through a dedicated portal and regional conferences and seminars be encouraged.

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Internationalisation

In a globally connected world, a country like India, with its size, diversity and aspirations of a billion plus people, needs world-class education system and institutions that cater to the needs of both domestic and international academic community and compete with the best institutions of the world. Further, to sustain the economic progress and extend its success to other socio-developmental domains, it is imperative that India remains on the forefront of global knowledge creation and innovation. For this, talent across the world has to be attracted and supported. Further, learners, researchers and faculties from diverse cultural backgrounds, ethnicities and nationalities bring in fresh perspectives, which is the most essential element in knowledge creation. All this dictate the need for Internationalisation of Education, which includes world-class quality education, attracting more international learners and faculty, to create a rich, multicultural study environment, nurturing global citizens. Furthermore, it means, and implies, embracing new global partnerships, harnessing technological applications to offer country's learners access to the best teaching from all over the world and, empower the institutions to benchmark against established, trusted and tough global standards.

Also, by allowing international institutions to operate in the country, provided they meet the conditions of maintaining financial transparency and all other rules, will ensure that institutions across the country compete with the best in the world and upgrade themselves.

Towards this end, the following initiatives be taken:

- To pursue the policy of 'Internationalisation at Home', which means the best quality education, matching international standards in terms of curriculum, pedagogy, assessment, infrastructure, research facilities and support, rich learning environment – flexible and

mobile, facilitative and learner-friendly systems, structures and processes be put in place.

- A major strategy for internationalisation, with special focus on substantially increasing the inward movement of international learners be put in place with an ecosystem approach. All the concerned organisations should be tasked to prepare a yearly action plan towards this goal. The strategic plan should look into leveraging and positioning India as an Education hub for Asia, Middle-East and African countries, especially with a focus on several nation groups, of which India is a part.
- A proper legislative framework facilitating the entry and simultaneously ensuring adequate regulation of foreign Universities be put in place. Only select top Universities which match the sectoral needs of the country, with a proven record of research and innovation, be permitted to operate in India.
- Universities with the potential for internationalisation be equipped with funding and other support for internationalisation of Higher Education. Institutions/Universities be encouraged to develop and offer specially designed courses on Indian Art, Music, Dance, Languages, Heritage, Yoga, Ayurveda, History, Politics, Development, etc., as these are areas where a country like India has something unique to offer to the International learners.
- Setting up of Special Education Zones is another idea to give a chance.

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Skills Education, Employability and Entrepreneurship

The country has to move away from being a degree factory. Education is not just about academics, but also about employable skills for sustenance. We have to ensure that people who pass out of our education system are not just academically literate but also functionally literate, i.e. skilled and employable. This way, they can contribute to the socio-economic development of the country. The policy recommends the following:

- An expert committee, consisting of academics and industry experts, be tasked with working out a strategy for educational institutions of all types, to engage in training youth for vocational education and skills, both in the formal as well as informal sector.
- Mainstreaming of vocational education within the formal academic system, will help in the vocationalisation of secondary education and beyond. An expert committee should create an implementation plan for this strategy.
- We have to give up this nomenclature of mainstream qualifications and vocational degrees. We need to redefine and name them as academic degrees (B.A./B.Sc.) or applied degrees (vocational). At grade XI level, the learners be given a choice to opt for vocational (applied) stream or academic education. In fact, the bachelor's degree, based on work experience or integrated skill development, has many advantages over the academic programs and must be scaled up. Horizontal or vertical movement from vocational (applied) to other academic courses, need to be clearly defined.
- A new curriculum framework for school education be created and the education system must make space for the integration of vocational subjects, from Grades 8-12, as a formal stream along with Science,

Maths and other subjects. The curriculum can then be adapted by all the regional Boards of Education.

- Each learner be allowed to choose his or her vocation on their own, based on their leaning and bent of mind. Counsellors be provided at schools, as a shared resource if necessary. Learners be exposed to as many vocations as possible during their preparatory years, but the final decision to take up a vocation in their secondary or senior secondary years, and the choice of the vocation, be left entirely to the learner.
- The computer labs be set up in the schools under Club@ Schools (computer clubs at school) scheme, which may be utilised for imparting vocational skills to the learners and the local youth community, post school hours, in partnership with the agencies who operate such computer labs.
- Schools which have adequate land and infrastructure, may be utilised to set up formal vocational skill centres, in partnership with Training Partners or otherwise, offering programmes that suit the needs of the learners and youth and are relevant to the local economy and the industry. Such centres can also function after school hours to offer Government sponsored skill development schemes. All these skill development courses can be formally compliant to a regional or national standard, and the Sectoral Skills Councils can enable the trainees to move up the chain of qualifications.
- The vocational skills qualifications acquired through Industrial Training Institute (ITI) (in case of India) be given a certificate of equivalence to either Class X or XII as the case may be, after the concerned learner completes the essential bridge course to address the gaps, if any, in the language and knowledge components. This measure would enable students to pursue higher academic programmes while allowing them to use the skills they have acquired for wage/self-employment. So, the son of a farmer or cobbler or carpenter, with prior learning and experience, should be able to give the competency assessment test and gain graduate degree in his field of work. This will result in better integration, career/academic progression and consequent acceptability of the vocational skills programs by the society at large.

- No mechanism for assessment and Recognition of Prior Learning (RPL) has been developed so far. To overcome this gap, the Government should endeavour to develop mechanisms to assess and certify such skills and competencies, and facilitate the entry of those who have no formal education and training, but have acquired the skills without any certification, for possession of those skills.
- There should be a special focus on skill education for tribal areas. Since most tribal schools are residential, it will not be difficult (wherever infrastructure is available), to start skill courses after regular school hours. One such example is in Dantewada in Bastar, where a Livelihood College offers nearly 20 skill courses, both in soft and industrial skills, and has created many job opportunities for tribal youth. There are many such examples, so it is clear that this is a viable task.
- From times immemorial, we have been an agrarian society, but now people are moving away from agriculture. The world has a challenge to feed more than 7 billion people and hence, there is a need to bring agriculture and rural areas in the mainstream of our educational system, and to familiarise students with rural/agricultural issues. These courses must begin at the vocational level and continue into secondary and senior secondary school. Learners should be exposed to subjects like soil health, balanced use of fertilisers, water conservation, and the importance of seeds in agriculture and pest control. If we are able to make the learner take an optional subject of farming and lend a helping hand to the farmer during the sowing season, it may serve a dual purpose of training the learner in farming and providing resources to farming which are becoming unaffordable. Learners can be remunerated by the farmers or by the government for their training. This will also sensitise the learners about our rural ecosystem and climate change.
- The National Institute of Open Schooling (NIOS), in collaboration with Ministry of Skill Development & Entrepreneurship, should redefine itself to address the large potential demand for vocational education. The issues of management, monitoring and oversight of NIOS be addressed appropriately.

- There is no need of a separate board for vocational education, and it is time to convert NCERT (National Council of Education, Research and Training) into NCESRT (National Council of Education, Skills, Research and Training), which needs to plan the syllabus, prepare a definite programme for grades 8-12, and issue NCESRT Secondary Certificate and Diploma after 12th. NSDC (National Skills Development Corporation) should also connect links between the job market and the training institutes so that there is always compatibility between the employment possibilities and the NCESRT school curricula.
- Universities be allowed to use their infrastructure and their connect with industry, to set up one or more Centres of Excellence in skills training. Some examples of such skills include toy making, tooling, jewellery design, fine arts – music, theatre, etc., healthcare related and many others. These can even be run as centres of profit, bringing in revenues for the university. Institutions be permitted to use facilities for carrying out Skill Development Programmes in off-hours. Institutions be encouraged to work closely with industries, governments and other local employers to identify areas where skills are needed.
- In fact, what we refer to as mainstream is actually a 'purely academic' education. We need to rename the so called 'mainstream' to 'academic' and rename 'vocational' to 'applied' . Then, we will see that more and more learners will start opting for 'applied graduate courses' – B.Sc. (Applied Sciences) etc. rather than B.Sc. (Academic). We need to think differently, else vocational education will not take off the way it should. The present skill-based programmes at higher secondary and technical education level be integrated through National Skills Foundation with the academic education, to facilitate greater social acceptability, as well as vertical and horizontal mobility. Institutional mechanism be created for certification of skills through multiple entry and exit options, credit bank system, institutional collaboration for credit transfer, and National Occupational Standards based delivery of skills for national recognition and outcome based assessment. The best way forward is to transform NCERT to NCESRT, and focus and promote on giving learners a varied choice of subjects (like chemistry, management and

tannery science, instead of PCM (Physics, Mathematics and Chemistry); Agriculture, Management and Innovation, instead of Botany, Zoology and Chemistry or pure agriculture stream. Learners should be at liberty to opt for suitable mix and match combinations, and even add additional subjects from a mix of academic and applied fields, as a part of undergraduate and graduate courses. This will spur innovation and entrepreneurship, besides making them relevant to the needs of future.

- Mandatory Articleship/Apprenticeship be introduced in all the courses, wherever possible, from undergraduate level, with suitable credits. The em-ployability skill education and counselling on how to manage failure, setbacks and disappointments, and risk taking, be introduced to learners at school level.
- Full-fledged Entrepreneurship education be encouraged with specific structure. It includes creation of entrepreneurship development centre with incubation support in universities and colleges. This be encouraged through funding and creating a network of venture capitalists, industrialists and other related institutions. Nurturing the ideas of the learners, and developing the entrepreneurial culture among the learners, be taken up – right from school education, as a module or a set of modules.
- At the higher education level, a web and mobile-based platform connecting the entire entrepreneurial ecosystem with education be established (in associ-ation with Ministry of Skill Development and Entrepreneurship, this minis-try should ideally be under the Ministry of Human Resource Development).
- Skill education be linked to geographic and gender-specific requirements through appropriate measures to recognise local need and improve employability. Mapping of the local occupations and skill sets required be initiated through Universities.

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Community Participation

Local community be encouraged to get involved in the development of institutions and universities, by creating a sense of public ownership, for better participation.

- The philanthropic contribution (donation) and CSR funds to education sector be promoted through supportive regulatory systems. Income Tax exemption to the extent of 100% be provided on all endowments and contributions made to schools, universities, colleges and other educational institutes by individuals, including alumni and other organisations.
- The social interface with the institutions be encouraged through extension activities. Public be given access to some of the facilities in schools and colleges, like library, skill development centres, etc.
- Universities should address the economic, business, employment, cultural and social needs of the local area, and promote indigenous knowledge system through suitable course, research, advocacy and publicity.
- The Government should recognise and support the work of community in their activities relating to education; like enrolment, regular teaching and coaching, health and nutrition programmes in schools, etc.
- To foster the culture of social responsibility among the learners, the institutions should create Institutional Social Responsibility Cell and organise activities in the interest of community.

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Levels of Education

Higher Education and Research

The number of PhDs being produced in India have been very small, under 10,000 a year, relative to most other countries (50,000 in US, 30,000 in China). The worrying thing though is that, in recent years, the quality of PhDs being produced has also taken a sharp downturn. This calls for a flexibility in approach of who can enrol in the PhD program (like one with a professional experience be a more desirable qualification than just having a degree). We need to remove artificial barriers and keep the focus on the quality of research. The sole criteria should be the idea behind the research. If the idea behind research is compelling, we need to look at making exceptions in the routine requirements and the institutions must be given the flexibility to take a call. Those who are already accomplished by bringing out new knowledge or doing work which qualifies as a research work, must be awarded the doctorate based solely on their work being reviewed by panel of experts in the field. Such contributions should be exempted from the routine PhD schedule and granted a doctorate for their exemplary contributions and thought leadership through a fast-track PhD.

Following steps need to be taken:

- For a country like India, which is like a subcontinent, every state is as big and diverse as a country. Firstly, we need to define the areas where we need research, nationally and regionally and sector specific – so that the research is application oriented and not just purely academic in nature. Hence the need of setting up state-specific universities, regional education research institutes and centres of excellence in research, in various fields of higher education, to promote excellence in research and encourage innovations. Private trusts, philanthropists, foundations and industry be invited to help

establish such Centres of Excellence. Universities should submit proposals that can be peer-reviewed and funded. Also, sector-specific universities should be set up to create new knowledge and expertise for the sector and establish the country as a world leader in each of the domain, dovetailing with the overarching theme of making the country a knowledge superpower by virtue of the world class output from its education system.

- A regulatory (rather facilitation) regime conducive to the encouragement/ establishment of such institutions of excellence be put in place.
- Access to research funding from the government be on a peer-reviewed basis, and grants should have a periodic disbursement, based on milestones based achievements.
- Budgetary allocation for research be increased and areas of research of strategic importance to the country be identified and selectively funded at higher levels.
- Appropriate measures be taken to ensure that poor quality PhDs doing repetitive research can be phased out. It might be a good idea to specifically mention right in the beginning of research the new knowledge brought forth in the work and how it can impact the domain or sector.
- The best researchers in the country, from the top national research institutions, must be roped in to mentor the PhDs scholars across colleges.
- Similarly, the budgets of the research institutions must be enhanced considerably.
- Access to libraries and online journals play a key role in the ability of researchers to conduct high quality research. The Government needs to explore becoming a single buyer for online access to journals for all institutions in the country, so as to save on costs and improve access, and there is a successful model of the National Medical Library, Delhi, that needs to be replicated for all domains.
- PhD fellowships vary widely in value and duration and need to be rationalised. In many cases, the PhD fellowships are not disbursed promptly to learners, creating a lot of hardship. A prestigious national

PhD fellowship program, that provides attractive stipends to meritorious learners to enrol in PhD programs of their choice around the country, be instituted and funded generously.

- A vibrant post-doctoral program be created and funded adequately, as it contributes significantly to the growth of the post-doctoral fellow as an independent researcher and also to the institution that hosts him/her.
- It is critical to cultivate the culture of research among a larger group of institutions and students. Colleges be encouraged to support research projects for interested learners at the undergraduate level. The Masters' degree program offered at universities be required to offer a research project during the second year, so as to give interested candidates early exposure to research methodology and processes.
- All PhD programs in the country be required to ensure that learners get adequate opportunities to serve as teaching assistants (TAs) during their PhD period. This will help improve the teaching skills of PhD candidates, and give them hands-on experience in mentoring undergraduate and Masters' degree students through their assignments and projects. Also, this will provide them with an opportunity to be remunerated for being a TA.
- Policy-makers too need access to good research. However, this element is not usually factored into most research projects. Also, policy-makers in general, seldom reach out to universities for research on issues of significance that call for a nuanced understanding. This needs to change. Universities must become the go-to places for government and the industry alike, for knowledge and expertise.
- India's record in global scientific writing and research has been abysmal, and there is a need to develop the habit of scientific writing, and hence the policy recommends a national program on scientific writing be launched in collaboration with the Department of Science and Technology.
- Health of citizens is important for sustainable development and it cannot happen without having adequate qualified and trained resources. Also, medical education is overly doctor and urban centric

and has to move beyond the doctors and the urban centric model, and hence the policy recommends that appropriate bodies under the Ministry of Health & Family Welfare to take note of the following recommendations:

- Common National level standardised syllabus with mentoring throughout and curriculum review – focusing on holistic healthcare
- Focus on quality, affordability, innovation and research leveraging technology
- Continuing education
- Improving Institution performance
- Avenue for professional development and career growth with lateral entry for certificate holders and diploma holders and even paramedics, post doing the necessary credits/courses to upgrade. A Nurse, Pharmacists or a Physiotherapist should have an opportunity to complete the remaining portions of the medical syllabus and upgrade to a doctor. The policy expects de-siloing the entire education sector and breaking artificial barriers to knowledge and skill enhancement, with adequate quality and assessment checks built in.

- Co-ordination between the regulatory bodies of the various systems of medicine for holistic healthcare and integrated courses in medicine.
- As a strategy to enroll outstanding talent from neighbouring countries and abroad, we must increase the post-graduate seats (it might be good to plan and forecast the number of post-graduate seats required and then, set aside a few extra seats created, for foreign students.
- Exposure to primary care and family medicine practice setting, before enrolling for post-graduation.
- Aim at District level self-sufficiency for human resources in healthcare and hence, it might be worth considering the converting of district hospitals into medical colleges.

Technical Education

Autonomy and Standards

Technical education institutions that fail to show basic benchmark based outcomes within the stipulated period no longer be permitted to offer programmes in technical education, which means that all technical institutes will have to meet a standard in terms of research and absorption of its learners in the industry.

Financial Resources

The agency in charge of regulating technical education should conduct a periodic review (e.g., every three years) to determine viable financial models for technical education institutions, to reduce over-dependence on government grants, and prevent over-commercialisation of the education system. The Accounting Statements of institutions be put in the public domain, and monitored by a governance committee of the institution, the structure of which is detailed in the earlier section.

Human Resource Planning

No vacancy should exist in an academic institution and hence every institution must have a clear three-line succession plan. This is besides the induction and training for every level of human resource.

Industry Academia Interaction

Industry comes from the academic institutions, and it cannot exist without academics creating the human resources and research for the industry. Hence, it calls for a close working between the industry and the academia that is not just limited to sabbaticals, but also engaging the industry in designing the curriculum for the technical subjects and industry leaders

joining as a faculty in academic institutions to support research and help the industry expand its horizons. Policy recommends the following:

1. Faculty be encouraged to take an Industry Sabbatical (in one or two phases), after they attain PhD. It should be mandatory for Professors to periodically take Industry Sabbaticals, with industries incentivised to pay salaries (e.g., under CSR). It is important to look at what Bhutan has done by giving highest salaries to teachers and doctors (The Indian Express, 2019). Unless we do that, teaching will remain low on the priority list for joining. Even in a 35 nation survey (Wood, 2019), teaching does not come in the top three professions. Head teacher comes 4th but secondary and primary teachers come much below police officers, nurses, accountants, local government managers and management consultant. Towards this end, industries be encouraged to establish centres of excellence in institutions, with a 51:49 formula for funding. These centres should encourage learners to work on industry-relevant problems, and will facilitate their absorption in the industry on graduation. These centres will also promote:
    - Joint R&D projects with in-house funding and collaborative research with learners (UG, M-Tech, PhD) & scholars under joint supervision model (with agreement/MoU for protecting intellectual property by joint patent filing or awarding ‘first use’ clause).
    - Collaborative projects with third party funding (governments or private trusts).
    - A revolving door policy for academia and industry professionals. Under this, the industry professionals return to academia and vice versa. Adjunct faculty position be offered to selected industry experts to deliver guest lectures and to serve in board of studies, besides joining directly as senior faculty in leading institutions and universities.
    - Executive training programs/refresher courses for the industry.
    - Organising joint seminars, workshops, theme meetings, etc.
    - Industry experts to serve on the academic councils and in curriculum design for vocational and technical courses.

- There should be an institutional mechanism in place for volunteering opportunity for accomplished individuals or organisations who wish to contribute to teaching at all levels.

2. For technical institutions conducting research with Masters/PhD programmes, a PhD or outstanding industry experience be mandatory for all regular faculty. For institutions offering only undergraduate programmes, a PhD should not be essential for posts of a Professor, but a deep understanding of the topic is what is needed. Strong industry/ professional experience should be a qualification to be appointed as distinguished professors in universities. Schemes to encourage faculty to pursue PhD and research be strongly promoted.

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Implementation Framework

The Futuristic Education Policy for GenNext has suggested transformative ideas for preparing the country for marching ahead in the 21st century. Since these ideas are truly transformative, we would not just need an implementation plan but also, a transition plan for a phased implementation of reforms in education sector. A detailed roadmap on the broader aspects of implementation framework, along with the tentative timelines, be developed, along with a virtual platform to monitor the progress, and it is recommended that the planners and policy makers put the annual report of inputs and outcomes in public domain, and to discuss in the legislature/parliament, to ensure that the policy does not just remain an academic document cast in stone but an agile plan of action for transforming this most crucial building block of a nation – 'Education'.

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Points to Ponder

Though in the section on the Futuristic Education Policy for GenNext, I have tried to cover all aspects of education system, governance, financing and delivery in a prescriptive manner, in a structured way, in this section, I walk the reader through some points in a non-prescriptive and random manner.

Completely redo Primary and Secondary Education

The education system needs a radical overhaul, and for reforming fundamentals of education, the first port of call, is the primary and secondary education. Let's take the case of a vast and diverse country like India. Despite a big thrust on education, the enrolment rates have gone down, rather than going up. The rate of decline in enrolments has been in double digits for mainstreaming the out-of-school children, for 8 out of 10 large states from the base year of 2015-2016. If we take the secondary education, the Net Enrolment Rate (NER) has dropped below 50% in states like Jharkhand, Andhra Pradesh and Jammu & Kashmir. In 2015-2016 in all the 20 large states and 7 Union territories and 8 smaller states of India, the NER is over 50% (Gohain, 2019). Also, according to an estimate, for children in the age group of 6-14, who are covered in the right to education (free and compulsory education), 4.5 crore children are still out of school and this constitutes 16.1% of all the children in this age group (Dubey, Pankaj & Mitra, 2018). All this is despite having compulsory and free education, mid-day meal scheme and many other state-level incentives and schemes. As a member of the national education policy committee, I had discussions with the team and it was pointed that we need more investments

to boost failing enrolments in secondary school. When I went to villages and talked to students, parents and teachers, the reality was, that the parents of these children didn't see much value in the current education system. So, despite initial increase in the primary level enrolments, the NER keeps dropping with higher classes or grades. Means, rather than just investing more, we need to innovate and make the education valuable for the learner at the primary level first. So, whereas the goal should have been to make primary education more meaningful, the thought went to investing more in secondary education as the enrolment in secondary came down due to poor level of primary education. Such missteps only waste the tax payers money and don't deliver on the goals. It is time to do an exhaustive study on the relevance of education at every level, and then take corrective steps.

Technical Education Needs to Reboot with Management

Moving beyond the school education, let us take a peep at the technical education. Given that India has been often called the 'body shop' for engineering graduates, with our techies all over the globe working for every major corporation; If India remains the best teaching place for engineering, then why are engineering schools closing because of not being able to fill seats anymore (The Times of India, 2019), and India is not in the list of top mobile app creators. In fact, if we look at the top mobile app creator countries, India does not feature on the list, still we talk about being the technological capital of the world ! So, is our education system not delivering the right skill set that can make India the country which produces the highest number of mobile apps, as it is just making technicians and engineers, and not technopreneurs? Education 'System' needs a re-look from what it delivers and probably, every engineering graduate needs to take lessons on business, so that when they become entrepreneurs, they don't work for valuations but value creation. Else, every company that is founded in the country will be sold off at a 'decent valuation' – which conveys a lack of long-term perspective and ability to run a business. So we need to create studentpreneurs who can think big and long-term and have the strategic thinking and ability to withstand market ups and downs.

Education system needs a complete overhaul to realise this full potential of the learners.

Education system needs to firstly define what it wants and then how it wants to go about achieving that. Simply putting in more money does not deliver; like the RTE has not led to sustained enrolments and similarly, by throwing out more engineering graduates, India has not become a tech leader by creating the world's largest tech company, but it has been reduced to a 'Tech body shop'. Indians might run companies, but they do so in the first world, owned by non-Indians. So the education system has not delivered in totality and this calls for a complete overhaul and probably, the right thing to do would be to start afresh at every touch point – for a radical change.

Table 25.1: Top 15 GII Economies in Mobile App Creation

Economy	*GII score*	*GII rank*
Cyprus	100.00	1
Finland	66.11	2
Lithuania	63.35	3
Israel	59.41	4
Estonia	52.44	5
Sweden	50.17	6
Denmark	49.65	7
Republic of Korea	48.88	8
Republic of Moldova	45.90	10
Hong Kong (China)	44.50	10
Lebanon	44.09	11
Slovenia	42.84	12
Switzerland	41.96	13
United States of America	41.79	14
Serbia	39.48	15

(WIPO, 2018, p. 67)

Focus on Innovation

USA remained a top innovator for a long time, but dropped out of the top 10 innovative countries from the Bloomberg Innovation Index, attributed to the decline of its tertiary education in terms of ratings (McKenna, 2018). So, one action item that stands out is, innovating the tertiary education itself and transforming it. There are multiple options – like making it application based, partnership with various stakeholders, drawing a national and a global grand challenge map, and letting people do their tertiary education to address – these challenges. Else, we will continue to be a degree factory. Moreover, every country must realise that we are living in an experience and innovation economy – wherein we value usage rather than the product and it's about experience and innovation, and where quality tertiary education holds the key.

If we look at China's success in innovation, it has moved up three ranks from 17th in 2018 to 14th (out of the 129 countries in 2019) in the Global Innovation Index and remains the only country in the upper-middle income group to rub shoulders with the higher-income group countries (Cornell University, INSEAD, WIPO, 2019, p. XX) & China produces innovation output which is equivalent to Germany, the UK, Finland, Israel and the USA, with considerably lower levels of inputs (Cornell University, INSEAD, WIPO, 2019, p. XXV) and this is what the rest of the world has to learn. "Indeed, China presents an impressive example for other middle-income countries to follow as they seek to join the echelons of high-income economies. With this success in mind, China's attention is now turning to the quality and impact of innovation." (WIPO, 2018). Also, the developing world's education system needs to focus on how Switzerland, Netherlands and Sweden effectively translate their innovation inputs into higher level of output (Cornell University, INSEAD, WIPO, 2019, p. XX). Their system needs to be studied with regards to the academia and industry collaboration. So, having a clearly charted out goal and a roadmap is the important step towards academic-economic collaboration and development, as education holds the key for bridging the innovation and economic divide!

"What is the best way to translate investments on education, a high number of qualified researchers, and high R&D expenditures into high-quality innovation outputs? Despite significant investment in innovation

inputs, some economies do not generate a corresponding level of innovation outputs. Most economies have a linear relationship between innovation inputs and outputs. Among upper-middle-income countries, China strongly overperforms in the said efficiency relationship" (WIPO, 2018). So, it is imperative that we look at every solution, debate it well and then arrive at the actions to be implemented. More money is not better outcomes!

How to Drive Innovation?

Our current teaching model only encourages memorisation and routine, there is absolutely no scope for creativity and innovation.

Transforming communities that surround the universities is a good way to start. Take the example of Indira Gandhi National Tribal University in India. It's learners work with the communities around it and try to understand their challenges, and provide solutions. Such examples need to be amplified and we need to go beyond to make education application oriented and relevant to the needs of communities around and the society we live in, through new design and practices.

Every university needs to become a part of the regional, national and its own captive Knowledge Bank. All knowledge developed by the Universities which can be commercialised should be monetised and learners and researchers who develop the solutions should be equal partners in the commercials. Professors and researchers could be entrepreneurs and academicians at the same time.

It might be a good idea to develop our own competency assessment rankings for educational institutions and those who deliver outstanding results should be rewarded with cash incentives and grants to fund innovation and research.

Learning at every level beyond preparatory level is needed to transition from education to work; from being dependent on family to work for the family, and it is time for India to think whether education and employment should run concurrently. Else, we will have more NEET (Neither Employed, nor in Education or Training). Education has to provide skills for labour market (OECD, 2018, p. 58) and entrepreneurship.

Thiel Fellowship, is a new way to look at innovation in education https://thielfellowship.org/

Overly Focussed on Science – De Siloing Education

It is interesting to learn how universities like Oxford are investing unprecedented amounts in humanities to understand the moral and ethical implications of Artificial Intelligence and engage with philosophy and ethics. These investments are aimed at providing an ethical framework for developing machine intelligence, for responding to the enhanced automation of work and the role of algorithms in all spheres of human life (University of Oxford, 2019). Quest University Canada's program aims at educating students for an interdisciplinary lifelong learning (Masi, 2019). In Greece, great philosophers, artists, scientists would talk, interact and exchange their knowledge and experience with one another (Masi, 2019) and there are umpteen examples of where the inter-disciplinary approach to education is practised – outcome is 'innovation'.

It is rightly said, 'The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn and relearn – Alvin Toffler', and with inter-disciplinary approach to education, people will learn and unlearn faster, and moreover, learn to accept multiple view points.

It is time to see what will lead a country to be a leader in application sciences and not just academic sciences. So, we need collaboration between sociology, psychology, economics, technologists and management. Else, siloed education will do more harm than good.

Doctorate Degree – PhD

One thing that has always intrigued me is the value of having a doctorate degree. We need to re-look at how we address this; not only that we have to make it interesting, but also change the way we look at qualifying criteria

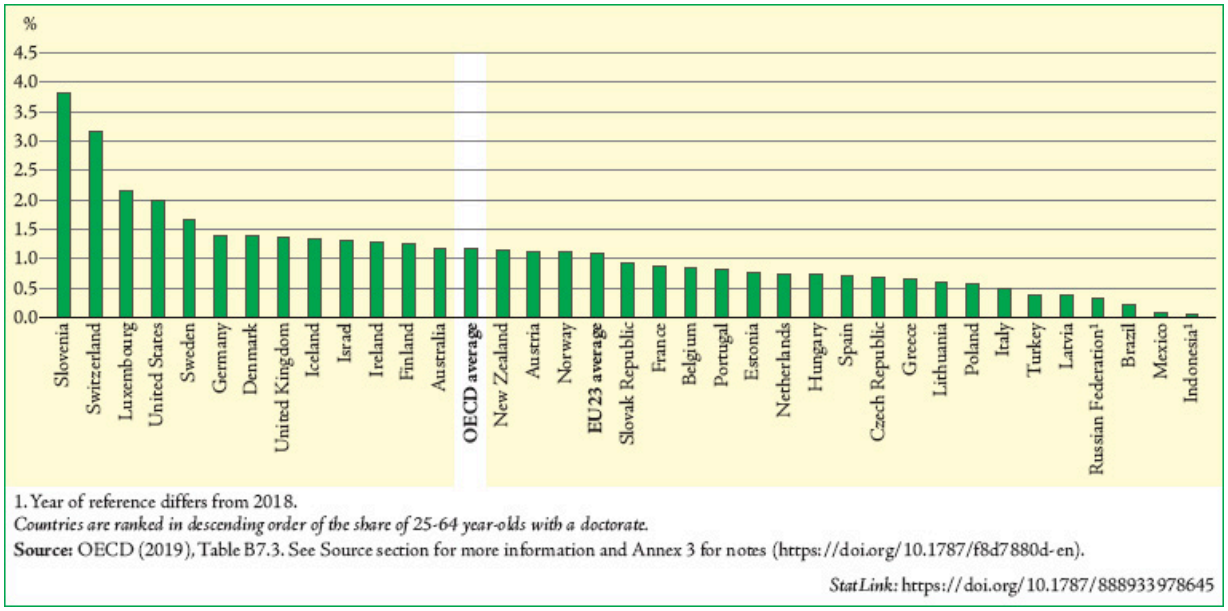
and delivering a doctorate/PhD. Doing a doctorate is about adding new knowledge to a domain and yet, we have so few doctorates. So, let us reset the doctorate/PhD system. If a graduate student wishes to do a PhD, why not ? If a corporate executive or a person working in an office or any organisation or even a school wishes to pursue a part-time doctorate, why not ? Temple Grandin is today the world's foremost authority on autism and is herself an autistic. She was in the sixth percentile in reasoning and ninety-fifth percentile in verbal ability, is a global expert in animal husbandry, and has helped change the thought on autism, and there is even a movie on her life by HBO (Grandin & Panek, 2014). Does such a contributor to the field not be given a PhD for her published work? Anyone who accomplishes such a path breaking work in a given field should qualify to get a doctorate, even without enrolling, based on their contributions.

Let us do away with the rule of having a qualifying examination once a year to enrol in a PhD. Does it make sense for a researcher to wait for a year because of missing an entrance test ? Why not make it open round the year and let a researcher have a compelling topic and an experienced guide in the field of research and enrol at a local or a dedicated national university that focusses only on research and let the candidate enrol for a doctorate. If the PhD leads to addition to knowledge, let us encourage it.

Also, the criteria for PhD and for teachers to get a promotion in university is to have a number of research papers/articles being published. While, it is a good way to boost academic contribution and research, but let us not create artificial barriers. Nobel Laureate, Randy Schekman said that he would not publish any more in 'luxury journals' such as Nature or Cell and Science, in protest against the 'tyranny of the impact factor' which 'distorts the scientific process' (Masi, 2019). So, the focus and goals should be clear and not be process driven, as such processes are nothing but artificial barriers. We must clean the education system of such barriers.

Looking at the Figures 25.1 and 25.2 (OECD, 2019), it clearly implies that not only doctorate degree holders stand a higher chance of employment even during economic crisis, but they also enjoy higher earnings. Most important-ly, these doctoral studies are crucial for economic growth and innovation and hence, any country which needs to stay ahead in terms of progress must invest in doctoral and post-doctoral program by matching

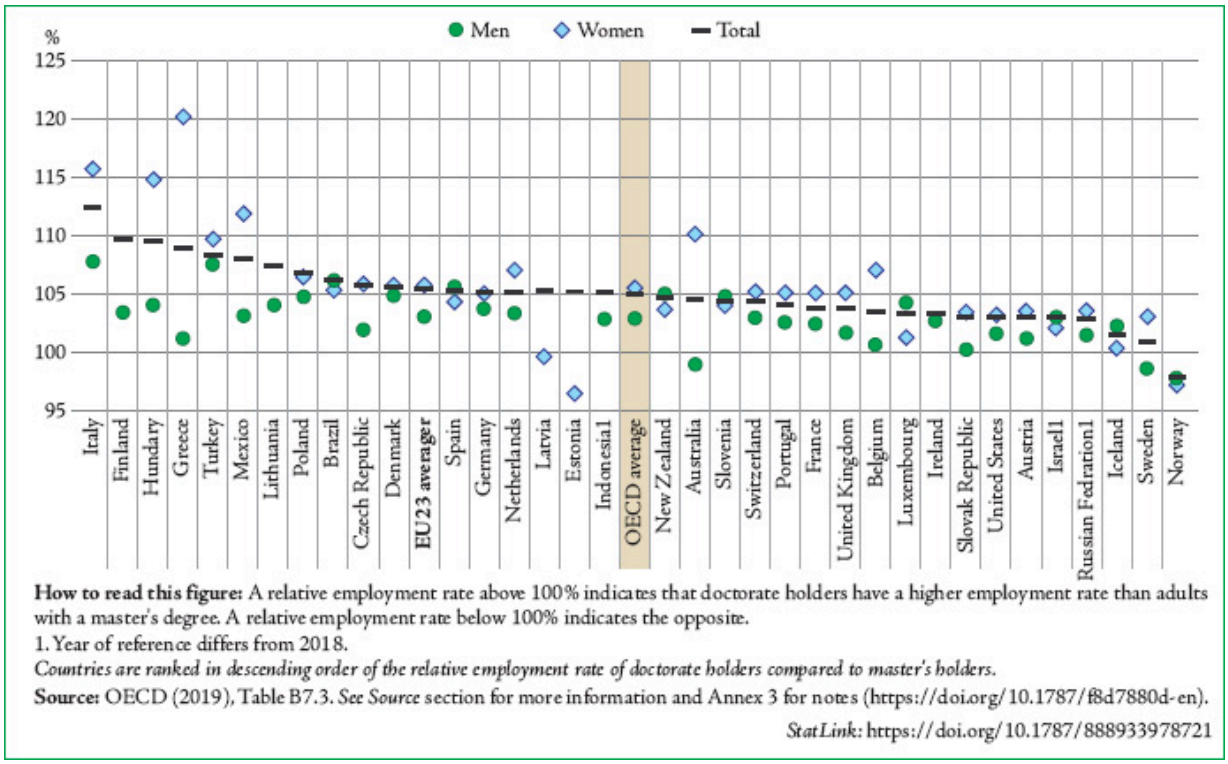
their needs and aspirational goals and this presents a unique academia-industry-government collaboration opportunity.



1. Year of reference differs from 2018.
Countries are ranked in descending order of the share of 25-64 year-olds with a doctorate.
Source: OECD (2019), Table B7.3. See Source section for more information and Annex 3 for notes (https://doi.org/10.1787/f8d7880d-en).

StatLink: https://doi.org/10.1787/888933978645

■ **FIGURE 25.1** *Share of 26-64 year-olds with a doctorate (2018)*



How to read this figure: A relative employment rate above 100% indicates that doctorate holders have a higher employment rate than adults with a master's degree. A relative employment rate below 100% indicates the opposite.
1. Year of reference differs from 2018.
Countries are ranked in descending order of the relative employment rate of doctorate holders compared to master's holders.
Source: OECD (2019), Table B7.3. *See Source* section for more information and Annex 3 for notes (https://doi.org/10.1787/f8d7880d-en).

StatLink: https://doi.org/10.1787/888933978721

■ **FIGURE 25.2** *Relative employment rate of 25-64 year-old doctorate holders compared to master's holders (2018)*

How Much Should a Country Spend on Education

Firstly, let's be clear that spending on education does not mean giving money only to universities and schools, but also to industries and small businesses and entrepreneurs, research labs, and collaborations for funding the training of people who are engaged in the 'hands-on' or 'applied courses' degrees through apprenticeship.

Spending more versus spending right

During my work at the national education policy, my question was why all reports recommend that India should invest 6% of its gross domestic product (GDP) on education. I asked the same from the secretary education, and from a former minister of education. Every one said the same thing: Since every committee recommended, we have maintained that stand. But every country must look at their needs and then, apportion and allot the funding to education sector. There is no ball-park figure. I tried to delve into the available data and the following data could help give a direction.

- According to the report Accountability in Education: Meeting our commitments (UNESCO, 2017, p. 8), governments should spend atleast 4% of GDP on education, or allocate 15% of the total government expenditure. But 75% of the countries do not achieve such an expenditure.
- In OECD countries, overall expenditure per student on educational institutions from primary to tertiary levels averages 26% of per capita GDP, broken down into 22% at primary level, 25% at lower secondary level, 26% at upper secondary level, 22% at post-secondary non-tertiary level and 39% at tertiary level (OECD, 2018, p. 250).
- In 2015, OECD countries spent an average of 5% of their GDP on educational institutions, from primary to tertiary levels, with large variations across OECD and partner countries.

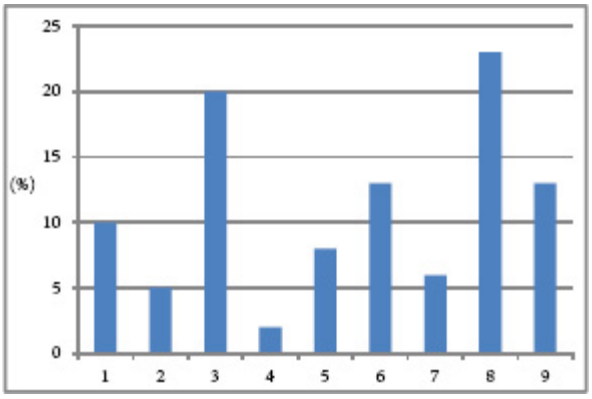
- Also, across OECD countries, the share of national resources devoted to educational institutions in non-tertiary education (primary, secondary and post-secondary non-tertiary levels) is 3.5% of GDP, much larger than the share devoted to tertiary education (1.5% of GDP). However, private sources play a crucial role in financing tertiary education, accounting on an average, for around 25% of expenditure on educational institutions (0.4% of GDP) (OECD, 2018, p. 258).
- Adult learning programs are more successful when they are explicitly linked to employment opportunities. One popular way to do this is through apprenticeships or internships that link training to day-to-day experiences and provide motivation through the promise of future economic returns (World Bank, 2019, p. 86).
- In Chile, the return to tertiary education ranges from 4 percent for humanities to 126 percent for engineering and technology. Tertiary enrolment and expenditure also vary considerably by region (World Bank, 2019, p. 77).
- On an average, across OECD countries, educational institutions are mainly publicly funded, with government funds accounting for 90% at primary, secondary and post-secondary non-tertiary and 66% for tertiary education.
- The share of private investment on tertiary educational institutions varies significantly across countries, mainly as a function of the tuition fees charged by tertiary institutions. Countries such as Colombia, Chile, Japan, UK and US account for the largest shares (around 70%).
- Public transfers to the private sector play an important role in the financing of tertiary education, representing 5% of total funds across OECD countries. Australia, New Zealand and the United Kingdom are the countries with the highest public-to-private transfers (between 20% and 35% of the total funds devoted to tertiary educational institutions) (OECD, 2018, p. 270).
- On an average, across OECD countries, staff compensation comprises the largest share of current expenditure in non-tertiary education (78%) and tertiary education (68%) (OECD, 2018, p. 308).

- OECD countries allocate, on an average, 8% of their total education spending to capital expenditure. The share is higher in tertiary education (12%) than in non-tertiary education (7%). Shares vary considerably across countries, as well as between public and private educational institutions within the same country.

Cost to learners for primary education

Given the data of household expenditure on primary education in India, Government must step up its investments in primary education

1. Private coaching 10%
2. Other expenses 5%
3. Tuition fee 20%
4. Exam fee 2%
5. Other Fees 8%
6. Books 13%
7. Transport 6%
8. Uniform 23%
9. Stationary 13%



■ **FIGURE 25.3** *Items of Household Expenditure on Primary Education. (Tilak J. B., 2009)*

Though, this is based on NSSO (1998 b) but the representation of expenses would not have changed much.

So, we need to innovate here and keep the cost low for learners and their parents.

Education, Innovation and R&D

Developing countries like India need to learn from Italy (with similar spending) and Australia in terms of more balanced innovation output. China's spectacular rise can be attributed to increasing the global R&D expenditure from 10% in 1996 to 31% in 2017. In 1997, China accounted for just 2% of global patent applications, and this has increased to 44% in 2017 (Cornell University, INSEAD, WIPO, 2019, pp. 3-4). Developing countries looking at global leadership need to see their expenditure in education and more specifically in R&D, not just for their own country, but in relation to the global R&D expenditure. Singapore, in 2016, committed to invest USD 16 billion to research, innovation and enterprise activities (Cornell University, INSEAD, WIPO, 2019, p. 22). Also, it is clear that private–public partnership (Industry and Academia) in research and development is yet to take off and make its mark in India (Kogleck, Priyadarshini, Pincock, Bocquet, & Gilloch, 2015, p. 7).

TABLE 25.2: 10 best-ranked economies by income group (rank)

Rank	*Global Innovation Index*	*Innovation Input Sub-index*	*Innovation Output Sub-index*
High-income economies (50 in total)			
1	Switzerland (1)	Singapore (1)	Switzerland (1)
2	Sweden (2)	Switzerland (2)	Netherlands (2)
3	United States of America (3)	United States of America (3)	Sweden (3)
4	Netherlands (4)	Sweden (4)	United Kingdom (4)
5	United Kingdom (5)	Denmark (5)	United States of America (6)
6	Finland (6)	United Kingdom (6)	Finland (7)
7	Denmark (7)	Finland (7)	Israel (8)
8	Singapore (8)	Hong Kong, China (8)	Germany (9)
9	Germany (9)	Canada (9)	Ireland (10)
10	Israel (10)	Republic of Korea (10)	Luxembourg (11)
Upper middle-income economies (34 in total)			
1	China (14)	China (26)	China (5)
2	Malaysia (35)	Malaysia (34)	Bulgaria (38)
3	Bulgaria (40)	Russian Federation (41)	Malaysia (39)
4	Thailand (43)	Bulgaria (45)	Thailand (43)

5	Montenegro (45)	Thailand (47)	Montenegro (46)
6	Russian Federation (46)	Peru (48)	Iran (Islamic Republic of) (47)
7	Turkey (49)	Belarus (50)	Costa Rica (48)
8	Romania (50)	South Africa (51)	Turkey (49)
9	Costa Rica (55)	North Macedonia (52)	Armenia (50)
10	Mexico (56)	Romania (54)	Romania (53)
Lower middle-income economies (26 in total)			
1	Viet Nam (42)	Georgia (44)	Ukraine (36)
2	Ukraine (47)	India (61)	Viet Nam (37)
3	Georgia (48)	Viet Nam (63)	Philippines (42)
4	India (52)	Mongolia (73)	Mongolia (44)
5	Mongolia (53)	Tunisia (74)	Republic of Moldova (45)
6	Philippines (54)	Philippines (76)	India (51)
7	Republic of Moldova (58)	Kyrgyzstan (78)	Georgia (60)
8	Tunisia (70)	Republic of Moldova (81)	Kenya (64)
9	Morocco (74)	Ukraine (82)	Tunisia (65)
10	Kenya (77)	Morocco (83)	Morocco (66)
Low-income economies (19 in total)			
1	Rwanda (94)	Rwanda (65)	United Republic of Tanzania (73)
2	Senegal (96)	Nepal (93)	Ethiopia (80)
3	United Republic of Tanzania (97)	Uganda (96)	Senegal (81)
4	Tajikistan (100)	Senegal (103)	Tajikistan (83)
5	Uganda (102)	Tajikistan (107)	Mali (100)
6	Nepal (109)	Burkina Faso (111)	Uganda (1 07)
7	Ethiopia (111)	Benin (114)	Madagascar (109)
8	Mali (112)	United Republic of Tanzania (115)	Zimbabwe (110)
9	Burkina Faso (117)	Mozambique (118)	Malawi (112)
10	Malawi (118)	Malawi (119)	Mozambique (114)

Note: Economies with top 10 positions in the GII, the Input Sub-Index, and the Output Sub-Index within their income group are highlighted.

Now, let us look at the 'cost versus return' on investing in child education.

INVESTING IN CHILD EDUCATION

“Investing in human capital is the priority to make the most of this evolving economic opportunity. Three types of skills are increasingly important in labour markets: advanced cognitive skills such as complex problem-solving, socio-behavioural skills such as teamwork, and skill combinations that are predictive of adaptability such as reasoning and self-efficacy. Building these skills requires strong human capital foundations and lifelong learning” (World Bank, 2019, p. 3).

Integrated approaches that combine health, nutrition, and stimulation investments have also been highly effective. Chile’s Crece Contigo program integrates the services provided by the health, education, welfare, and protection services, so that a child’s first contact with the system occurs while still in the womb during the mother’s first prenatal visit (World Bank, 2019, p. 76).

We need to rethink our strategies for investing in education. If we look at the annual expenditure per learner on educational institutions as a share of the GDP per capita, it amounts to 23% at primary, secondary and post-secondary non-tertiary levels on an average across OECD countries. The figure goes much higher to 38% GDP per capita at tertiary levels on funding short-cycle, bachelor’s, master’s and doctoral candidates (OECD, 2019, p. 265). Overall spending on education across OECD countries averages at 5% of their GDP on educational institutions from primary to tertiary levels, where the primary, secondary and post-secondary non-tertiary levels get 3.5% and 1.5% is devoted to tertiary education. (OECD, 2019, p. 278). Also, there is a lot to learn on the share of private and public investment in education. Across OECD countries, 83% of the funding comes from public sources and 17% from private. In Finland, Luxembourg, Norway and Sweden, private funds contribute 3% or less and in countries like Australia, Chile, Colombia, Japan, Korea, United Kingdom and the United States, private funds contribute one third to educational expenditure (OECD, 2019, p. 292). However, given the scenario of the nations and their progress, it is imperative that the majority of educational expenditure must come from the government.

Investment in education, according to me, yields deferred dividends, which keep increasing with time. According to a world bank report (World Bank, 2019, p. 75), an additional dollar invested in quality early childhood programs yields a return of US$6–$17. Also, an interesting barometer of

school education system's relevance to the society's need is reflected in the School Life Expectancy (SLE), which is defined as, "number of years a person of school entrance age can expect to spend within the specified level of education" (UNESCO, 2019). Of course, the flip side is that, it does not segregate the repeaters. Every developed nation must check its education system's relevance, not just for school level through SLE, but also for every level of education in terms of 'Education Life Expectancy', as a measure of the total number of years a citizen engages with the education system, and this will also be helpful for continuing education and re-skilling.

For individuals, an additional year of school generates higher earnings on an average. These returns are large in low and middle-income countries, especially for women. However, what children learn matters more than how long they stay in school. In United States, replacing a low-quality teacher in an elementary school classroom with an average-quality teacher raises the combined lifetime income of that classroom's students by US$250,000 (World Bank, 2019, p. 50). So the quality of teachers is an important factor when it comes to outcomes of education. So, it is time to go back to the drawing board, set our targets , map our needs and then, allocate financial resources.

26

Education—Moving Beyond the Four Walls and a Rigid Curriculum

A Child educated only at school is an uneducated child

-George Santayana, Philosopher

If I had to write a quote for a new form of schooling, I would write, 'we need to build a system to *develop* and not just 'educate' our children for the future; not just *cover* the syllabus but *discover* practical knowledge, where their life's only goal should not be to get *settled* but to prepare them for being *unsettled*.' Education, in my view, is anti-curriculum and cannot be confined to a rigid process. The failure of education is evident when, despite teaching so many subjects in school, we need to have 'Moral Science' and 'General Knowledge' as separate subjects. If we look at some of the best achievers in their fields, they traversed across multiple disciplines. The future of education lies in not just opening schools and universities, but in 'opening the mind' – to newer possibilities, which have hitherto not been comprehended. What might appear fiction today will be facts tomorrow and this is the difference the student of tomorrow will make to humanity.

Today, it is not pupil-centred education, it is the teacher-centric education and this has to change. Classrooms, if used as the only format for imparting education, only close the learner's mind, rather than opening them. Today's schooling does not mean learning, '*and in many countries achievements in learning is disturbingly low. While more than 90% of children in the world today receive some schooling, fewer than half of those in school achieve minimum proficiency in reading and mathematics by the end of primary school and over half of the world's children cannot read and understand a simple story by age 10'* (UNDP, 2019, pp. 48-51). Through the current education system, we are creating subservience in the name of

obedience and discipline, curriculum instead of curiosity, routine activities instead of innovation and rote memorisation instead of learning. This needs to change.

Today's schooling is not in the best interest of students. Also, education system has run out of steam because it has run out of ideas and experiments. As a member of the National Education Policy Committee, I realised this when I saw people in their seventies and eighties deciding about the future of those who are yet to be born. These people are trying to push their past into future based on their experiences, which are half a century old. When the time, technology and temperament has changed dramatically, we need to push the future into the present. Hence the idea to look at 'going beyond schools for education came to my mind'. When I researched on this topic, I did come across 'alternative schools'. Montessori schools are named after Maria Montessori, the first women in Italy to earn a doctorate and to have found several schools based on a new pedagogy which emphasised on independence, freedom and rest for a child's natural psychological development (Masi, 2019).

Other alternative school models, be it Steiner-Woldorf, Krisnamurti, Sita, Patha Bhavan, Anand Niktetan, Poorna, Agastya or Montessori, all these were developed in either 19th or 20th century and also, none of these have scaled up and all of them together could count up to around 150 (Pathak, 2016). Given the developments of technology, these experiments sound like those from the stone age. Now, it is time to develop a model which works for the 21st century as none of the alternative schools have scaled up. Also, the institutions of 21st century shouldn't just assess the learner on quantitative scale but by qualitatively judging on various parameters like proficiency of applications, skills and knowledge for the real world.

Even the world's biggest changemakers agree with what I am writing here. I am sharing a few quotes from history:

Knowledge that is acquired under compulsion obtains no hold on the mind – Plato

Reward and punishment are the lowest form of education – Chuang Tzu

I have never let my schooling interfere with my education. Soap and education are not as sudden as a massacre, but are deadlier in the long run

– Mark Twain

The whole theory of modern education is radically unsound – Oscar Wilde

I always like to learn, but I don't always like to be taught. How I hated schools, and what a life of anxiety I lived there. I counted the hours to the end of every term, when I should return home – Winston Churchill

I loathed every day and regret every moment I spent in a school – Woody Allen

I remember that I was never able to get along at school, I was at the foot of the class – Thomas Edison

Men are born ignorant, not stupid; they are made stupid by education. Education is one of the chief obstacles to intelligence and freedom of thought – Bertrand Russel

Thank goodness I was never sent to school; it would have rubbed off some of the originality – Helen Beatrix Potter

Education is a method whereby one acquires a higher grade of prejudices – Laurence J Peter

(Gray, 2011)

Nobel Laureate Tagore had said, "Those days were unhappy ones for me… it may be that if I had been a little sensitive, I could gradually have accommodated myself to the pressure and survived long enough to earn my university degrees. But at the same, schools are schools, though some are better and some worse, according to their own standard". He said this while delivering the lecture, *My School* in America (Published in *Personality*, London: McMillan, 1933) (Pathak, 2016).

Tagore believed that in the preteen years, the child's mind should be educated along the lines of its own natural tendencies and instincts, and books be introduced only in the teens (Pathak, 2016).

"We had to sit inert, like dead specimens of some museum, whilst lessons were pelted at us from on high, like hailstones on flowers", wrote Tagore (Pathak, 2016).

Many successful personalities never studied at school, and some of the famous homeschoolers are George Washington, Theodore Roosevelt, Wolfgang Amadeus, Mozart, Erwin Schrodinger, Ernst Mach, Thomas

Edison, Palmer Luckey, Selena Marie Gomez, Arran Fernandez (Masi, 2019).

German writer, poet and scientist Johann Wolfang von Goethe never went to school at all and so didn't Ampere, one of the greatest physicists of 17th century (Masi, 2019). So, outliers will always continue to perform, irrespective of whether they are formally in the education system or totally out of its bounds and influence. We need to change a lot of things.

"The Young mind should be saturated with the idea that it has been born in a human world which is in harmony with the world around it. And this is what our regular type of school ignores with an air of superior wisdom, severe and disdainful. It forcibly snatches away children from a world full of the mystery of God's own handiwork, full of suggestiveness of personality…", Tagore said in one of his speeches delivered in America in 1930's, adding, "…. It is a mere method of discipline which refuses to take into account the individual. It is a manufactory specifically designed for grinding out uniform results….. For according to the school; life is perfect when it allows itself to be treated as dead, to be cut into symmetrical conveniences …" (Pathak, 2016).

In his book 'My Experiments with Truth', Mahatma Gandhi wrote, " Though I went to school, I did not particularly excel at anything but learned the things that were expected of me" and further he wrote, " ….our children languish as a result of this education. They become incapable of any great achievement" (Pathak, 2016).

Nobel Laureate Peter Higgs accepted that by today's standard of education he wouldn't have been qualified, as he did not have enough publications to be even hired, and he is credited for the discovery of the particle named after him (Masi, 2019).

Dr. Marco Masi (Masi, 2019) calls schools as prison camps and classes as non-violent communications, and an institutionalised child abuse, and he is so right.

There are multiple quotes from legends who believed that the school system is a failed system, but none have come forward to present an alternative for how the system can be changed. We will have to keep trying till we achieve the answers.

To me, Education is the best risk management and risk mitigation strategy for any serious state head who thinks long- term for a nation, but I cannot apply this to the current form of education. Education is in need of a fundamental reform to qualify for this.

It is time to understand that, continuing with the same pattern of schooling, curriculum and timing has not helped deliver results and it is time to go back to the drawing board.

During one of the meetings of the education policy committee tasked to draft an education policy for 1.3 billion to take care of the future of the nation, I made a statement, 'this, perhaps, is the last education policy being drafted by humans, the next would be done by AI'. I sounded futuristic then, but as I see, education will move beyond the confines of the four walls of the schools into the hands of the learner. Imagine, an AI-backed system which includes smart gadgets, like a finger ring, spects, fitness band, bracelet, necklace, which tracks all our conversations and activities as a child or a learner and when you step into your study, it exactly knows what you want to do and what you can. Algorithms of the future will be able to do what the psychometric tests do today, i.e. it can be based on your spending time in the garden, or with animals, machines, gadgets, decide the level of interest and the bent of your mind for biology, maths, engineering, humanities, etc. Further, as you play games, it tests your level of intelligence and leaning interest and accordingly helps you chose what you need to study and focus on. Also, when you pick a topic and start taking lessons, the eyeball movements and the intelligent headset tells the AI-backed system your level of attention and understanding, and accordingly, the lessons and lectures are tuned to your pace. Also, the camera on your device, motion sensors and browser history can detect if the learner is cheating for the answer! So, you have the digital supervisor or the invigilator. This is the teacher, classroom and exam of the future, which isn't far off. Also, the curriculum may not be standardised, for the same degree. I may be taught something different as my level would be different and also, there would be no exams, as during the lectures, the AI-backed system would have assessed my proficiency in the course I am taught. This is how personalised and adaptive teaching of the future will look like, and above all, it would be asset light and affordable. Let me give a real life example of AI as a teacher. According to an article in the MIT Technology Review, a learner in China was weak at maths and AI curated his lessons.

By the end of the semester, the test scores had increased from 50% to 62.5% and two years later, it was 85% in the middle school examinations (Karen, 2019). So, the fundamentals of education will change. No more we would talk of school or university which means a walled campus, the teacher-student ratio, quality of teachers, curriculum, content, assessment, design of classrooms, etc. Everything related to education is in for a massive change. Yes, it may be a few years away from mass scale deployment. But, as we know technology moves fast and let's not forget the Moore's law, computing power would dramatically increase in power, and decrease in relative cost at an exponential pace (Intel, 2019).

Also, learners should go and meet various professionals in small groups and see how they work and what difference they make to the lives of others, nation and the society. Learners should, and must be exposed to: (a) post office (b) bank (c) government office (d) museum (e) culture festival (f) theatre (g) historical site tour (h) all major religious texts (i) human body and functions – video about major chronic diseases and how it impacts human behaviour and functioning.

Suppose a learner meets a lawyer and interacts about how a lawyer can help get justice for someone. Similarly a police officer, a doctor, a teacher, a business person, etc. All these are a part of learning beyond school and will certainly inspire and help learner to decide what the learner wants to do in future. Learner really does not know what the learner likes, so it might be a good idea to expose the learner in grade 9^{th} about various options – as role plays, video modules or face to face interactions with functionaries and professionals from various walks of life. This may, in fact, be of great help to the learner to ignite the spark for future. If education is not progressive, a nation can never progress.

School must be 'a moving experience, different every day'. Not just confined to four walls. We should be able to connect the learner to the external surrounding, organisations (private and government) and society. So that, they go beyond the academic intelligence and build a repository for working intelligence. In my view, educational system starts at home, continues with schooling and lasts a lifetime. I want to see education starting at home, continuing in museums, labs, offsite visits, offices and all through life. May be, some part in school. Then only, education will fulfil its goal of equipping and understanding. We will have to go to the drawing

board. I am quite confident that the definition of campus will change, and it will not be a learner going to the campus, it will be the other way around. Sitting on the chair with a desk can only create armchair learners who will be disconnected from the reality, for which the time is up.

Parents or group studies should be the ways to discuss and do preparation for subjects like civics, etiquettes, social customs and traditions and other traits, and with this, parents will also refresh their knowledge and spend time with their children.

In the current system, education is forced on the learner and the learner has no option but is forced to accept it. This has to change. Both the learner and the system should be agile and a moving goalpost, based on the learner's speed of grasping and developments in various fields.

We are teaching even science as history of what has happened. Question to ask, can this lead to futuristic mindset? Not at all! In fact; Coding, Calligraphy, Astronomy, Quantum Mechanics, Unsolved Problems, Music and Dance are areas to consider, if we need to expand our frontiers of thinking when the learners are exposed to the granularity and vastness of the universe and its diversity. Learning about discoveries is as much important as how discoveries happened, and just teaching the discovery is not good enough.

It would be a great idea to have flexibility on what and how many competencies a learner can acquire through multiple subjects delivered through blended learning and teaching methods (offline, experience and teaching in a class) and each should have a credit score. Also, a number of credits should make a learner become a graduate – say for example, 36 credits should lead to a graduate degree, 24 credits to diploma, 48-60 credits should lead to masters, depending on the quality of work, and so on.

We should put in a system beyond examination. Even countries like Singapore have done away with the school examination system (Teng, 2019).

The reason why I talk of competence and not just academic education is because, after a certain amount of time spent in the education system, a learner should acquire competence for something specific, which should be assessed through a multiple evaluation system – like one-third through a question and answer based system, one third project based and one third practical, demonstration and experience based, spread over a period of time.

Let us not forget the importance of gaining work experience. *An additional year of work in cognitive professions increases wages by 3 percent, whereas for manual occupations the figure is 2 percent. Work provides a venue for a prolonged acquisition of skills after school—but such opportunities are relatively rare in emerging economies*. (World Bank, 2019, p. 13). Time to be clear and objective of what skills and competence we want the learner to acquire through our education system.

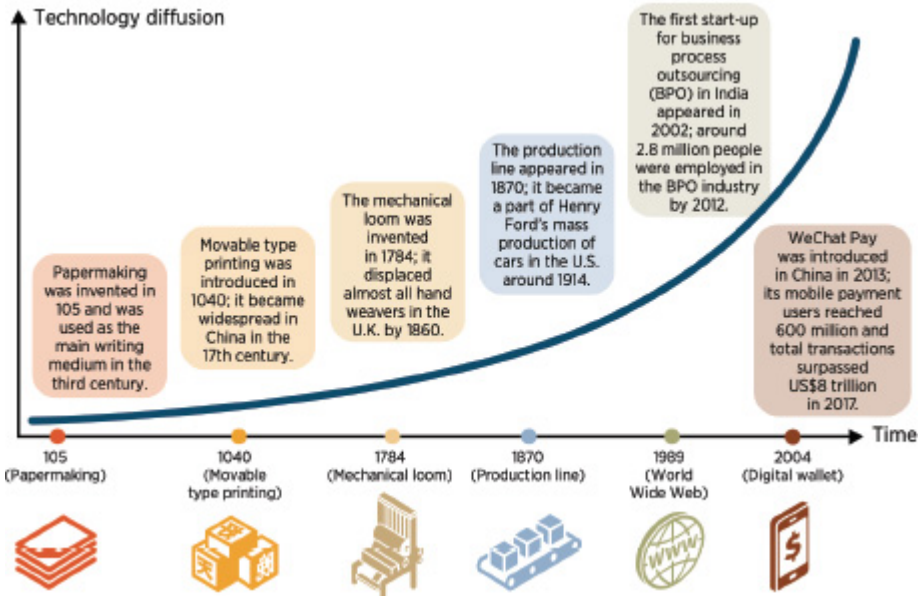
Future of work is changing faster than we can think, and we aren't fully aware of the consequences of not tuning our education system to cope up with it.

A large share of children entering primary school in 2018 will work in occupations that do not yet exist. Even in low- and middle-income countries, many people are employed in jobs that did not exist three decades ago. India has nearly 4 million app developers; Uganda has over 400,000 internationally certified organic farmers; and China has 100,000 data labelers. (World Bank, 2019, p. 70).

If we take the case of a large developing country like India, according to the latest estimates, household expenditure on education in India is sizeable. It increased from `59 crore in 1950–51 (Tilak J., 2002, pp. 191-207) to `62.7 thousand crore in 2007–08. This is not a small amount and with respect to the poor and unmeasured outcomes it has made, it is time to rethink of what this money should deliver as a value.

So, now schools of today need a new level of literacy mission to cope up with the transition into schools of tomorrow.

It is time to create a unique university, which is a combination of an academic campus, workshop, company, research lab, community – anyplace where a learner can engage and enhance his knowledge, and this interaction with a specified purpose in a field of study should earn the learner a degree. Education is about experience and knowledge transfer and we need to break the current system of classroom and monologue of lectures as a way to learn.



Source: WDR 2019 team

FIGURE 26.1: *The rate of technology diffusion is increasing*

Nelson Mandela, the first president of post-apartheid South Africa, once said, "Education is the great engine of personal development. It is through education that the daughter of a peasant can become a doctor, that the son of a mineworker can become the head of the mine, that the child of a farmworker can become the president of a great nation. It is what we make out of what we have, not what we are given, that separates one person from another."

In India, children have to help their parents in agriculture and leave school for 3-4 months. Education system should take care of the same (UNESCO, 2019, p. 5). In fact, the education system must allow for flexibility to engage in such professions, and make the learners write what they learned, and how it helps, and what can be done to improve on the same, and add value to such work – that's education. Rather, we let the learners drop out to become a helping hand to their parents in farms during the sowing or harvesting season. So, when we look at dropouts in secondary level, we want to invest more money and resources, forgetting that the learners drop out because of irrelevance of the primary education. Education (academic) is not enough. So, it makes a strong case of going beyond the four walls of a classroom to make the education system relevant to the learner.

Teacher needs to realise where the interest of the learner lies and not only come out of the dictated classroom style and form of teaching, but also think and help learners go beyond. The world would not have seen the proliferation of technology and philanthropy at a scale Bill Gates has achieved, had his teacher not excused him from class, so that he could go and write the code through the teletype terminal accessible to school learners. (Grandin & Panek, 2014, p. 173). This also gives us an important message – that all students of the same class didn't look at the teletype as an opportunity and become Bill Gates. It is a wonderful example of a student wanting to go beyond the class room and it was his teacher's foresight and out of the box (class) thinking that allowed this learner to become the Bill Gates of today!

Student–teachers, teacher-parents meeting happens, but do teacher – teacher meetings happen ? Why not ? They can meet and discuss what worked, what didn't and what they innovated, every two months (if not every month). Not just intra but interschool meetings must happen every six months, and social media must be used to share the key takeaways and innovations and even print media should cover such meetings for wider dissemination. So, time to move beyond the four-walled education and redo our classroom-based lecture styled education.

27

Goal of Education

You cannot teach a man anything, you can only help him find it within himself (Galileo Galilei- 1564-1642)

Education system's main goal is to ignite the passion, expand the horizons of our thinking, shake us out of our comfort zone and prepare us for the VUCA (volatile, uncertain, complex and ambiguous) world, and ensure that the learner has adequate ability to withstand physical, psychological and emotional stress, bullying, criticism, flattery and humour, at ease.

Scars of education are found in crime and unemployment, and hopefully, we will realise it sooner than later, and transform it. But before we take the plunge, we have to first arrive at a consensus on what is the education system supposed to deliver, and unless we have clearly defined goals – how can we measure outcomes? This is a subject of a wider consultation. Is it only to prepare a learner for a job, or to make him or her a good Samaritan, and make him or her meaningful to the society, or to make everyone entering the education system to become a curious lifelong learner? What is the end game or the ultimate goal of the person entering the education system?

The new education system cannot be just about reading, writing and learning the past and the principles of science, maths and economics. It has to be about envisioning the future, and preparing ourselves to handle it gainfully, or alter it. Today, we are doing what we did in the past and assuming it prepares us for the future. Which is irresponsible! Let us not forget this important statement from Albert Einstein that, "Problems cannot be solved with the same mindset that created them".

Education is not just about reading history but, about learning from it, and making history!

Also, incremental changes will not deliver the breakthrough which the education system needs. We must remember this fact that, “The Electric light did not come from the continuous improvement of candles” – Oren Harari.

This needs a global consultation with all stakeholders and not just academicians, on what level of skills and competence do we need at every level in the education system.

Levels of Skills Mastery – These may vary with the level of education but we must have a clearly defined overarching goal of education with certain underpinning themes. If I were to personally specify, the overarching theme of education is to create a mindset which is always willing to learn more and accept more, and become proactive and follow certain principles in life, which aren’t a compromise. Education system should also help shape the following in the learner:

- Ability to ask questions
- Ability to focus
- Ability to give and receive feedback
- Ability to handle failures
- Analysis and synthesis
- Awareness of, and ability to use professional tools and programs
- Basic problem solving
- Business conduct
- Coding
- Collaboration
- Communication
- Content creation
- Creativity
- Critical thinking
- Curiosity
- Data interpretation
- Debating with logic and reasoning
- Decision making

- Delegation
- Design thinking
- Developing the inner self
- Digital literacy
- Empathy
- Entrepreneurial mindset
- Financial planning
- Flexibility
- Futuristic mindset
- Global mindset
- Goal setting
- Graphic and visual design
- Growth mindset
- Helping people
- Job search and activities associated with it
- Judgment
- Listening
- Logical reasoning
- Motivation to learn
- Numeracy
- Openness
- Optimism
- Planning and execution
- Reading
- Receptiveness to change
- Report interpretation
- Resilience
- Self- motivation
- Self-control
- Service mindset

- Software design
- Story telling
- Supervision and Leadership
- Teamwork
- To adventure (Discovery Break)
- Turning a crisis into an opportunity
- Understanding of professional tools and programs' functionality
- Writing

Foundation and Preparatory school should ensure that the learner knows how to open a bank account, how to make food and do the basic daily chores, follow hygiene, how to observe and experiment, reading and writing skills, basic civic duties and how to pay bills, appreciating nature and caring for environment, sustainability, clearing concepts about basic things through experiment, observation and practice, time management, getting organised, creativity and innovation, critical thinking and problem solving attitude, appreciate diversity, social behaviours, etiquette, mannerism, cultural diversity, conflict resolution, sports and self-defence, legal rights and ability to question and inculcate curiosity, become good Samaritans, etc. Classroom should be transformed into experimental labs for opening minds.

We must teach about the real life stories of outstanding people in every field and they should be both – historical and living legends – whom the learners can relate to and see role models in.

A few select biographies should be taught in the form of brief documentaries or stories in school, like:

- Mahatma Gandhi – how he made peace the biggest weapon and fought against the might of the British
- Martin Luther King – how he inspired millions for a change
- Nelson Mandela – how sacrifice was important to achieve freedom for Africa and how he made it happen
- Mustafa Kemal Pasha – how he tried to reform Turkey
- Raja Ram Mohan Roy and his social reforms
- Subhash Chandra Bose and his fight for freedom

- Charles Darwin and how he wrote the Origin of Species
- Gregor J Mendal and the experience that made him the father of genetics
- Chanakya – the father of policy making and politics
- Bill Gates – Corporate leader and a Philanthropist
- Azim Premji – Corporate leader and a Philanthropist
- Life of Milkha Singh, M.S. Dhoni and P.T. Usha
- Abraham Lincoln – His persistence for success and how he abolished slavery
- Stephen Hawking – how he became a scientist
- Alfred Nobel – using a fortune for a better world
- Mark Zuckerberg and Facebook
- Raja Harishchandra – that life is about truth, impartiality and duty
- A.P. J. Abdul Kalam – from ordinary to extraordinary

There are many more such personalities, and learners should be taught about people from different fields to inspire them. All these stories/life sketches should not be more than 15 minutes. So, in a class period of 30 minutes, two life sketches (one local and one global) can be taught, along with what were their hardships, achievements and life lessons.

Also, local achievers should be chosen from all walks of life; business, sports, spirituality and religion, politics, officials, etc., and interactions arranged with learners. These interactions will inspire the young minds with real life examples.

Also, to make the brains think beyond the routine, some examples with explanations like, bumble bee as per the laws of aerodynamics should not be able to fly, but it does. Similar examples be taught to teach them how to accomplish the impossible. Also, how the inventions like wheel, electricity and internet changed the world. So that these kids can have a futuristic mindset and they may make space travel a faster reality than we can think, and address the key ecosystem challenges for which we have been struggling for generations.

Tagore's three core principles of learning: Anand (Joy), Prakash (expression) and Atmashakti or atmapatritha (self- governance) (Pathak,

2016) are important for reforming education.

Our system has to move from assessing three Rs – reading, w(r)iting and a(r)ithmetic and the goal of education is to remove the mind from authority and mental boundaries and bring in curiosity and large canvas thinking.

People who are capable of using logic can never be controlled by *their emotions* (Damon, 2017). Our education system has to instil this in our learners.

Also, education system has to enlighten the learners to help gain control over their subconscious mind, which can help accomplish anything in life. Psychologists have stated that the subconscious mind cannot differentiate between reality and fantasy and is a storehouse of reactive information, which is accumulated over time for a quick reference, and developing social skills do require us to condition our subconscious mind and this helps to avoid self-sabotage. It is also important to note that conscious mind can have between 10,000-20,000 thoughts a day but the sub-conscious mind can have up to 100,000 unique thoughts a day (Damon, 2017).

We need to focus on the Intelligence Quotient, Physical Quotient, Emotional Quotient, Spiritual Quotient and Imagination Quotient. Some of these parameters are well established and some need more scientific research.

Report Card of the Futuristic Learner

The report card of the futuristic learner should be based on learner's self-awakening, and understanding of where the learner stands, learner's intelligence, interest and adaptability, and should put his/her scores in relation to learner's psychometric analysis. The report card must cover the following to assess the learner with regard to outcomes and holistic development.

Self-appraisal should be the first part. If the learner does not know where s/he stands with regards to various aspects, then we have not built in a mechanism of self-assessment and self-actualisation. This will help the

learner to introspect honestly and judge what needs to be done. The self-assessment should cover a learner's:

- Reading and writing speed
- Physical fitness and health (including posture)
- Etiquette and mannerism
- Imagination Quotient
- Spiritual Quotient (SQ)
- Emotional Quotient (EQ)
- Intelligence Quotient (IQ)
- Handling of mental and physical stress
- Practical and Application orientation
- Core strength areas
- Life skills
- Potential areas of excellence
- Core competencies acquired

28

Importance of Education: Why Education Needs Reforms

If you are not born equal, only your education can help you. Education is a great leveller

Education is the key to solving all challenges, and if the education system is not progressive and future proof, a nation must not dream big, and politicians should not become loudmouths about development. The Human Development Report 2019 (UNDP, 2019) starts with the following line in the foreword, 'The wave of demonstrations sweeping across countries is a clear sign that, for all our progress, something in our globalised society is not working'. If the education system is not relevant to the needs of time, one outcome is certain – joblessness and 'working poor' will rise with increase in education level. The same is getting reflected in the unplanned growth. According to NASSCOM, 80 percent of all Indian Engineering graduates are unemployable (Radley, 2019). For a LMIC (Lower middle-income country) like India, I would prioritise education, health and infrastructure. We should never forget that, if we don't teach, we don't reach! To reach our goal of a developed nation, we must teach like a developed nation.

Poor Education System = Poor Performance

We need a clear metrics to measure the contribution of education to the society, country and the economy. Since we don't have that as yet, it might be a good idea to see where India stands with regards to other nations on key national metric and also, domestic indicators, to establish if India, as a nation, benefited from the education system. Also, my belief is that though

financial power is vital for a nation, but without educational power, financial power cannot remain with a nation for long. So, I am taking the data available from various sources to ascertain India's current position in the global scenario and how/where education can make a difference.

1. With regards to income group, the world classifies income group as follows;
   - High Income (Above US$ 12,236)
   - Upper-Middle Income (US$ 3,996-12,235)
   - Lower -Middle Income (US$ 1,006 -3,995)
   - Low Income (under US$ 1,005)

   In 2019, according to IMF, India's GDP per capita was US $2,340. India is bracketed in the bottom 50 countries of the 195 countries, and falls in the middle rung of the lower middle-income group. When compared to China's GDP per capita at US $10,870 and USA's GDP per capita at US $67,430 (IMF, 2020), India has a long way to go!
2. Where does India stand with regards to Human Development Index (HDI), which considers the changes in health, education and income? India stands at 129 out of 189 countries (UNDP, 2019), and this, pegs India's HDI value at 0.647, i.e. in the medium human development category. It is also pertinent to note that people living in the top tier of the human development countries live 19 years longer and spend 7 more years in school when compared to those living in the countries which fall in the category of low human development countries (UNDP India, 2018). India still has a long way to go to reach the top 10, which should ideally be our goal – to be amongst the top 10 in HDI rankings.
3. Where does India stand with regards to Human Capital Index? With regards to Human Capital Index (HCI) from the World Bank, India ranks 115/157 countries categorised under LMIC (Lower-Middle Income Country) with expected years in school at 10.2 years, and Human Capital Index of 0.44. According to the HCI;
   - A child born in India today will be only 44 percent productive when the child grows due to lack of complete education and full health.

- Harmonised Test Scores: Students in India score 355 on a scale where 625 represents advanced attainment and 300 represents minimum attainment (World Bank, 2018). Although India did not accept the findings of the HCI and officially ignored the report citing objections to its methodology and conclusion (PIB, Ministry of Finance, Government of India, 2018), but closing our eyes does not take away the reality in front of us. We can close our eyes to reality but not the consequences arising out of that reality!

4. Where does India stand with regards to Patents? In 2017, India received 46582 application for patents (World Intellectual Property Organisation, 2019). Out of the total applications, 14961 came from Indian individuals or entities, where as 31,621 applications came from foreigners, and of them, 9,222 came from the US. No Indian company or university figures in the list of top 50 patent applications. China, on the other hand, received 1.38 million patent applications – more than double of the US patent applications which stood at 606,956. (IANS, 2018), and India is ranked 36th out of 50 nations on International IP Index (ET Bureau, 2019).
5. Where does India stand with regards to research? As per the Global Nature Index, India's position is at no. 13 – below Spain, Italy, and Australia, with less than 1% of the gross domestic product spent on research (Kogleck, Priyadarshini, Pincock, Bocquet, & Gilloch, 2015). Given, the size of India's population, states in India are much bigger than countries higher above than India in the Index. (See Figure 28.1 & 28.2).
6. Where does India stand in the global competitive index? (Schwab, 2019). (See Figure 28.3).

   India ranks 68. According to this report, enhancing competitiveness is the key to improving the living standards. Education plays an important role.
7. Both China & India are nations with historical similarities in terms of GDP, population, both being a predominantly agrarian economy, and both being liberated around the same time- India (1947) and China (1949) (Weisskopf, 1975). But, while China has moved ahead in the past three decades, India continues to struggle. Answer lies in China leaving India and even rest of the world much behind in terms of

focus, investment and output in education, research and development.

8. In terms of the top global innovation clusters (World's largest science and technology clusters) of economies or cross border regions within the top 50 in 2019, India does not figure in the list and China has two clusters in the list. See Table 28.1 (Cornell University, 2019, p. XXVII).

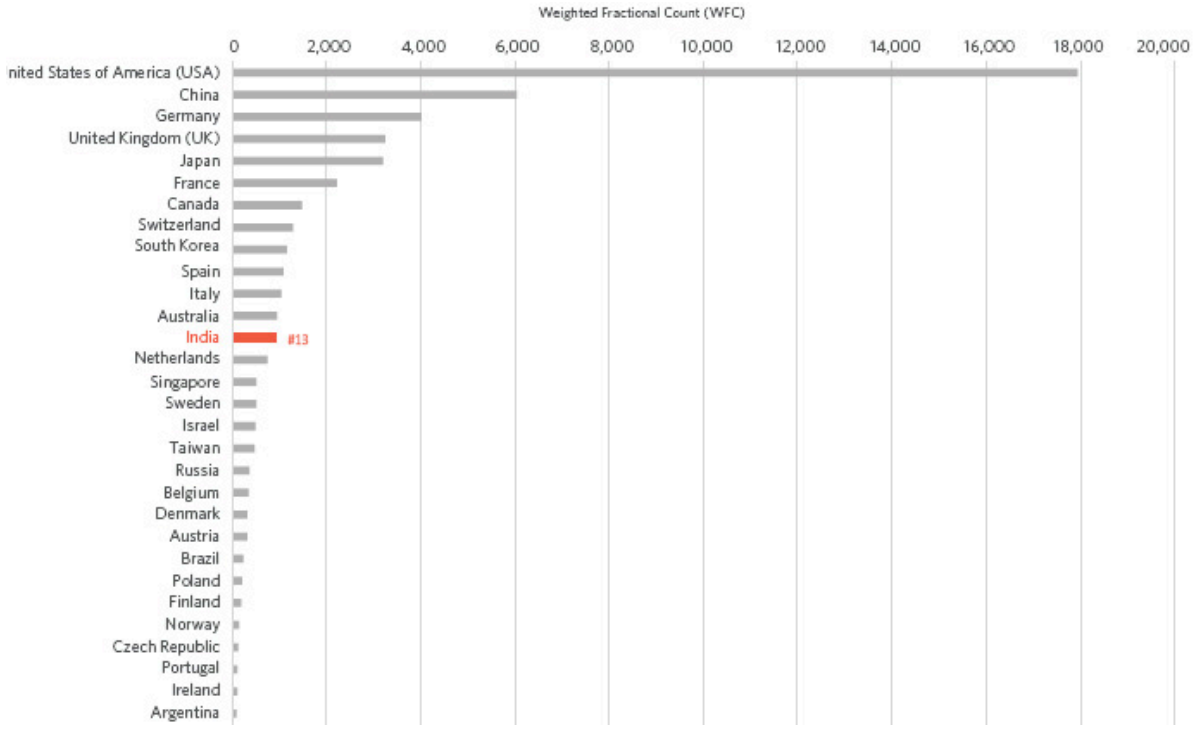
TABLE 28.1: Top cluster of economies or cross-border regions within the top 50, 2019

Rank	*Cluster name*	*Economy(ies)*
1	Tokyo-Yokohama	JP
2	Shenzhen-Hong Kong	CN/HK
3	Seoul	KR
4	Beijing	CN
5	San Jose-San Francisco, CA	US
9	Paris	FR
15	London	GB
18	Amsterdam-Rotterdam	NL
20	Cologne	DE
23	Tel Aviv-Jerusalem	IL
28	Singapore	SG
31	Eindhoven	BE/NL
32	Stockholm	SE
33	Moscow	RU
35	Melbourne	AU
39	Toronto, ON	CA
40	Brussels	BE
42	Madrid	ES
46	Tehran	IR
48	Milan	IT

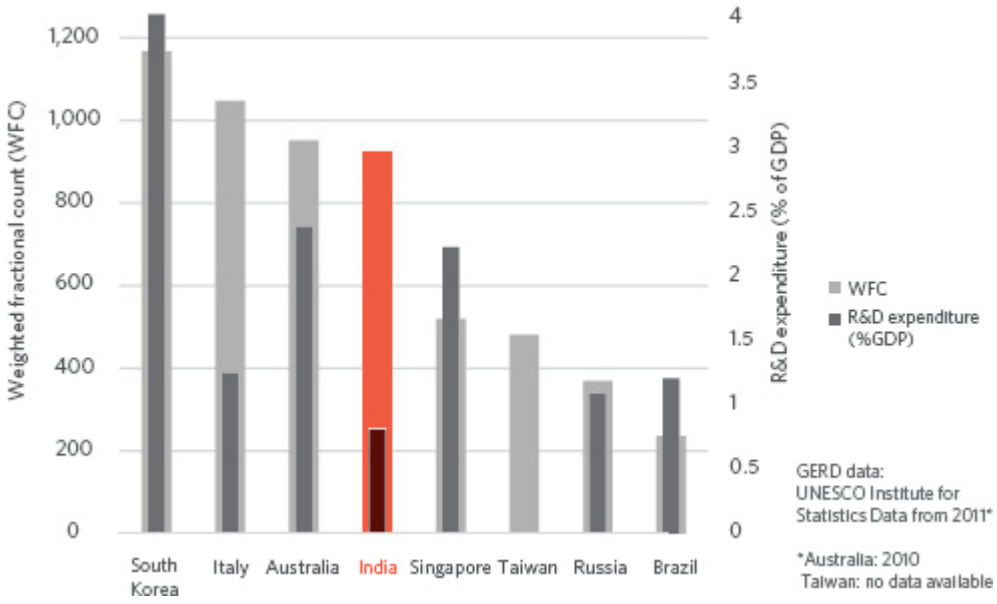
50	Zürich	CH/DE

Source: Special Section: Identifying and ranking the world's largest science and technology clusters (Cluster Rankings).

9. According to the Global Innovation Index 2018, In terms of scientific publications in top 100 clusters across countries, China ranks no. 1 and Chinese clusters are having 16 spots (1, 8, 14, 19, 23, 27, 32, 33, 37, 44, 53, 62, 65, 69, 71, 97) in overall 100 clusters. India has only three clusters (Delhi at 47th position with 29802 publications, Mumbai at 83rd Position with 16475 publications and Bengaluru at 86th position with 15696 publications). China produced 7,91,266 scientific publications whereas, India produced only 61973 scientific publications. China produced about 1177% more than what India produced (WIPO, 2018, p. 207).



■ **FIGURE 28.1** *Global Top 30 in the Nature Index 2014 - India's position at number 13 in the world puts it among the global leaders in producing high-quality science.*



■ **FIGURE 28.2** *R&D expenditure and overall output in the Nature Index 2014 - India's R&D spending as a percentage of its GDP is relatively low compared to other nations with a similar output in the Nature Index 2014.*

The Global Competitiveness Index 4.0 2019 Rankings

Covering 141 economies, the Global Competitiveness Index 4.0 measures national competitiveness—defined as the set of institutions, policies and factors that determine the level of productivity.

Rank	Economy	Score[1]	Diff. from 2018[2] Rank	Diff. from 2018[2] Score
1	Singapore	84.8	+1	+1.3
2	United States	83.7	–1	–2.0
3	Hong Kong SAR	83.1	+4	+0.9
4	Netherlands	82.4	+2	–
5	Switzerland	82.3	–1	–0.3
6	Japan	82.3	–1	–0.2
7	Germany	81.8	–4	–1.0
8	Sweden	81.2	+1	–0.4
9	United Kingdom	81.2	–1	–0.8
10	Denmark	81.2	–	+0.6
11	Finland	80.2	–	–
12	Taiwan, China	80.2	+1	+1.0
13	Korea, Rep.	79.6	+2	+0.8
14	Canada	79.6	–2	–0.3
15	France	78.8	+2	+0.8
16	Australia	78.7	–2	–0.1
17	Norway	78.1	–1	–0.1
18	Luxembourg	77.0	+1	+0.4
19	New Zealand	76.7	–1	–0.8
20	Israel	76.7	–	+0.1
21	Austria	76.6	+1	+0.3
22	Belgium	76.4	–1	–0.2
23	Spain	75.3	+3	+1.1
24	Ireland	75.1	–1	–0.6
25	United Arab Emirates	75.0	+2	+1.6
26	Iceland	74.7	–2	+0.2
27	Malaysia	74.6	–2	+0.2
28	China	73.9	–	+1.3
29	Qatar	72.9	+1	+1.9
30	Italy	71.5	+1	+0.8
31	Estonia	70.9	+1	+0.2
32	Czech Republic	70.9	–3	–0.3
33	Chile	70.5	–	+0.3
34	Portugal	70.4	–	+0.2
35	Slovenia	70.2	–	+0.6
36	Saudi Arabia	70.0	+3	+2.5
37	Poland	69.9	–	+0.7
38	Malta	69.5	–2	–0.2
39	Lithuania	69.4	+1	+1.2
40	Thailand	69.1	–2	+0.6
41	Latvia	67.0	+1	+0.7
42	Slovak Republic	66.8	–1	–0.1
43	Russian Federation	66.7	–	+1.1
44	Cyprus	66.4	–	+0.8
45	Bahrain	65.4	+5	+1.7
46	Kuwait	65.1	+8	+3.0
47	Hungary	65.1	+1	+0.8
48	Mexico	64.9	–2	+0.3
49	Bulgaria	64.9	+2	+1.3
50	Indonesia	64.8	–5	–0.3
51	Romania	64.4	+1	+0.9
52	Mauritius	64.3	–3	+0.5
53	Oman	63.8	–8	–0.8
54	Uruguay	63.5	–1	+0.8
55	Kazakhstan	62.9	+4	+1.1
56	Brunei Darussalam	62.8	+8	+1.3
57	Colombia	62.7	+3	+1.1
58	Azerbaijan	62.7	+11	+2.7
59	Greece	62.6	–2	+0.5
60	South Africa	62.4	+7	+1.7
61	Turkey	62.1	–	+0.5
62	Costa Rica	62.0	–7	–0.1
63	Croatia	61.9	+5	+1.8
64	Philippines	61.9	–8	–0.3
65	Peru	61.7	–2	+0.4
66	Panama	61.6	–2	+0.8
67	Viet Nam	61.5	+10	+3.5
68	India	61.4	–10	–0.7
69	Armenia	61.3	+1	+1.4
70	Jordan	60.9	+3	+1.8
71	Brazil	60.9	+1	+1.4
72	Serbia	60.9	–7	–
73	Montenegro	60.8	–2	+1.2
74	Georgia	60.8	–8	–0.3
75	Morocco	60.0	–	+1.5
76	Seychelles	59.8	–2	+1.1
77	Barbados	59.6	n/a	n/a
78	Dominican Republic	58.3	+4	+0.9
79	Trinidad and Tobago	58.3	–1	+0.4
80	Jamaica	58.3	–1	+0.4
81	Albania	57.8	–5	–0.5
82	North Macedonia	57.3	+2	+0.7
83	Argentina	57.2	–2	–0.3
84	Sri Lanka	57.1	+1	+1.1
85	Ukraine	57.0	–2	–
86	Moldova	56.7	+2	+1.2
87	Tunisia	56.4	–	+0.8
88	Lebanon	56.3	–8	–1.4
89	Algeria	56.3	+3	+2.5
90	Ecuador	55.7	–4	–0.1
91	Botswana	55.5	–1	+1.0
92	Bosnia and Herzegovina	54.7	–1	+0.8
93	Egypt	54.5	+1	+1.0
94	Namibia	54.5	+8	+1.8
95	Kenya	54.1	–2	+0.5
96	Kyrgyz Republic	54.0	+1	+1.0
97	Paraguay	53.8	–2	+0.3
98	Guatemala	53.5	–2	+0.2
99	Iran, Islamic Rep.	53.0	–10	–1.9
100	Rwanda	52.8	+8	+1.9
101	Honduras	52.7	–	+0.2
102	Mongolia	52.6	–3	–0.1
103	El Salvador	52.6	–5	–0.2
104	Tajikistan	52.4	–2	+0.2
105	Bangladesh	52.1	–2	–
106	Cambodia	52.1	+4	+1.9
107	Bolivia	51.8	–2	+0.4
108	Nepal	51.8	+1	+0.8
109	Nicaragua	51.5	–5	–
110	Pakistan	51.4	–3	+0.3
111	Ghana	51.2	–5	–0.1
112	Cape Verde	50.8	–1	+0.8
113	Lao PDR	50.1	–1	+0.8
114	Senegal	49.7	–1	+0.7
115	Uganda	48.9	+2	+2.1
116	Nigeria	48.3	–1	+0.8
117	Tanzania	48.2	–1	+1.0
118	Côte d'Ivoire	48.1	–4	+0.8
119	Gabon	47.5	n/a	n/a
120	Zambia	46.5	–2	+0.5
121	Eswatini	46.4	–1	+1.1
122	Guinea	46.1	+4	+2.9
123	Cameroon	46.0	–2	+0.9
124	Gambia, The	45.9	–5	+0.5
125	Benin	45.8	–2	+1.4
126	Ethiopia	44.4	–4	–0.1
127	Zimbabwe	44.2	+1	+1.8
128	Malawi	43.7	+1	+1.3
129	Mali	43.6	–4	–
130	Burkina Faso	43.4	–6	–0.5
131	Lesotho	42.9	–1	+0.8
132	Madagascar	42.9	n/a	n/a
133	Venezuela	41.8	–6	–1.3
134	Mauritania	40.9	–3	+0.1
135	Burundi	40.3	+1	+2.7
136	Angola	38.1	+1	+1.1
137	Mozambique	38.1	–4	–1.7
138	Haiti	38.3	–	–0.1
139	Congo, Dem. Rep.	38.1	–4	–2.1
140	Yemen	35.5	–1	–0.9
141	Chad	35.1	–1	–0.4

East Asia and the Pacific · Eurasia · Europe and North America · Latin America and the Caribbean · Middle East and North Africa · South Asia · Sub-Saharan Africa

Note: The Global Competitiveness Index 4.0 captures the determinants of long-term growth. Recent developments are reflected only insofar as they have an impact on data measuring these determinants. Results should be interpreted in this context. "–" indicates score or rank is unchanged from the previous year; "n/a" indicates the countries were not covered by the Index the previous year.

1 Scale ranges from 0 to 100.

2 Rank and score differences with 2018 Index. For details refer to Appendix A.

■ **FIGURE 28.3**



INDIA

GII 2019 rank **52**

Output rank	Input rank	Income	Region	Population (mn)	GDP, PPP$	GDP per capita, PPP$	GII 2018 rank
51	61	Lower middle	CSA	1,354.1	10,401.4	7,873.7	57

		Score/Value	Rank
INSTITUTIONS		**59.5**	**77**
1.1	**Political environment**	**53.0**	**71**
1.1.1	Political and operational stability*	61.4	91
1.1.2	Government effectiveness*	48.8	65 ◆
1.2	**Regulatory environment**	**64.5**	**69**
1.2.1	Regulatory quality*	35.1	90
1.2.2	Rule of law*	46.5	64 ◆
1.2.3	Cost of redundancy dismissal, salary weeks	15.8	63
1.3	**Business environment**	**60.9**	**101**
1.3.1	Ease of starting a business*	81.0	104
1.3.2	Ease of resolving insolvency*	40.8	95
HUMAN CAPITAL & RESEARCH		**33.5**	**53** ◆
2.1	**Education**	**28.0**	**110** ○
2.1.1	Expenditure on education, % GDP ②	3.8	84
2.1.2	Government funding/pupil, secondary, % GDP/cap ②	16.8	72
2.1.3	School life expectancy, years	12.3	87
2.1.4	PISA scales in reading, maths, & science ②	336.0	71 ○ ◇
2.1.5	Pupil-teacher ratio, secondary ②	28.5	104 ○ ◇
2.2	**Tertiary education**	**38.4**	**40** ◆
2.2.1	Tertiary enrolment, % gross	27.5	86
2.2.2	Graduates in science & engineering, %	32.6	7 ● ◆
2.2.3	Tertiary inbound mobility, %	0.1	107 ○
2.3	**Research & development (R&D)**	**34.2**	**35** ◆
2.3.1	Researchers, FTE/mn pop. ②	216.2	77
2.3.2	Gross expenditure on R&D, % GDP ②	0.6	50 ◆
2.3.3	Global R&D companies, avg. exp. top 3, mn US$	73.9	15 ● ◆
2.3.4	QS university ranking, average score top 3*	47.3	21 ● ◆
INFRASTRUCTURE		**43.0**	**79**
3.1	**Information & communication technologies(ICTs)**	**62.5**	**75**
3.1.1	ICT access*	38.5	105 ○
3.1.2	ICT use*	20.8	106 ○
3.1.3	Government's online service*	95.1	9 ● ◆
3.1.4	E-participation*	95.5	15 ● ◆
3.2	**General infrastructure**	**41.9**	**42** ◆
3.2.1	Electricity output, GWh/mn pop.	1,115.8	92
3.2.2	Logistics performance*	52.1	43 ◆
3.2.3	Gross capital formation, % GDP	31.5	17 ●
3.3	**Ecological sustainability**	**24.7**	**117** ○
3.3.1	GDP/unit of energy use	9.2	62
3.3.2	Environmental performance*	30.6	125 ○ ◇
3.3.3	ISO 14001 environmental certificates/bn PPP$ GDP	0.8	70
MARKET SOPHISTICATION		**56.3**	**33** ◆
4.1	**Credit**	**38.7**	**57**
4.1.1	Ease of getting credit*	80.0	20
4.1.2	Domestic credit to private sector, % GDP	49.7	69
4.1.3	Microfinance gross loans, % GDP	0.8	23
4.2	**Investment**	**50.8**	**37**
4.2.1	Ease of protecting minority investors*	80.0	6 ● ◆
4.2.2	Market capitalization, % GDP	76.9	20 ◆
4.2.3	Venture capital deals/bn PPP$ GDP	0.0	30 ◆
4.3	**Trade, competition, & market scale**	**79.4**	**9** ● ◆
4.3.1	Applied tariff rate, weighted avg., %	5.8	93
4.3.2	Intensity of local competition†	67.6	70
4.3.3	Domestic market scale, bn PPP$	10,401.4	3 ● ◆

		Score/Value	Rank
BUSINESS SOPHISTICATION		**31.0**	**65**
5.1	**Knowledge workers**	**24.1**	**99**
5.1.1	Knowledge-intensive employment, % ②	14.2	91
5.1.2	Firms offering formal training, % firms	35.9	38
5.1.3	GERD performed by business, % GDP ②	0.3	49 ◆
5.1.4	GERD financed by business, %	n/a	n/a
5.1.5	Females employed w/advanced degrees, % ②	1.6	103 ○
5.2	**Innovation linkages**	**33.6**	**41** ◆
5.2.1	University/industry research collaboration†	60.1	23 ◆
5.2.2	State of cluster development†	60.4	25 ◆
5.2.3	GERD financed by abroad, %	n/a	n/a
5.2.4	JV-strategic alliance deals/bn PPP$ GDP	0.0	48
5.2.5	Patent families 2+ offices/bn PPP$ GDP	0.2	46 ◆
5.3	**Knowledge absorption**	**35.4**	**56**
5.3.1	Intellectual property payments, % total trade	1.2	29 ◆
5.3.2	High-tech imports, % total trade	10.3	27
5.3.3	ICT services imports, % total trade	1.2	62
5.3.4	FDI net inflows, % GDP	1.9	83
5.3.5	Research talent, % in business enterprise ②	26.4	46
KNOWLEDGE & TECHNOLOGY OUTPUTS		**33.5**	**32** ◆
6.1	**Knowledge creation**	**20.9**	**42**
6.1.1	Patents by origin/bn PPP$ GDP	1.6	52
6.1.2	PCT patents by origin/bn PPP$ GDP	0.2	51 ◆
6.1.3	Utility models by origin/bn PPP$ GDP	n/a	n/a
6.1.4	Scientific & technical articles/bn PPP$ GDP	5.3	77
6.1.5	Citable documents H-index	38.9	21 ● ◆
6.2	**Knowledge impact**	**43.4**	**35**
6.2.1	Growth rate of PPP$ GDP/worker, %	5.9	4 ● ◆
6.2.2	New businesses/th pop. 15-64	0.1	100 ○
6.2.3	Computer software spending, % GDP	0.2	65
6.2.4	ISO 9001 quality certificates/bn PPP$ GDP	3.8	65
6.2.5	High- & medium-high-tech manufactures, % ②	0.3	33 ◆
6.3	**Knowledge diffusion**	**36.1**	**23** ◆
6.3.1	Intellectual property receipts, % total trade	0.1	50
6.3.2	High-tech net exports, % total trade	2.8	46
6.3.3	ICT services exports, % total trade	10.4	1 ● ◆
6.3.4	FDI net outflows, % GDP	0.3	76
CREATIVE OUTPUTS		**23.5**	**78**
7.1	**Intangible assets**	**37.8**	**81**
7.1.1	Trademarks by origin/bn PPP$ GDP	25.6	79
7.1.2	Industrial designs by origin/bn PPP$ GDP	0.8	77
7.1.3	ICTs & business model creation†	61.1	58
7.1.4	ICTs & organizational model creation†	59.6	47 ◆
7.2	**Creative goods & services**	**15.2**	**66**
7.2.1	Cultural & creative services exports, % total trade	0.7	39 ◆
7.2.2	National feature films/mn pop. 15-69 ②	2.2	60
7.2.3	Entertainment & Media market/th pop. 15-69	0.5	60 ○
7.2.4	Printing & other media, % manufacturing ②	0.6	88 ○
7.2.5	Creative goods exports, % total trade	2.7	22
7.3	**Online creativity**	**3.2**	**76**
7.3.1	Generic top-level domains (TLDs)/th pop. 15-69	0.9	98
7.3.2	Country-code TLDs/th pop. 15-69	0.6	91
7.3.3	Wikipedia edits/mn pop. 15-69	1.0	105
7.3.4	Mobile app creation/bn PPP$ GDP	10.7	42

NOTES: ● indicates a strength; ○ a weakness; ◆ an income group strength; ◇ an income group weakness; * an index; † a survey question. ② indicates that the economy's data are older than the base year; see Appendix II for details, including the year of the data, at https://globalinnovationindex.org. Square brackets [ ] indicate that the data minimum coverage (DMC) requirements were not met at the sub-pillar or pillar level.

FIGURE 28.4

10. According to Global Innovation Index 2018, in terms of patents in top 100 clusters across countries, China ranks 2nd and Chinese clusters are having 16 spots (2, 8, 17, 43, 44, 66, 77, 79, 81, 84, 91,

92, 93, 97, 98, 99) in overall 100 clusters, whereas India has only three clusters (Bengaluru at 37th position, with 2952 patents, Mumbai at 76th position with 1262 patents, and Delhi at 89th position with 730 patients). So, in all, India had 4944 patents and China had 87208 patents, almost 1664% more than Indian patents (WIPO, 2018, p. 207).

TABLE 28.2: Innovation clusters – Ranking of various clusters country-wise – 2018

No.	USA	China	Japan	India
1	San Jose – 4	Shenzhen (HK) - 2	Tokyo - 1	Bengaluru - 65
2	Boston – 7	Beijing - 5	Osaka–Kobe-Kyoto - 6	Delhi- 72
3	New York City - 8	Shanghai - 12	Nagoya - 11	Mumbai - 92
4	San Diego - 10	Nanjing - 27		
5	Washington - 13	Guangzhou- 32		
6	Los Angeles - 14	Hangzhou- 41		
7	Houston - 16	Wuhan - 43		
8	Seattle - 18	Xi'an - 52		
9	Chicago - 19	Chengdu- 56		
10	Minneapolis - 25	Tianjin- 67		
11	Philadelphia - 26	Changsha - 68		
12	Raleigh- 34	Harbin - 93		
13	Denver - 47	Changchun 95		
14	Portland - 49	Hefei - 97		
15	Atlanta - 54	Jinan - 99		
16	Pittsburgh - 60	Suzhou - 100		
17	Dallas – 61			
18	Cincinnati - 62			
19	Ann Arbor - 63			
20	Cleveland - 71			
21	Austin - 77			
22	Bridgeport – New Haven - 81			
23	Phoenix - 86			
24	Columbus - 88			
25	St. Louis - 89			
26	Indianapolis - 91			

11. According to Global Innovation Index 2019, if we consider the top 100 cluster rankings by publishing and patent performance, Japan retains the lead and China continues to be no 2. While China has made gains with 18 clusters at numbers (2, 4, 11, 21, 25, 30, 38, 47, 52, 60, 67, 80, 81, 87, 88, 89, 90, 93), India has gone down in terms of position ranking for clusters (as compared to 2018), with Bengaluru at 65, Delhi at 70, and Mumbai at 97 (Cornell University, 2019, pp. 68-70).
12. Where does India stand with regards to global innovation rankings? (See Figure 28.4).

As per the Global Innovation Index 2019 (Cornell University, 2019, p. XXXIV), China is ranked 14th overall and 1st in upper middle income group, whereas India is at 52nd in overall position and 4th position in lower middle income group amongst the 129 nations (Cornell University, 2019). Even in the lower-middle income group, India ranks 4th, even below, Vietnam, Ukraine & Georgia (Cornell University, 2019, p. XVI). This gives us a clear picture of how far we are from catching up with China.

TABLE 28.3: Innovation clusters – Ranking for various clusters – country-wise. March – 2019

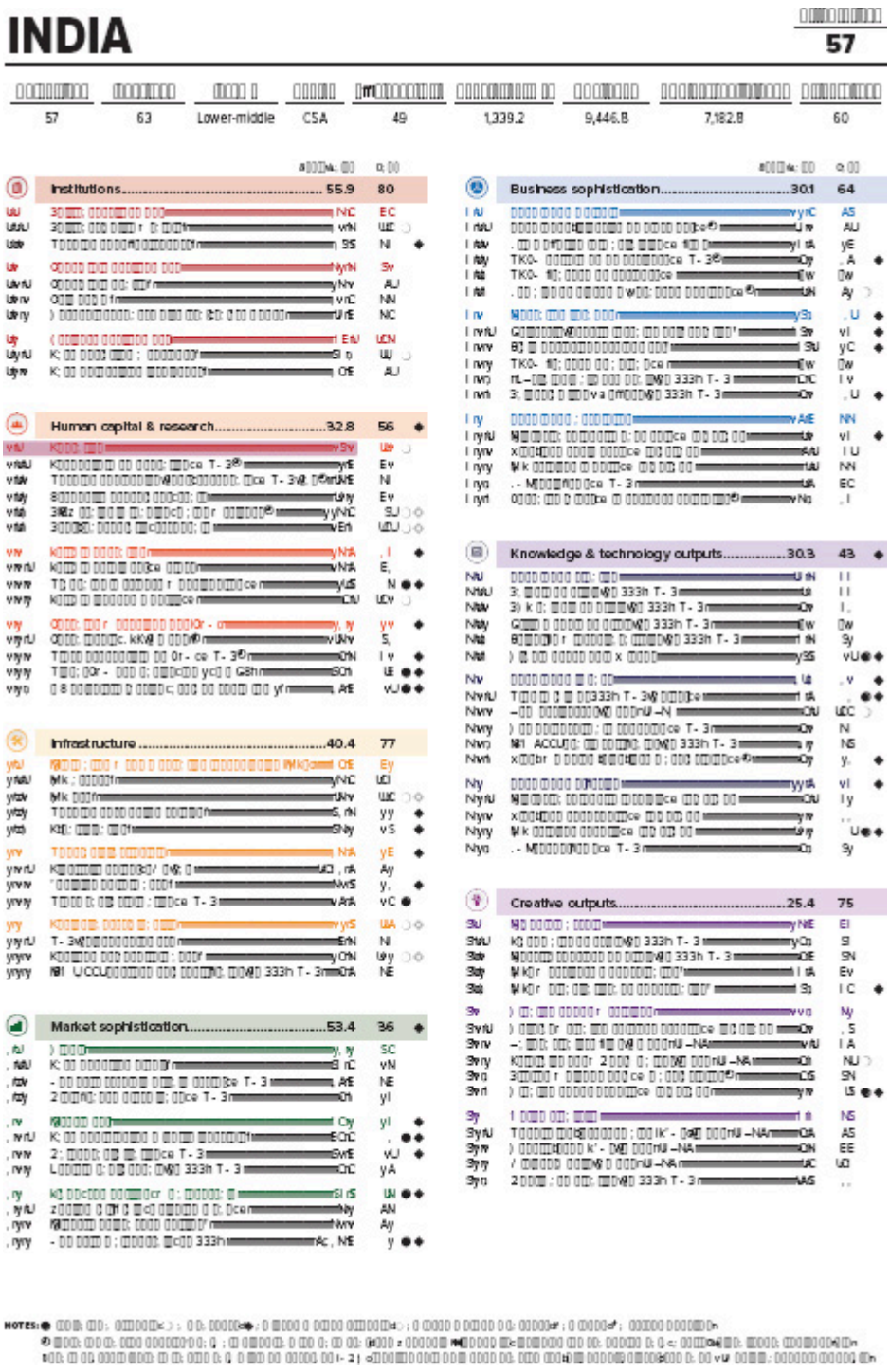
No.	*USA*	*China*	*Japan*	*India*
1	San Jose - 5	Shenzhen - 2	Tokyo - 1	Bengaluru - 65
2	Boston - 7	Beijing - 4	Osaka–Kobe–Kyoto - 6	Delhi - 70
3	New York City - 8	Shanghai - 11	Nagoya - 12	Mumbai - 97
4	San Diego - 10	Guangzhou - 21		
5	Washington DC - 13	Nanjing - 25		
6	Los Angeles - 14	Hangzhou - 30		
7	Houston - 16	Wuhan - 38		
8	Seattle - 17	Xi'an - 47		
9	Chicago - 19	Chengdu - 52		
10	Minneapolis - 27	Tianjin - 60		

11	Raleigh - 34	Changsha - 67		
12	Denver - 49	Qingdao - 80		
13	Atlanta - 56	Suzhou - 81		
14	Cambridge - 58	Harbin - 87		
15	Cincinnati - 61	Chongqing - 88		
16	Pittsburgh - 63	Jinan - 89		
17	Dallas - 64	Hefei - 90		
18	Ann Arbor - 66	Changchun - 93		
19	Cleveland - 73			
20	Phoenix - 76			
21	Austin - 79			
22	Bridgeport – New Haven - 82			
23	St. Louis - 94			
24	Columbus - 96			
25	Indianapolis - 98			

13. If we look at the institutions which are driving innovation, it is the universities which are driving the innovation clusters. So, every country must focus on education system and that too, higher education to rise up the ranks on innovation. Going forward, in this VUCA world, innovation will not only help thrive but also will be a key driver for survival.
14. India's rank in education as per the Global Innovation Index (2017) was 112 out of 126 nations in the table (See Table 28.4). Which means, our education system over the decades has put us at the bottom of world's ranking.
15. Indian institutes when ranked for SDGs, didn't figure in the top 100 amongst the University Impact Rankings 2019 done by The Times Higher Education in partnership with Elsevier, for assessing the universities against the United Nation's Sustainable Development Goals across three broad areas; research, outreach and stewardship (Education, 2019).
16. Where does India stand with regards to PISA rankings? India, so far, was not covered in the PISA (Programme for International Student Assessment rankings), and the only test it took in 2012 with two of

its best states (Tamil Nadu & Himachal Pradesh) participating, it came second last amongst the 73 participant countries (Aiyar, 2019). So, India needs to bring in a radical overhaul to avoid shameful rakings when it participates in the 2021 round of PISA rankings.

Table 28.4



INDIA

57

57	63	Lower-middle	CSA	49	1,339.2	9,446.8	7,182.8	60

Institutions	55.9	80
Human capital & research	32.8	56
Infrastructure	40.4	77
Market sophistication	53.4	36
Business sophistication	30.1	64
Knowledge & technology outputs	30.3	43
Creative outputs	25.4	75

Key features of PISA:

1. PISA is a triennial international survey (every three years) which aims to evaluate the education system worldwide by testing the skills and knowledge of 15-year-old students.

2. Students are assessed in reading, mathematics, science and collaborative problem-solving.
3. Participation in PISA allows benchmarking performance against a wide range of countries.
4. PISA uses test items aligned with international benchmarks. Test items are adapted to the local context and language, pilot tested and validated before being used for the test.
5. OECD have agreed to contextualise the questions for Indian students

(PIB, Ministry of HRD, Government of India, 2019)

Given that India will participate in PISA rankings in 2021, it makes sense to reform the system before it's too late.

17. India's position in global best institutions ranking: According to The World University Rankings, none of the Indian educational institutes show up in the top 250, whereas China has 7 institutions in top 200. (Times Higher Education, 2019). When I started writing this book, India was not in top 250, and in the recent ranking announced by Times Higher Education World University Rankings 2020, in partnership with Elsevier, we are not even in the top 300 (Elsevier, 2019). So, with every passing year, our standard of education is deteriorating on key metrics.
18. Learners seeking studies abroad is another indicator of the inferiority and mediocrity of our education system and the numbers tell the real story. Those who can afford, go to the greener pastures.
19. Indians who migrated abroad and made name in the field of education and science:

    It is time we look at the same Indian students who go abroad and do well, but when in India, they suffer. We can keep taking pride in their being of Indian origin, but nothing goes beyond that! Our academic system's contribution to make a difference in their life is difficult to figure out. Indian learners going abroad for studies and their spending on education abroad is increasing, and has gone up by 44 percent, to US$ 2.8 billion in 2017-18 (Today, 2019). This is despite many Indian universities tying up with foreign universities. If that didn't exist, the number of learners going abroad would have been

much higher. Let us also look at the reverse migration of foreign learners coming to India to draw a fair conclusion. As is evident from the OECD report, the percentage of foreign learners coming to India from abroad is zero. While, the number of students going out of country for tertiary studies is 1% (Refer Table 28.4) (OECD, 2018, p. 230). Out of those coming as foreign learners, 43% are from neighbouring countries. During my interactions with learners coming to India from abroad, I was informed that this was mainly because the fee for learners is miniscule and few institutes like IITs, IIMs, etc. are recognisable brands outside. So, had these institutes not been there giving cost effective quality education, the numbers would have been abysmally low. Also, now, government has started a program 'Study in India' with a dedicated website to get more students to study in India. https://www.studyinindia.gov.in/Home

TABLE 28.5: Mobility patterns of foreign and international students (2016)

Version 2 – Last updated: 05-Sep-2018

Disclaimer: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Percentage of national students enrolled abroad and balance of cross-border mobility in total tertiary education

		Percentage of national tertiary students enrolled abroad	*Number of international or foreign students per national student abroad*	*Number of international or foreign students for every hundred national students home and abroad*	*Percentage of international or foreign students coming from neighboring countries*[1]
		(1)	(2)	(3)	(4)
OECD	Australia	1	26	21	4
	Austria	5	4	19	59
	Belgium	3	4	13	40
	Canada	3	4	13	4
	Chile	1	0	0	37
	Czech Republic[2]	4	3	13	55
	Denmark	2	7	12	38

	Estonia	8	1	7	50
	Finland	4	2	8	16
	France	4	3	11	16
	Germany	4	2	8	15
	Greece[2]	5	1	3	66
	Hungary	4	2	9	27
	Iceland	13	0	6	8
	Ireland	7	1	8	10
	Israel[2,3]	4	1	3	2
	Italy[2]	4	1	5	21
	Japan	1	5	4	63
	Korea[2]	3	1	2	65
	Latvia	7	1	8	18
	Luxembourg	74	0	23	58
	Mexico	1	0	0	m
	Netherlands	2	5	12	31
	New Zealand	3	10	24	6
	Norway	7	1	4	19
	Poland	2	2	3	72
	Portugal	4	2	6	5
	Slovak Republic[2]	17	0	5	56
	Slovenia	4	1	3	36
	Spain	2	1	3	29
	Sweden	4	2	7	20
	Switzerland	5	4	20	55
	Turkey[2]	1	2	1	44
	United Kingdom	2	13	22	11
	United States	0	14	5	5
	OECD total	2	3	6	~
	EU22 total	4	3	9	~
Partners	Argentina[2,4]	m	0	m	m
	Brazil[2]	1	0	0	37
	China[2]	2	0	0	m
	Colombia[2]	1	0	0	54
	Costa Rica[2]	m	1	m	m
	India[2]	1	0	0	43

Indonesia[2]	m	0	m	m
Lithuania	8	1	4	27
Russian Federation[2]	1	4	4	55
Saudi Arabia[2]	6	1	5	32
South Africa[2,4]	1	6	4	46

1. Neighboring countries are considered to be those with land or maritime borders with the host country.
2. National tertiary students are calculated as total enrolment minus foreign students instead of total enrolment minus international students.
3. Excluding internationally mobile students enrolled in short-cycle tertiary programmes.
4. Year of reference 2015.
5. 'm' denotes missing data.
6. Lithuania was not an OECD Member at the time of preparation of this publication. Accordingly, Lithuania does not appear in the list of OECD Members and is not included in the zone aggregates. OECD and EU23 totals including Lithuania have been added at the end of this table for information purposes.

Analysing the above, while some of these indicators are an outcome of multiple inputs besides education, but we have to understand the basic fact that, education is the starting point, and education is a denominator in everything we do, no matter what is the method of calculation or analysis.

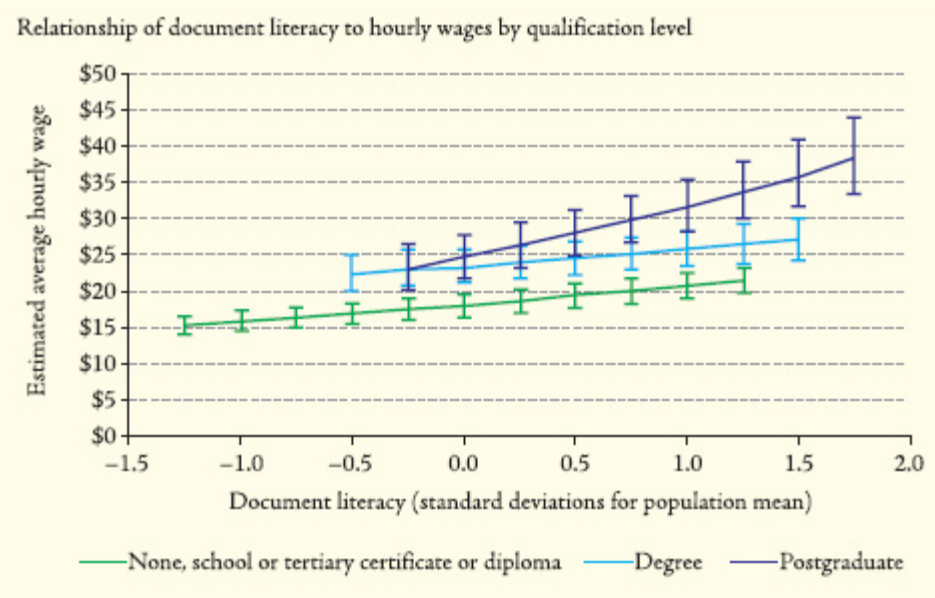
So, even if for the sake of assumption, we use the above global rankings to rank India globally, (there could be more disagreements about its methodology), but with 1.3 billion population, which is about 1/6th of the world population, we are not leveraging the human potential of the population in our country, and we are not at the top or middle, but towards the bottom, if we divide all global rankings into three parts as top, middle and bottom. Whichever methodology or index we take, we are a failed nation due to a broken education system. If we have to break into the next level of global rankings and become a developed nation, we need to address the education system and transform it.

Education (Including Skills) and Economy

Education and economic growth are interlinked and directly proportional, but we will have to look at some evidence to support the same to make a case for higher investments in education. It is believed that education is a contributor to long-term economic performance and it is to be considered from these three vantage points (Earle, 2010):

1. *Human Capital Approach*: Leads to improvement in knowledge and skills
2. *Innovation Approach*: Contributes to innovation capabilities of the population
3. *Knowledge Transfer Approach*: Leads to new knowledge and ideas

Also, it is the quality of learning rather than the quantity of time that matters in school education when it comes to improved economic performance. Though, *'tertiary education provides a small, but important, contribution to driving economic growth'* (Earle, 2010), evidence does exist that increased tertiary education can lead to increase in average gross domestic product per capita (Earle, 2010, p. 2). Tertiary qualification is defined as diploma and above.



■ FIGURE 28.5

Source: Earle (2010b).

Note: Results are from a log-linear model of hourly wages. The reference group is males, aged 30, with English as a first language. The lines show the distribution from the 10th to 90th percentile for each qualification level.

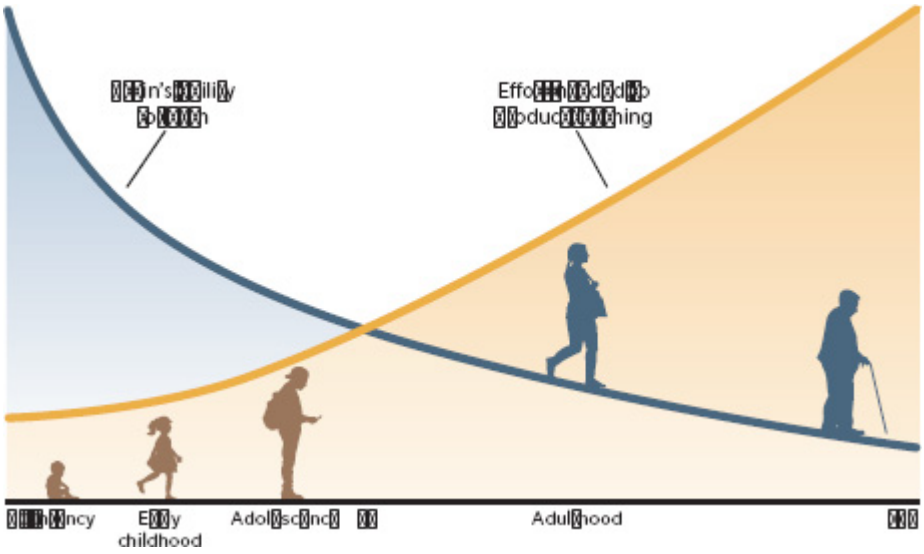
(Earle, 2010, p. 5)

Children and Education

First 1000 days are very critical to cognitive development and socio behavioural skills and this must be an area of focus for the education system. "*In fact, inequities in education start during infancy. Exposure to stimuli and the quality of care, both in the family and in institutional environments, are crucial for expanding children's choices in later life and for helping them develop their full potential"* (UNDP, 2019, p. 77).

"*By the age of 3, children from low-income families have heard 30 million fewer words than their more affluent peers. As children turn into teenagers, interventions to close these gaps become more expensive. Evidence suggests that, for governments seeking to invest wisely in human capital, there is no better possibility than investing in the first thousand days of a child's life* " (World Bank, 2019, p. 53). The architecture of the brain forms from the prenatal period to age 5, and so, this is an important stage for developing cognitive and socio-behavioural skills. During this period, the brain's ability to learn from experience is at its highest level (Figure 28.6).

If we consider the neurobiological development process, brain patterning is complete at birth, and further dramatic biological development happens during the pre-school years, and it roughly quadruples in weight before the age of six (Dobbing, 1973), and by then, the brain has attained about 90% of its adult volume (Brown & Jernigan, 2012) Experiences and learning during this period directly affect achievement in adulthood. If this window is missed, building skills becomes harder. (World Bank, 2019, p. 73) (Figure 28.6).



Source: WDR 2019 team.

■ **FIGURE 28.6** *The brain's ability to learn from experience decreases with age*

From the age of 3, socialisation and more formal early learning become important to prepare children to succeed in primary school. A quality pre-school strengthens children's executive functions (such as working memory, flexible thinking, self-control), launching them on higher learning trajectory.

Investment in education (according to me) yields deferred dividends, which keep increasing with time. According to a World Bank report (World Bank, 2019, p. 75), an additional dollar invested in quality early childhood programs yields a return of US$6–$17.

Integrated approaches that combine health, nutrition, and stimulation investments have also been highly effective. Chile's Crece Contigo program integrates the services provided by the health, education, welfare, and protection services so that a child's first contact with the system occurs while still in the womb during the mother's first prenatal visit (World Bank, 2019, p. 76).

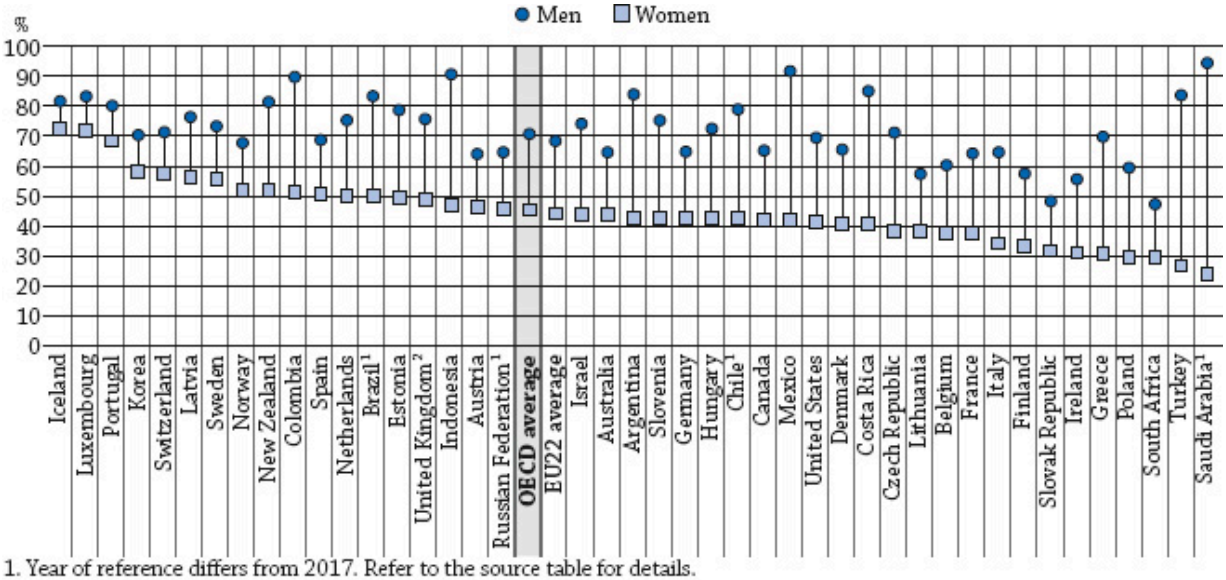
Adult learning programs are more successful when they are explicitly linked to employment opportunities. One popular way to do this is through apprenticeships or internships that link training to day-to-day experience

and provide motivation through the promise of future economic returns (World Bank, 2019, p. 86).

In Chile, the return to tertiary education ranges from 4 percent for humanities to 126 percent for engineering and technology. Tertiary enrolment and expenditure also vary considerably by region (World Bank, 2019, p. 77).

Education and Employment: Just by enhancing the qualifications by one level (upper secondary level), the employment of 25-34 year olds across OECD countries increased by more than 35 percent compared to those who did not complete upper secondary education. Also, if we look at the chart on the following page (in Figure 28.7), it is clear that higher the education level, higher the chances of being employed. The employment rate across OECD countries based on the level of education is as follows; 85% for tertiary-educated adults; 76% for adults with upper secondary or post-secondary non-tertiary qualification; below 60% for adults who have not completed upper secondary education (OECD, 2018, p. 70). Based on the data in OECD countries, those countries who have established VET (Vocational Education and Training) and apprenticeship programs are more effective in addressing the issue of youth unemployment (OECD, 2018, p. 151).

1. Year of reference differs from 2017.
2. Data for upper secondary attainment include completion of a sufficient volume and standard of programmes that would be classified individually as completion of intermediate upper secondary programmes (17% of adults aged 25–64 are in this group).



1. Year of reference differs from 2017. Refer to the source table for details.

2. Data for upper secondary attainment include completion of a sufficient volume and standard of programmes that would be classified individually as completion of intermediate upper secondary programmes (17% of adults aged 25-64 are in this group).

Countries are ranked in descending order of the employment rate of 25-34 year-old women with below upper secondary education.

Source: OECD / ILO (2018), Table A3.2. See *Source* section for more information and Annex 3 for notes (http://dx.doi.org/10.1787/eag-2018-36-en).

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■ **FIGURE 28.7** *Employment rates of 25-34 year-olds with below upper secondary education, by gender (2017)*

Table 28.6: Trends in employment rates of 2 5-34 year-olds, by educational attainment and gender (2007 and 2017) *Percentage of employed 25-34 year-olds among all 25-34 year-olds*

Percentage of employed 25-34 year-olds among all 25-34 year-olds

		Below upper secondary						Upper secondary or post-secondary non-tertiary						Tertiary					
		Men		Women		Total		Men		Women		Total		Men		Women		Total	
		2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
OECD	Australia	80[b]	65	46[b]	44	64[b]	55	91[b]	89	68[b]	67	81[b]	80	93[b]	91	80[b]	79	85[b]	84
	Austria	78	64	56	46	65	56	89	86	73	83	82	85	92	89	83	85	87	87
	Belgium	69[b]	60	44[b]	37	58[b]	50	88[b]	83	72[b]	70	81[b]	78	91[b]	89	89[b]	86	90[b]	87
	Canada	70	65	50	42	62	57	86	83	74	70	81	78	89	89	83	84	85	86
	Chile[1]	m	79	m	43	m	61	m	80	m	57	m	69	m	89	m	83	m	85
	Czech Republic	66[b]	71	35[b]	38	50[b]	54	93[b]	94	63[b]	66	79[b]	82	93[b]	93	70[b]	71	80[b]	80
	Denmark	84[b]	66	63[b]	41	74[b]	56	91[b]	83	82[b]	72	87[b]	78	91[b]	85	86[b]	81	89[b]	83
	Estonia	77	79	53	50	69	69	95	92	69	68	83	82	94	94	82	75	87	83
	Finland	74	58	53	m	66	48	85	79	70	67	78	74	94	90	81	79	87	83
	France	75	64	45	37	61	52	89	82	72	66	81	74	90	90	84	84	87	87
	Germany	68[b]	65	42[b]	43	55[b]	55	82[b]	86	72[b]	79	77[b]	83	93[b]	90	83[b]	84	88[b]	87
	Greece	89[b]	70	43[b]	31	71[b]	54	86[b]	68	62[b]	48	73[b]	59	84[b]	75	77[b]	63	80[b]	68
	Hungary	60	73	33	43	47	58	87	91	63	69	76	82	92	94	74	74	82	82
	Iceland	90	82	74	72	83	78	93	89	76	80	86	85	95	96	89	90	92	93
	Ireland	74[b]	56	45[b]	31	62[b]	46	90[b]	82	71[b]	63	81[b]	73	93[b]	90	87[b]	85	89[b]	87
	Israel	61[b]	74	22[b]	44	45[b]	62	74[b]	74	58[b]	66	67[b]	71	87[b]	90	81[b]	84	84[b]	87
	Italy	81[b]	65	42[b]	34	64[b]	52	83[b]	73	64[b]	53	73[b]	64	75[b]	69	69[b]	65	71[b]	66
	Japan[2]	m	m	m	m	m	m	m	m	m	m	m	m	92	93[d]	69	79[d]	80	86[d]
	Korea	71[b]	70	42[b]	58	61[b]	64	76[b]	71	51[b]	54	64[b]	65	84[b]	81	65[b]	69	74[b]	75
	Latvia	79	76	52	56	70	70	91	86	70	69	81	79	92	94	83	83	86	87
	Luxembourg	90[b]	83	71[b]	72	81[b]	78	88[b]	88	77[b]	79	83[b]	84	89[b]	90	86[b]	84	87[b]	87
	Mexico	93	92	40	42	64	66	91	89	58	54	73	71	90	88	77	74	83	81
	Netherlands	88[b]	75	59[b]	50	75[b]	65	94[b]	88	83[b]	77	88[b]	83	96[b]	93	92[b]	90	94[b]	91
	New Zealand	80	81	56	52	69	68	92	91	69	68	82	80	92	93	76	85	83	89
	Norway	77	68	61	52	70	61	90	85	81	74	86	80	91	87	88	88	89	88
	Poland	61[b]	59	38[b]	30	51[b]	48	84[b]	89	63[b]	60	74[b]	77	92[b]	95	85[b]	84	88[b]	88
	Portugal	87	80	71	68	80	76	80	82	77	82	78	82	87	85	84	86	85	86
	Slovak Republic	27[b]	48	21[b]	32	24[b]	40	89[b]	89	62[b]	62	76[b]	78	93[b]	90	76[b]	68	83[b]	77
	Slovenia	78[b]	75	59[b]	43	70[b]	64	89[b]	88	79[b]	76	85[b]	83	94[b]	90	88[b]	81	90[b]	84
	Spain	85	69	58	51	74	61	86	73	72	65	79	69	89	79	82	76	85	77
	Sweden	75[b]	73	51[b]	55	64[b]	66	89[b]	87	79[b]	81	84[b]	84	89[b]	88	86[b]	86	87[b]	87
	Switzerland	84[b]	71	59[b]	58	70[b]	65	91[b]	89	78[b]	82	84[b]	85	94[b]	91	84[b]	86	90[b]	89
	Turkey	83[b]	84	20[b]	27	49[b]	54	86[b]	87	31[b]	35	65[b]	65	87[b]	85	68[b]	64	79[b]	75
	United Kingdom[3]	78[b]	76	44[b]	49	60[b]	63	90[b]	91	73[b]	75	82[b]	83	93[b]	93	85[b]	84	89[b]	89
	United States	77	69	46	42	64	57	84	80	68	66	76	73	92	88	81	81	86	85
	OECD average	76	71	48	45	63	60	88	84	69	68	79	77	91	89	81	80	85	84
	EU22 average	75	68	49	44	63	58	88	85	71	70	80	78	91	88	82	80	86	83
Partners	Argentina	m	84	m	43	m	67	m	84	m	60	m	72	m	93	m	85	m	88
	Brazil[1]	88	83	56	50	72	68	90	86	69	64	79	75	92	91	86	83	89	86
	China	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Colombia	m	90	m	51	m	72	m	88	m	62	m	75	m	89	m	78	m	83
	Costa Rica	94	85	45	41	71	66	95	88	59	55	77	71	94	84	85	77	89	80
	India	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Indonesia	92[b]	91	46	47	67[b]	68	80[b]	90	39[b]	49	60[b]	71	72[b]	91	54[b]	79	62[b]	84
	Lithuania	66[b]	57	53[b]	38	61[b]	51	87[b]	86	75[b]	69	81[b]	79	92[b]	94	89[b]	91	90[b]	92
	Russian Federation[4]	m	65	m	46	m	57	m	88	m	70	m	80	m	94	m	82	m	87
	Saudi Arabia[5]	m	94	m	24	m	65	m	91	m	12	m	59	m	92	m	35	m	62
	South Africa	m	47	m	29	m	40	m	58	m	43	m	50	m	86	m	81	m	83
	G20 average	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m

Note: In most countries there is a break in the time series, represented by the code "b", as data for 2017 refer to ISCED 2011 while data for 2007 years refer to ISCED-97. For Indonesia and Saudi Arabia data refer to ISCED-97. *See Definitions* and *Methodology* sections for more information. Data and more breakdowns are available at http://stats.oecd.org/, Education at a Glance Database.

1. Year of reference 2015 instead of 2017.
2. Data for tertiary education include upper secondary or post-secondary non-tertiary programmes (less than 5% of adults are in this group).
3. Data for upper secondary attainment include completion of a sufficient volume and standard of programmes that would be classified individually as completion of intermediate upper secondary programmes (17% of adults aged 25-64 are in this group).
4. Year of reference 2016 instead of 2017.
5. Year of reference 2014 instead of 2017.

Source: OECD/ILO (2018). See *Source* section for more information and Annex 3 for notes (http://dx.doi.org/10.1787/eag-2018-36-en).

Please refer to the Reader's Guide for information concerning symbols for missing data and abbreviations.

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Changing Nature of Jobs in the Gig Economy

The job market is changing faster than we thought, and the cycles of earlier industrial revolutions that lasted for decades have been reduced to months. The Gig economy (referred to as short-term work or freelance work i.e.

temporary & flexible job like working online) will be harsh on people who are not upskilled. This throws the biggest challenge to education planners, parents and learners on how to prepare for the unknown ! Well, that's the reality. The new education system is about creating a mindset to be prepared for such an environment. Imagine a new world with 3D printing. Will we require large plants and factories? Does your degree prepare you with the skills needed in such a world? The education world is more VUCA then ever before. VUCA – (Volatile, Uncertain, Complex and Ambiguous) (UNC Executive Development, 2017) was a terminology used by the US Army War College to describe the world in the aftermath of the cold war, and is now the new normal. Which means, jobs are going to be VUCA in the turbulent environment and the world needs to be prepared for it.

For the New Generation: Generation A and U (Agile & Uncertain) – New Jobs (tasks), new locations, new sectors, new markets, new products, new work timings, and a new workplace culture – this is what the education system will have to be ready to cope up with.

We know automation and robotisation is happening and in Germany, where the robot density is the highest, it has reduced the hiring of the new entrants (World Bank, 2019, p. 20). In China, the leading tech company Foxconn Technology Group, which is the world's largest technology assembler, reduced its workforce by 30% due to robotisation of the production process. Same with Adidas which set up two 'speed factories' for shoe production in Germany and the United States and cut 1000 jobs in Vietnam. Philips moved back production from China to Netherlands (World Bank, 2019, p. 21).

Now, the largest bank in Russian Federation, Sberbank uses AI to make more than 1/3rd of their loan decisions and they predict that it will increase to 70 percent in less than five years. 'Robot Lawyers' have replaced 3000 employees in Sberbank's legal team and the back office team is likely to be cut by more than 98 percent from 59000 to just 1000 by 2021 (World Bank, 2019, p. 21).

In Bolivia, automation of jobs is happening fast and ranges between 2-41 percent. It is estimated that between 100,000 to 2 million jobs will be automated. In Lithuania, the number of jobs which are at risk of being automated ranges between 5-56 percent, in Japan between 6-55 percent (World Bank, 2019, p. 21).

If we relate to the experience in India, Tata's Harrier plant in Pune is 90 percent automated. So, the direction of education and employment is clear. Not only jobs may be cut in the third world, production can move back to the first world or the place of consumption.

Since 2001, the share of employment in occupations intensive in non-routine cognitive and socio-behavioural skills has increased from 19 to 23 percent in emerging economies and from 33 to 41 percent in advanced economies (World Bank, 2019, p. 12), and this must give us a sense of the direction in which we are headed.

In Vietnam, within a given industry, workers performing non-routine analytical tasks earn 23 percent more than those performing tasks that are non-analytical, non-interactive, and non-manual; and those undertaking interpersonal tasks earn 23 percent more (World Bank, 2019, p. 23). In Armenia and Georgia, the earnings premium for problem solving and learning new skills at work is close to 20 percent (World Bank, 2019, p. 24).

The demand for non-routine cognitive and interpersonal skills is largely rising much faster than for other skills (World Bank, 2019, p. 24). Designing, producing art, conducting research, managing teams, and nursing have proven to be hard tasks to automate. Robots have, for the most part, struggled to replicate the skills, which require a high emotional quotient. But technology is re-imagining roles and automating them faster than we can comprehend.

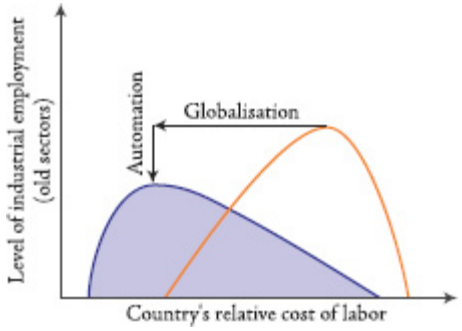
In China, due to an online marketplace, the 'clusters – Taobao Villages' increased from 3 in 2009 to 2118 across 28 provinces in 2017 and about 4,90,000 villages were online (World Bank, 2019, p. 25).

Bangladesh contributes 15 percent to the global labour pool online by means of its 650,000 freelance workers (World Bank, 2019, p. 25).

Asuqu in Nigeria connects creatives and other experts with businesses across Africa. Tutorama, based in the Arab Republic of Egypt, connects students with local private tutors. In Russia, students work as Yandex drivers whenever they can fit it into their university schedules. They identify peak hours in different locations to achieve the highest level of passenger turnover.

In the USA, 57.3 millions of free-lancers also do traditional jobs (World Bank, 2019, p. 26). So the gig economy is a great leveller for the current

education and skills ecosystem and a great opportunity for job and wealth creation. But, one fear I have from this virtual economy, is that the wealth and jobs will get shifted to aggregators like the Amazon and Uber, and this is something that the education and other policy planners will have to address before it is too late. Countries which are proactive will become richer and developing world will remain where it is (if not deteriorate). This is something that the education system will have to address.



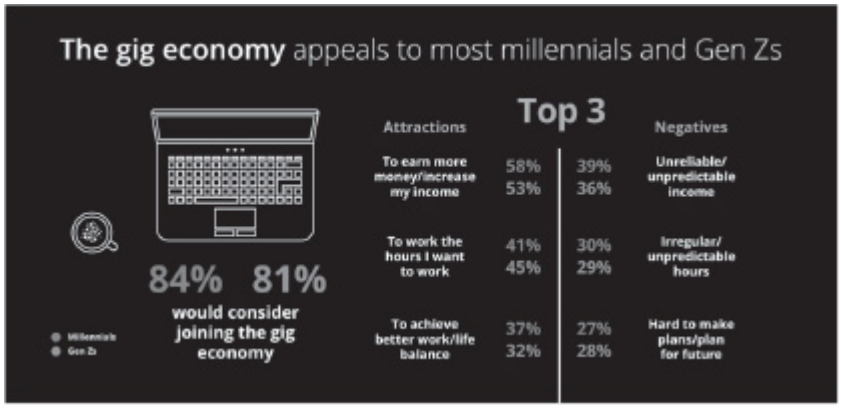
Source: Glaeser 2018.

Note: The curves are inverse U-shaped to reflect the empirical regularity that manufacturing employment constitutes a larger share of employment in middle-income countries; higher-income countries tend to specialise in services; and low-income countries have a relatively higher share of employment in agriculture.

■ **FIGURE 28.8** *Automation and Globali-sation Affect Industrial Employment*

The future world of work is uncertain. Innovation may outpace automation. Globalisation may move quickly enough, so that industrialisation may allow even countries in Africa to grow and prosper. Yet, given the considerable uncertainty about the future of employment, governments should rethink policies that deter job creation, and emphasise policies that protect the vulnerable, while still encouraging employment (World Bank, 2019, p. 31).

Even the millennials prefer to work in the gig economy and their aspirations are to earn more, and have a work-life balance and this was revealed in a survey (Deloitte, 2019, p. 16). According to this survey,



(Deloitte, 2019, p. 5)

■ **FIGURE 28.9**

It is difficult to estimate the size of the gig economy. Where data exists, the numbers are still small. Data from Germany and the Netherlands indicate that only 0.4 percent of the labour force of these countries is active in the gig economy. Worldwide, the total freelancer population is estimated at around 84 million, or less than 3 percent of the global labour force of 3.5 billion. A person counted as a freelancer may also engage in traditional employment. In the United States, for example, more than two-thirds of the 57.3 million freelancers also hold a traditional job, using freelancing to supplement their income. The best estimate is, that less than 0.5 percent of the active labour force participates in the gig economy globally, with less than 0.3 percent in developing countries (World Bank, 2019, p. 26).

Capitalism requires "the perennial gale of creative destruction," wrote Schumpeter in 1942, the education system of the future has to prepare a nation where 'Capitalism' leads the growth and 'Socialism' leads to distribution through job creation. We are far-far away and the challenge is too big but there is no other way out!

Education and Income

OECD data (OECD, 2018, p. 88) (Refer Table 28.7) clearly shows the link between the level of education and income: 25–64-year adults who have a tertiary degree earn 54% more than those having upper secondary qualifications. Whereas, those who have below upper secondary education earn 22% less. If we take the case of India, according to a recent study by Centre for Sustainable Development, 82% of males and 92% of female

workers earn less than ₹10,000 per month – much below the stipulated income of ₹18000 as per the seventh pay commission of the Government of India (TNN, 2019). This is an outcome of a broken education system that is akin to a degree factory which lacks in equity and quality.

Table 28.7: Relative earnings of workers, by educational attainment (2016)

25-64-year-olds with income from employment (full- and part-time workers): upper secondary education = 100

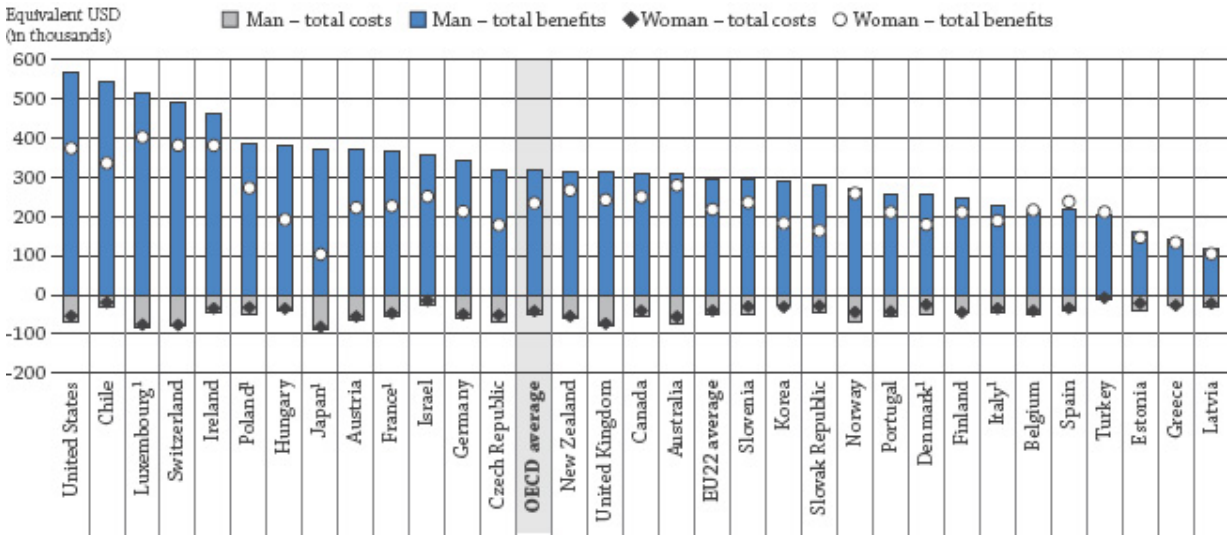
OECD	Notes	Below upper secondary		Post-secondary non-tertiary		Tertiary						Total	
						Short-cycle tertiary		Bachelor's or equivalent		Master's, doctoral or equivalent			
		(1)		(2)		(3)		(4)		(5)		(6)	
Australia		87		101		107		135		152		131	
Austria		69		112		133		93		174		146	
Belgium	1	82			c		c	126		165		141	
Canada	1	83		126		121		152		186		144	
Chile	1	68			a	142		264		472		237	
Czech Republic	1,2	74			m	112		142		180		169	
Denmark		80		136		116		111		166		129	
Estonia		89		89		90		124		139		127	
Finland	1	98		118		124		125		169		141	
France	3	80			c	125		142		210		155	
Germany		76		114		151		165		183		169	
Greece		77		99		145		133		174		140	
Hungary		76		98		110		172		234		194	
Iceland			m		m		m		m		m		m
Ireland	4	80		91		129		167		208		168	
Israel		77			a	115		149		216		159	
Italy	3	78			m		x (5)		x (5)	138	d	138	
Japan	5	78			x (6)		x (6)		x (6)		x(6)	152	d
Korea		72			a	116		149		198		145	
Latvia	4	89		97		118		136		166		145	
Luxembourg	4	77			c	122		139		159		148	
Mexico	4	59			a	133		192		303		195	
Netherlands	3	82		124		132		132		184		150	
New Zealand		87		108		114		130		154		132	
Norway		76		102		118		114		156		127	
Poland		83		100			m	139		161		156	
Portugal		75		103		166		170	d		x(4)	169	
Slovak Republic	2	65			m	123		124		174		168	
Slovenia			m		m		m		m		m		m
Spain	1	73		101	r		x(6)		x(6)		x(6)	151	
Sweden		82		109		98		105		135		115	
Switzerland	2	78			m		x(4,5)	141	d	167	d	155	
Turkey	4	72			a		x(6)		x(6)		x(6)	171	
United Kingdom		76			a	125		148		172		150	
United States	2	74			m	112		169		233		175	
OECD average		78			m	123		144		191		154	
EU22 average		79		107		125		136		173		151	
Partners													
Argentina			m		m		m		m		m		m

Brazil	1,2	62			m		x(4)	235	d	449		249	
China			m		m		m		m		m		m
Colombia	2	67			m		m		m		m	236	
Costa Rica		69			c	119		207		337		203	
India			m		m		m		m		m		m
Indonesia			m		m		m		m		m		m
Lithuania	3	86		113			a	155		213		179	
Russian Federation			m		m		m		m		m		m
Saudi Arabia			m		m		m		m		m		m
South Africa			m		m		m		m		m		m
G20 average			m		m		m		m		m		m
OECD average incl. Lithuania		78			m	123		145		191		155	
EU23 average incl. Lithuania		79		107		125		137		175		152	

Note: See *Definitions* and *Methodology* sections for more information. Data and more breakdowns available at http://stats.oecd.org/, Education at a Glance Database.

1. Year of reference 2015.
2. Index 100 refers to the combined ISCED levels 3 and 4 of the educational attainment levels in the ISCED 2011 classification.
4. Earnings net of income tax.
5. Year of reference 2012.

Source: OECD (2018). See *Source* section for more information and Annex 3 for notes (http://dx.doi.org/10.1787/eag-2018-36-en)



■ **FIGURE 28.10** *Private costs and benefits of education for a man or a woman attaining tertiary education (2015)*

As compared with returns to upper secondary education, in equivalent USD converted using PPPs for GDP. Future costs and benefits are discounted at a rate of 2%.

Figure 28.10 shows that higher education gives an edge, which translates into higher incomes, taking country specific labour market outcomes. A tertiary educated man will earn US$319600 more while a

tertiary educated women will earn US $234000 more (OECD, 2018, p. 105).

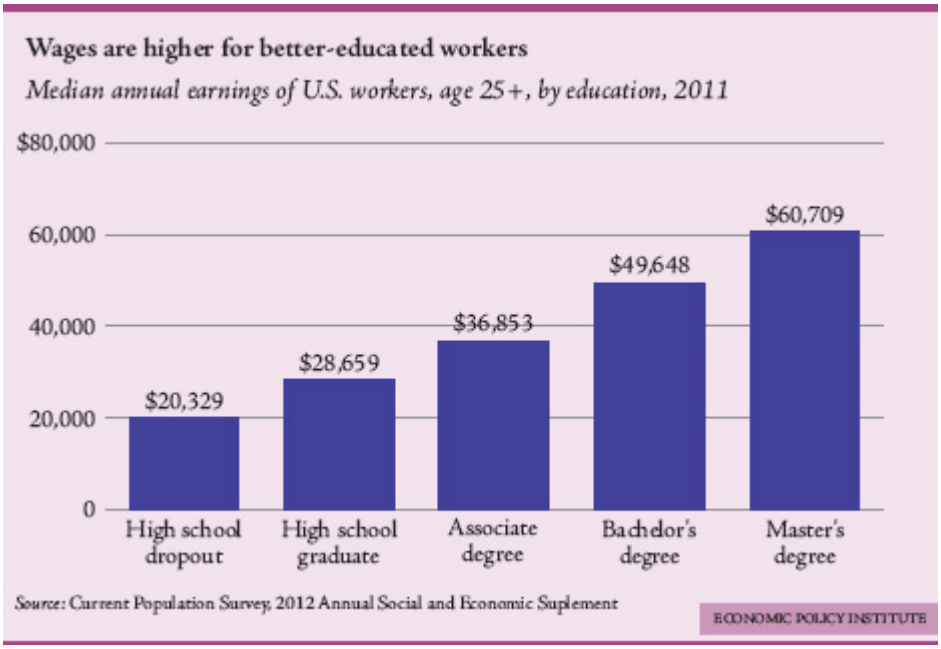


FIGURE 28.11 *Wages are higher for better-educated workers*

From the Figure above, it is apparent that the median wages are substantially higher in states with better-educated workers. (Berger & Fisher, 2012).

Earlier, it was believed that it was luck that was responsible for a person's ability, and determined the income. But Jacob Mincer's work in 1970's found that males in non-farm employment increased their income by 10.7 percent for an additional year of education (World Bank, 2019, p. 92).

So, based on the available data, the relation between educational qualifications and employment and income is clearly established – i.e. those with higher qualifications have higher chances of employment and earning.

If we consider the net financial return for people investing in education, the returns justify the investment and make a compelling case for undergoing tertiary education, and this also is a call to action for governments to invest in higher education, offer flexibility and to incentivise people seeking higher education, remove artificial barriers, and

innovate in higher education and not confine it to the exclusive realm and boundaries of a university.

Education, Poverty Eradication and Inclusive Growth

If in health, there is wealth – in education there is wealth and prosperity!

If we consider countries in Europe more than a century ago, they were able to reduce poverty not by economic progress alone, but by providing better healthcare and education (Gupta, Healthcare Reforms in India: Making up for the lost decades, 2016)**.** If we consider the Human Capital approach (which includes knowledge, skills, and health), which people accumulate over their lives enabling them to realise their potential as productive members of the society (World Bank, 2019, p. 50), the human capital returns extend to others and across generations. The nations become richer as more human capital accumulates.

Human capital and physical capital together are important for technology innovation and long-term growth. "As a result, between 10-30% of the per capita gross domestic product differences is attributable to cross-country differences in human capital. This percentage could be even higher when considering the quality of education or the interactions between workers with different skills. And not to be overlooked, by generating higher incomes, human capital accelerates demographic transition and reduces poverty" (World Bank, 2019, p. 51). If India can educate its workforce as per the current needs, it is likely to increase its GDP between 1-3% and this will have a huge impact on job creation as well (as every percentage increase in GDP creates 7,50000 jobs). This means that India can support between 0.75 – 2.1 million additional jobs every year.

Gestation period may be higher but education and income link is well estab-lished. "In Jamaica, providing toddlers with psychosocial stimulation increased earnings by 25 percent, but these returns only materialised 20 years later."

Table 28.8: The Human Capital Index (HCI), 2018

Rank	Economy	HCI score	Rank	Economy	HCI score	Rank	Economy	HCI score
157	Chad	0.29	104	Egypt, Arab Rep.	0.49	51	Mongolia	0.63
156	South Sudan	0.30	103	Honduras	0.49	50	Ukraine	0.65
155	Niger	0.32	102	Nepal	0.49	49	United Arab Emirates	0.66
154	Mali	0.32	101	Dominican Republic	0.49	48	Vietnam	0.67
153	Liberia	0.32	100	Cambodia	0.49	47	Bahrain	0.67
152	Nigeria	0.34	99	Guyana	0.49	46	China	0.67

151	Sierra Leone	0.35	98	Morocco	0.50	45	Chile	0.67
150	Mauritania	0.35	97	El Salvador	0.50	44	Bulgaria	0.68
149	Côte d'Ivoire	0.35	96	Tunisia	0.51	43	Seychelles	0.68
148	Mozambique	0.36	95	Tonga	0.51	42	Greece	0.68
147	Angola	0.36	94	Kenya	0.52	41	Luxembourg	0.69
146	Congo, Dem. Rep.	0.37	93	Algeria	0.52	40	Slovak Republic	0.69
145	Yemen, Rep.	0.37	92	Nicaragua	0.53	39	Malta	0.70
144	Burkina Faso	0.37	91	Panama	0.53	38	Hungary	0.70
143	Lesotho	0.37	90	Paraguay	0.53	37	Lithuania	0.71
142	Rwanda	0.37	89	Tajikistan	0.53	36	Croatia	0.72
141	Guinea	0.37	88	Macedonia, FYR	0.53	35	Latvia	0.72
140	Madagascar	0.37	87	Indonesia	0.53	34	Russian Federation	0.73
139	Sudan	0.38	86	Lebanon	0.54	33	Iceland	0.74
138	Burundi	0.38	85	Jamaica	0.54	32	Spain	0.74
137	Uganda	0.38	84	Philippines	0.55	31	Kazakhstan	0.75
136	Papua New Guinea	0.38	83	Tuvalu	0.55	30	Poland	0.75
135	Ethiopia	0.38	82	West Bank and Gaza	0.55	29	Estonia	0.75
134	Pakistan	0.39	81	Brazil	0.56	28	Cyprus	0.75
133	Afghanistan	0.39	80	Kosovo	0.56	27	Serbia	0.76
132	Cameroon	0.39	79	Jordan	0.56	26	Belgium	0.76
131	Zambia	0.40	78	Armenia	0.57	25	Macao SAR, China	0.76
130	Gambia, The	0.40	77	Kuwait	0.58	24	United States	0.76
129	Iraq	0.40	76	Kyrgyz Republic	0.58	23	Israel	0.76
128	Tanzania	0.40	75	Moldova	0.58	22	France	0.76
127	Benin	0.41	74	Sri Lanka	0.58	21	New Zealand	0.77

126	South Africa	0.41	73	Saudi Arabia	0.58	20	Switzerland	0.77
125	Malawi	0.41	72	Peru	0.59	19	Italy	0.77
124	eSwatini	0.41	71	Iran, Islamic Rep.	0.59	18	Norway	0.77
123	Comoros	0.41	70	Colombia	0.59	17	Denmark	0.77
122	Togo	0.41	69	Azerbaijan	0.60	16	Portugal	0.78
121	Senegal	0.42	68	Uruguay	0.60	15	United Kingdom	0.78
120	Congo, Rep.	0.42	67	Romania	0.60	14	Czech Republic	0.78
119	Botswana	0.42	66	Ecuador	0.60	13	Slovenia	0.79
118	Timor-Leste	0.43	65	Thailand	0.60	12	Austria	0.79
117	Namibia	0.43	64	Mexico	0.61	11	Germany	0.79
116	Ghana	0.44	63	Argentina	0.61	10	Canada	0.80
115	India	0.44	62	Trinidad and Tobago	0.61	9	Netherlands	0.80
114	Zimbabwe	0.44	61	Georgia	0.61	8	Sweden	0.80
113	Solomon Islands	0.44	60	Qatar	0.61	7	Australia	0.80
112	Haiti	0.45	59	Montenegro	0.62	6	Ireland	0.81
111	Lao PDR	0.45	58	Bosnia and Herzegovina	0.62	5	Finland	0.81
110	Gabon	0.45	57	Costa Rica	0.62	4	Hong Kong SAR, China	0.82
109	Guatemala	0.46	56	Albania	0.62	3	Japan	0.84
108	Vanuatu	0.47	55	Malaysia	0.62	2	Korea, Rep.	0.84
107	Myanmar	0.47	54	Oman	0.62	1	Singapore	0.88
106	Bangladesh	0.48	53	Turkey	0.63			
105	Kiribati	0.48	52	Mauritius	0.63			

Source: WDR 2019 team.

Note: The human capital index ranges between 0 and 1. The index is measured in terms of the productivity of the next generation of workers relative to the benchmark of complete education and full health. An economy in which the average worker achieves both full health and full education potential will score a value of 1 on the index.

The OECD framework for policy action on inclusive growth acknowledged the role of education in inclusive growth. According to OCED, if we consider the three building blocks for inclusive growth, investing in people including early education and life-long acquisition of skills is one of them (OECD, 2018).

Education and income are directly related and when people invest in education, they are in fact investing to earn more. The higher income that results from investing in a degree is also referred as the 'college wage premium' and there is evidence to support that this premium has grown over time. So more the skills, better the employment (Wolla & Sullivan, 2017).

TABLE 28.9: Family Financial Outcomes Based on Education

*Education**	*Percentage of families*	*Median income (2013)*	*Median wealth (2013)*	*Wealth-to-income ratio***	*Millionaires (family wealth)*
No high school diploma	12%	$22,320	$37,766	1.43	1 in 110
High school diploma	50%	$41,190	$95,072	2.15	1 in 18
Two- or four-year degree	25%	$76,293	$273,488	3.45	1 in 4.6
Advanced degree	13%	$116,265	$689,100	5.58	1 in 2.6

Note: *Based on the education level of a family headed by someone 40 years of age or older. **This ratio shows how much wealth each group has per dollar of income. For example, the ratio for families without a high school degree was 1.43, which means that, on average, for every $1 of income there was $1.43 of wealth. The ratio is a measure of how efficient people are at turning income into wealth.

Source: Boshara, Ray; Emmons, William R. and Noeth, Bryan. "The Demographics of Walth: How Age, Education and Race Separate Thrivers from Strugglers in Today's Economy." Essay No. 2: Education and Wealth, Federal Reserve Bank of St. Louis, May 2015, pp. 4, 5, 9, and 13;
https://www.stlouisfed.org/~/media/Files/PDFs/HFS/essays/HFS-Essay-2-2015-Education-and-Wealth.pdf.

Education and wealth are directly proportional. Higher income leads to more savings and wealth creation. Also, it is implied that those with higher education make better decisions which is a contributor to making people wealthier (Wolla & Sullivan, 2017).

Increase in education levels since the 19th century has contributed to 1/5th to 1/3rd of the economic growth in the United States (Dean, 1984) (Barro & Lee, 2015).

Education and living standards: If we look at the USA, the highest living standards in the globe is here, and this has been for a long time. Their income per capita is also high at US$ 67,430 in 2019 as per IMF. Still, there is a feeling that there is an inequality in distribution of wealth. While there are multiple factors at play when it comes to income and inequality, the role of education holds the key in bridging the divide. (Wolla & Sullivan, 2017).

Education and Agriculture

The world population is 7.7 billion (Population Reference Bureau, 2019) and growing. Though every major report from either World Bank or any reputed organisation states that we have to find ways to address the shift from agriculture to manufacturing and service sector, but on the other side, we are moving towards automation. So, we are not sure which direction we are taking. Imagine, a country like India has about 60-65% population dependent on agriculture, so can we accommodate people into other jobs in an era of automation? More importantly, how do we enhance the productivity and profitability to feed 7.7 billion people on the planet? This can be addressed only through investing and reforming the education system.

Returns to primary schooling in India increased during the Green Revolution of the 1960s and 1970s, with more educated farmers adopting new technologies. In India, the informal sector has remained at around 90 percent, notwithstanding fast economic growth and technology adoption. Both wages and productivity are significantly lower in the informal sector. (World Bank, 2019, p. 19)

Major findings from a study prove that:

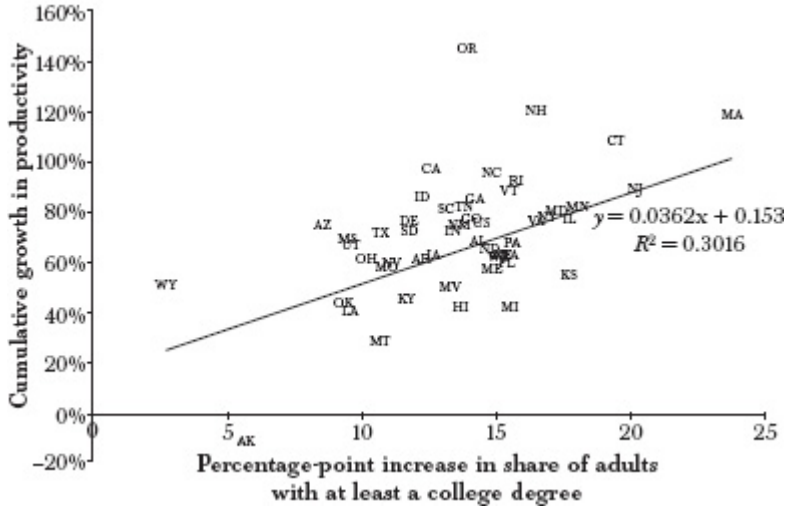
- States can build a strong foundation for economic growth and prosperity by investing in education.
- Workers with a higher income also contribute to more taxes.
- High wage states are the ones with a well-educated workforce. There is a strong relation between education and median wages.

(Berger & Fisher, 2012)

Education and Productivity

As per the World Bank's Human Capital Index 2018, a child born in India today will be 56% less productive due to lack of appropriate education and health. So, lack of education drastically reduces productivity of people (Gupta, Your Vote is Not Enough, 2019, p. 79). Research also reveals that education impacts the ability to exploit the opportunities, and productivity (White, 2017).

It is proven, that the productivity has grown more in states with greater growth in the educational attainment of their workforce relationship, between state productivity growth and increase in college attainment between the period 1979 to 2012. (Refer Fig. 28.12)



Source: EPI analysis of unpublished total economy productivity data from the Bureau of Labour Statistics (BLS) Labour Productivity and Costs program, state employment data from BLS Local Area Unemployment Statistics, and college attainment data from the Current Population Survey basic monthly microdata.

■ **FIGURE 28.12**

Education and Sustainable Development

A strong education system plays an important role in sustainable development and provides the necessary skills for sustainable economic development. Education can change the way we think, act and deliver on our responsibilities (Bokova, 2015).

Role of education in sustainable development has been recognised by The Economic Commission for Europe (ECE) as *'critical to influencing the knowledge, skills and values of citizens to support a more sustainable world'* (United Nations Economic Commission for Europe, 2015).

Finland recognises the role of education in sustainable development across the country (United Nations Economic Commission for Europe, 2015, p. 102).

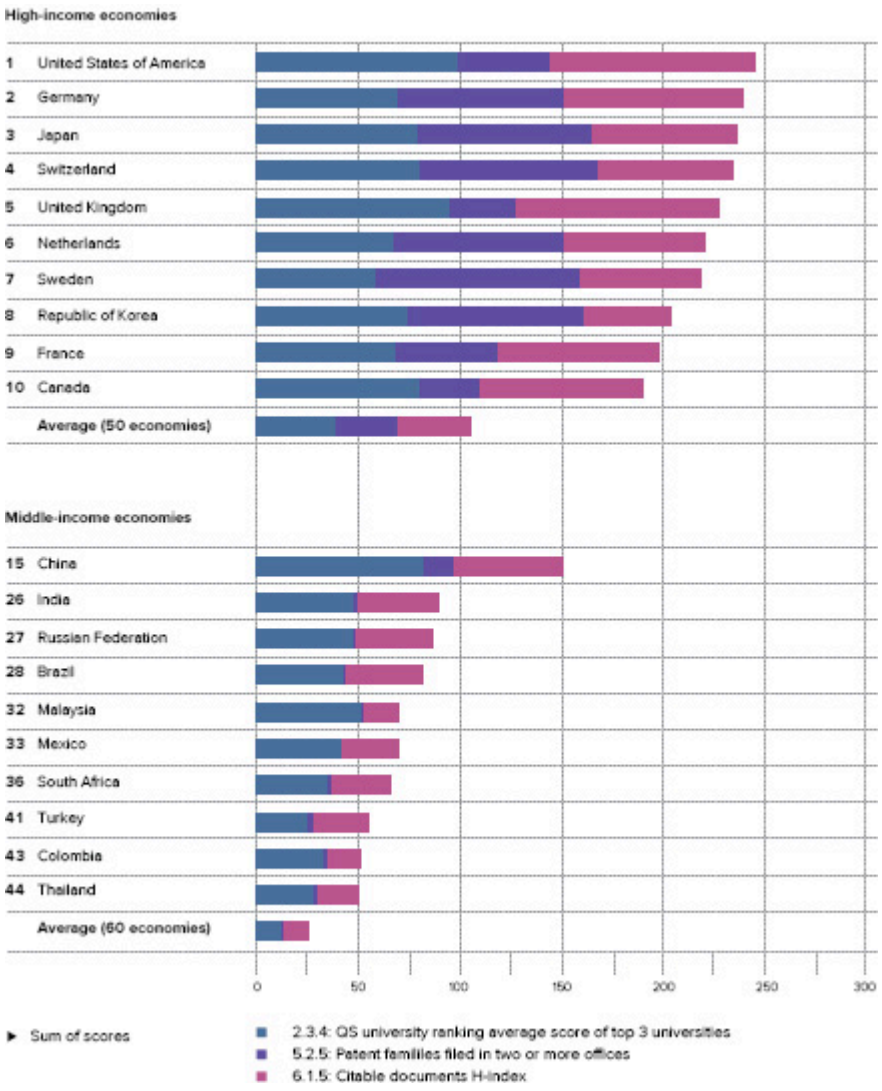
Currently, India ranks 112 out of 156 in SDG Index 2018 (Bertelsmann Stiftung and Sustainable Development Solutions Network, July, p. 16) and so, if India has to address the issue of sustainable development, education has to become a priority.

Education and Innovation

For India to become a developed country by being globally competitive and attaining a double-digit growth, India will have to become amongst the top innovative countries, and education will play a pivotal role in opening the minds for innovation. If we look at India from a standpoint of innovation, it will be good to see where India stands in terms of innovation, globally. In The Global Innovation Index 2018 (Cornell University, INSEAD & WIPO, 2018), India is ranked 57 out of 126 countries, and as per the key findings; USA & Canada are the top innovative regions. This report is specific for energy sector as it appears from its analysis, but the scenario can be extrapolated to other sectors when it comes to the role of education and science in innovation. The index also puts leaders by income group, and India does not figure even in the top three in the lower middle income category nations.

- High Income (Above $ 12236) – Switzerland, Netherlands and Sweden
- Upper Middle-Income ($3996 – 12235) – China, Malaysia and Bulgaria
- Lower Middle-Income ($1006-3955) – Ukraine, Vietnam and Moldova
- Low Income (under $1005) – Tanzania, Rwanda and Senegal

Metrics for quality of innovation: top 10 high- and middle-income economies, 2019



■ **FIGURE 28.13** *Innovation divide: Stable at top 10, China moving up Source: Global Innovation Index Database, Cornell, INSEAD, and WIPO.*

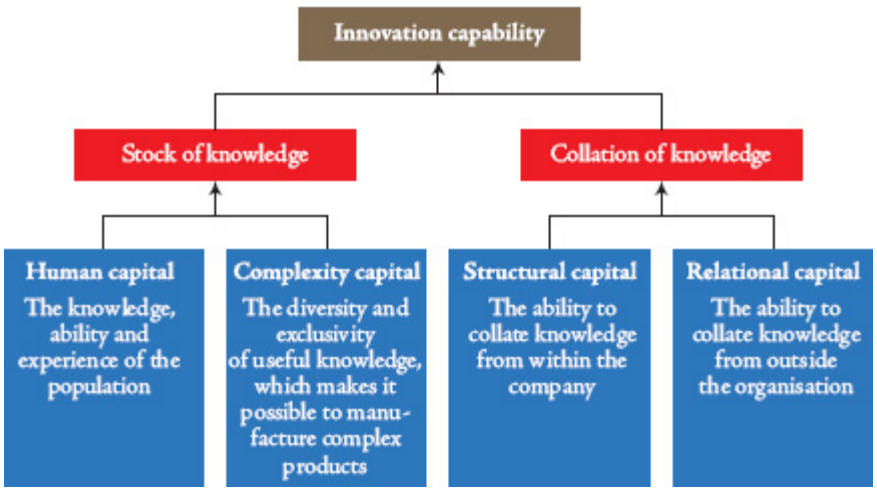
China is fast closing the gap with the high-income countries with regards to patent filings, and quality of scientific publications. When it comes to quality of scientific publications and quality of universities, China performs better than high income group average (Cornell University, INSEAD & WIPO, 2018, p. 33). Important message here is the spectacular rise of China and the key reasons attributed to its rise are – drastic improvements in global R&D companies, high tech imports, the quality of its publications and tertiary enrolments. China now leaves behind most high-income economies in key parameters of innovation and R&D and this should show any developing country the way forward – invest more in

education and research to become an innovative nation- not just to be globally competitive but also to have a higher GDP per capita.

If we look at the GE Global Innovation Barometer Report 2018, (Edelman Intelligence, 2018, p. 53), 64% of the respondents (business executives) believed that not finding the right talent and skill sets is limiting the ability for a business to innovate efficiently. Having obtained a master's degree in innovation and advised organisations on innovation across geographies, I can say with surety, that innovation will need a major mindset and a cultural shift in education sector in curriculum, pedagogy and teacher-learner relationship, and we certainly have a long way to go.

According to a report on Innovation Capability Indicator – An IQ test for countries (Hartmann, Engelhardt, & Birner, 2018); It is about the 'Collective Intelligence' of an economy that enables it to innovate – which the report terms as it's "Innovation Capability" – the ability to use the inputs to create outputs. The Innovation Capability Indicator covers four areas of capital, which together determine the capacity for innovation.

Higher education is a key input for innovation and according to this report, *"Human capital is a key determinant for innovation capacity because without well-educated employees, there can be no innovation"*. So, if a country needs to innovate, it needs to invest heavily in transforming education from investment, infrastructure, curriculum, pedagogy and cultural standpoint.



Source: Hartmann, Engelhardt, & Birner, 2018, p. 6

■ **FIGURE 28.14** *Innovation Capability as the ability to use knowledge*

Human capital: The education, training and lifelong learning of the workforce

Complexity capital: The diversity of useful knowledge, which makes it possible to manufacture complex products

Structural capital: The ability to combine knowledge from within the company

Relational capital: The ability to combine knowledge from outside the organisation

Also, we will need to come out with an innovation scoreboard like the European Innovation Scoreboard, developed by the European Commission (European Commission, 2018), which is an interactive tool for its member states. A country which needs to move up the economic growth will need to develop the same for its states, regions, and districts. Similarly, the universities will have to develop their indicators and mappings on such a scoreboard for its higher education institutions, as a live interactive tool in public domain, to visualise their comparative trends, strengths, and weaknesses – through various indicators.

EDUCATION AND ENVIRONMENT

Across the OECD countries, the level of positive attitude towards environmental protection increases with higher educational attainment (OECD, 2018, p. 125).

EDUCATION AND PEACE

If we don't teach our children peace, someone else will teach them violence.

–Colman McCarthy

As per the global peace index (Institute for Economics & Peace, 2019, p. 9), India is ranked 141 out of 163 nations. Climate change and low peace is also associated with low income countries (Institute for Economics &

Peace, 2019, p. 79)**.** In my research on the topic of climate change and low income, education has a key role and hence, peace and education are directly linked. According to Central Asia Institute, education can be seen as the most important tool for promoting peace (Central Asia Institute, 2015). It quotes Confucius, 500 B.C., "Education breeds confidence. Confidence breeds hope. Hope breeds peace", and mentions 10 ways in which education promotes peace (1) Education boosts confidence and hope (2) Education promotes independent thinking (3) Education inspires problem solving skills (4) Education builds communication skills (5) Education opens doors (6) Education reduces poverty (7) Education increases political involvement (8) Education reduces support of terrorism and militancy (9) Education builds empathy and tolerance (10) Education cultivates respect. According to UNESCO "Education transforms lives and is at the heart of UNESCO's mission to build peace, eradicate poverty and drive sustainable development**"** (UNESCO, 2019).

"Providing public services that contribute to a healthy, educated labour force helps build national stability, reduces the likelihood of political unrest and strengthening the legitimacy of governments" (United Nations Development Programme, 2013).

EDUCATION AND CRIME

The relation between rising levels of education and falling crime is proven. Besides law enforcement, evidence from Europe and United States have revealed a strong link between education and crime (Hjmalarsson & Lochner, 2012). According to a research (Gonzalez)**,** just 5% increase in the college graduation rate is believed to bring in a significant (16.5%) reduction in homicide rate and education leads to crime reduction. If we look at the statistics from the National Crime Records Bureau report 2016 (Ministry of Home Affairs, Government of India, 2017), the highest crime rate is reported in Kerala (a state with the highest literacy level). While on the face of it, it might appear that more literacy (education) leads to more crime, but actually, it might be good to look at the fact that since people are more literate, they are more aware of their rights and lodge more complaints compared to other parts of the country. The crime records of juveniles show

that crime is lesser for people with higher qualifications (matric, higher secondary and above) (Ministry of Home Affairs, Government of India, 2017, pp. 242, 256). The data on educational back ground of criminals is not available for adults.

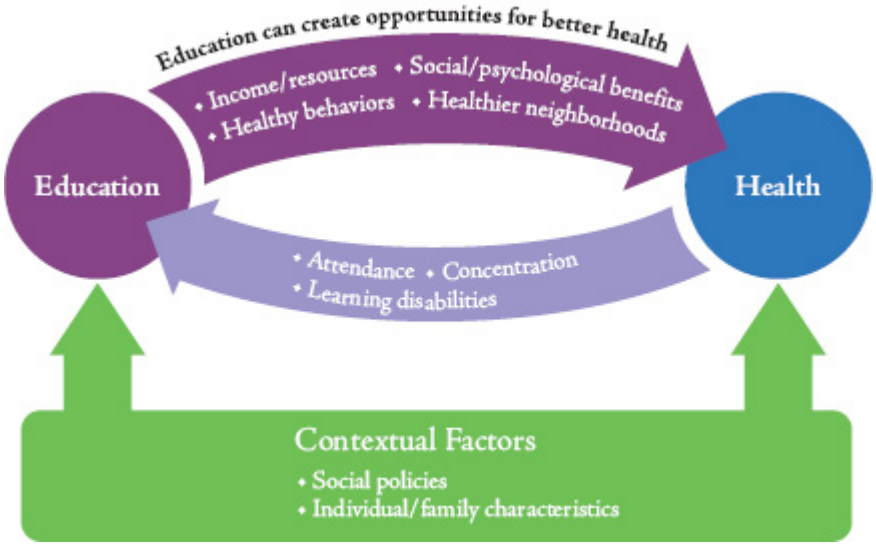
EDUCATION AND HEALTH

Mostly, education and healthcare are referred to as social sectors and are expected to be delivered as a social good by the government. However, I strongly believe that these are essential sectors for economic and societal impact. I have already dealt with the issue of Health in detail in my previous book 'Healthcare Reforms in India – Making up for the Lost Decades' (Gupta, Healthcare Reforms in India: Making up for the lost decades, 2016), and during my work in villages, I realised that, though, health is a priority for the present but education is equally important for a bright future.

Meanwhile, a multi-country study in Southeast Asia found that both underweight and obese children had lower IQ scores than healthy-weight children. (World Bank, 2019, p. 51).

Mothers who did not have any formal education reported significantly higher level of underweight and stunting amongst their children. Whereas the mothers who cannot read have a 45 percent prevalence of underweight children, in mothers with 10 or more years of education, the prevalence of underweight children is 27 percent (Gupta, Healthcare Reforms in India: Making up for the lost decades, 2016, p. 39).

It is known that people who are educated live longer and healthier lives when compared with people with fewer years of schooling. The figure below gives a sense of how education impacts health and vice-versa (VCU Center on Society and Health, 2015).



■ FIGURE 28.15

During my interactions with learners (and I had put a criteria to meet the top performers, average graders and those who were detained or had lowest grades in school), a common underlying finding amongst all the low grades and detained learners was that, they were either suffering from a medical complication or were malnourished. So, good health is important for good education and both are dependent on each other.

EDUCATION AND QUALITY OF LIFE

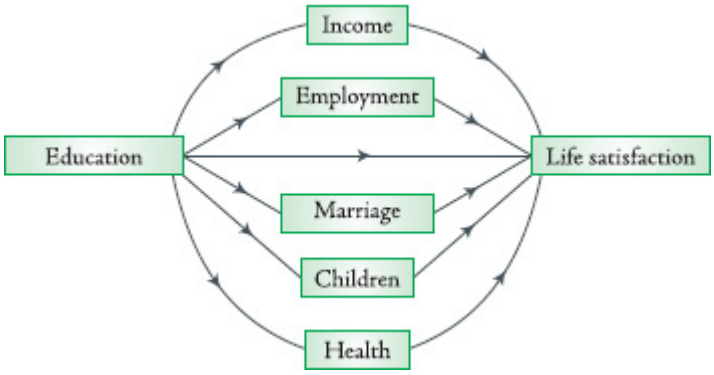
WHO defines Quality of Life as, "an individual's perception of their position in life, in the context of the culture and value systems in which they live, and in relation to their goals, expectations, standards and concerns" (World Health Organisation, 2019).

If we look at the quality of life indicators from Eurostat **(European Commission, 2019)**, nine dimensions that constitute the measure of quality of life are:

1. Material living conditions
2. Productive or main activity
3. Health
4. Education

5. Leisure of social interactions
6. Economic and physical activity
7. Governance and basic rights
8. Natural and living environment
9. Overall experience of life

Enough evidence exists on the positive impact of education on quality of life (Javed, Javed, & Khan, 2016), education is an important constituent that defines the quality of life.



■ FIGURE 28.16

The above figure shows the relation between education and life satisfaction (based on multiple analysis and according to studies conducted in Australia), "*For both men and women, the largest estimated indirect effect of education on life satisfaction is through income. This is followed by its positive effect on long-term health. On average, men tend to benefit slightly more than women from education, in part because education is more strongly associated with a greater likelihood of employment for men*" (Powdtavee, Lekguangfu, & Wooden, 2015).

Education and Women Empowerment

Education remains the best tool for women empowerment and its effectiveness is unmatched when it comes to economic and professional impact than any other input. Education leads to better decision making and boosts the self- confidence. When women are educated, they are more

productive than their male counterparts and studies have proven this point in Kenya – that women farmers, when were provided with similar resources and education like male farmers, crop yields went higher by 22 percent.

Also, in poor countries, if women spend an additional year of schooling beyond grades three and four, it leads to a 20 percent increase in annual income. This is a big contributor in self sufficiency, when it comes to taking care of families and empowering women (Cleveland, 2014).

EDUCATION AND VALUES

During early years, a child, as a learner in school, spends a decent part of his/her day time in school or trying to absorb what transpires in school, and this shapes the child's value system and perhaps, has an equal contribution to his/her upbringing. So, the role of education in inculcation of right values cannot be undermined. Of course, I am not referring to the moral science period in school, but every minute, every interaction of the learner in school shapes the value system of the learner, like the sunlight shapes the direction of the sapling. Hence, education just cannot be limited to academic goals but has to be holistic. Given the unrestricted exposure to internet for all ages and the increase in crime rate amongst juveniles, the role of value education becomes all the more important.

There is an interesting curriculum at Ledbury Primary School, UK (School, 2019) and interesting resources on value based education at VBE International (International, 2019) refer the table below.

TABLE 28.10

Month	*I am...*	*I show...*	*Value*
September	Determined	Perseverance	Determination
October	Understanding	Tolerance	Understanding
November	Peaceful	Consideration	Peace
December	Caring	Empathy	Caring
January	Positive	Encouragement	Positivity
February	Kind	Love	Kindness
March	Humble	Respect	Humility
April	Honest	Responsibility	Honesty
May	Resilient	Courage	Resilience
June	Friendly	Co-operation	Friendship
July	Imaginative	Creativity	Imagination

Given India's rich literature and ancient texts on values, India will be the world's top curriculum developer for all values – social, human, interpersonal and leadership values.

Education as a Social Good and Social Commitment

"Education generates collective benefits, called positive externalities, which far exceed individual benefits. These collective benefits entail notably a country's economic growth, innovation capacity and competitiveness, as well as social cohesion and shared values. These are generally not taken into account by individuals who, having to pay to attend school or university, would therefore complete levels of education that are too low to maximise collective benefits. Expressed in economic terms, this is a case of market failure and state provision of education is required in order to bring the private costs and benefits in line with the social costs and benefits. From this perspective, education is a public good: it requires state intervention" (Daviet, 2016).

The above paper also summarises the relation of education as a public good in the following logical chain:



■ FIGURE 28.17

But given the current developments and the phenomenal rise of private sector in education, education is moving from social good to common good (*Common Good is a collective decision that involves the state, the market and civil society*) (Daviet, 2016, p. 8).

Treating education as a public good provides strategic benefits. "On the one hand, this leads to the personal development of individuals and, on the other hand, provides global benefits for whole societies under the inductive effects of education" (Polcyn, 2015).

Education – Multi-lateral bodies and Indian Constitution

UNESCO states that everyone has a right to education (UNESCO, 2019)*, and believes that education is a human right for all throughout life and that access must be matched by quality* (UNESCO, 2019). According to SDG 4 – Education 2030 agenda, the UNESCO aims to provide inclusive and equitable quality education and lifelong learning for all by 2030 (UNESCO, 2019).

According to the United Nations, *"Obtaining a quality education is the foundation to creating sustainable development. In addition to improving quality of life, access to inclusive education can help equip locals with the tools required to develop innovative solutions to the world's greatest problems"* (United Nations, 2019).

Education and constitutional provisions:

Right to Education

The Constitution (Eighty-sixth Amendment) Act, 2002 inserted Article 21-A in the Constitution of India to provide free and compulsory education to all children in the age group of six to fourteen years as a Fundamental Right in such a manner as the State may, by law, determine. The Right of Children to Free and Compulsory Education (RTE) Act, 2009, which represents the consequential legislation envisaged under Article 21-A, means that every child has a right to full time elementary education of satisfactory and equitable quality in a formal school which satisfies certain essential norms and standards.

Article 21-A and the RTE Act came into effect on 1 April, 2010. The title of the RTE Act incorporates the words 'free and compulsory'. 'Free education' means that no child, other than a child who has been admitted by his or her parents to a school which is not supported by the appropriate Government, shall be liable to pay any kind of fee or charges or expenses which may prevent him or her from pursuing and completing elementary education. 'Compulsory education' casts an obligation on the appropriate Government and local authorities to provide and ensure admission, attendance and completion of elementary education by all children in the 6-14 age group. With this, India has moved forward to a rights based framework that casts a legal obligation on the Central and State Governments to implement this fundamental child right as enshrined in the Article 21-A of the Constitution, in accordance with the provisions of the RTE Act.

The RTE Act provides for the:

- Right of children to free and compulsory education till completion of elementary education in a neighbourhood school.
- It clarifies that 'compulsory education' means obligation of the appropriate government to provide free elementary education and ensure compulsory admission, attendance and completion of elementary education to every child in the six to fourteen year age group. 'Free' means that no child shall be liable to pay any kind of fee or charges or expenses, which may prevent him or her from pursuing and completing elementary education.
- It makes provisions for a non-admitted child to be admitted to an age appropriate class.
- It specifies the duties and responsibilities of appropriate Governments, local authority and parents, in providing free and compulsory education, and sharing of financial and other responsibilities between the Central and State Governments.
- It lays down the norms and standards relating inter alia to Pupil Teacher Ratios (PTRs), buildings and infrastructure, school-working days, teacher-working hours.
- It provides for rational deployment of teachers by ensuring that the specified pupil teacher ratio is maintained for each school, rather than

just as an average for the State or District or Block, thus ensuring that there is no urban-rural imbalance in teacher postings. It also provides for prohibition of deployment of teachers for non-educational work, other than decennial census, elections to local authority, state legislatures and parliament, and disaster relief.

- It provides for appointment of appropriately trained teachers, i.e. teachers with the requisite entry and academic qualifications.
- It prohibits (a) physical punishment and mental harassment; (b) screening procedures for admission of children; (c) capitation fee; (d) private tuition by teachers and (e) running of schools without recognition.
- It provides for development of curriculum in consonance with the values enshrined in the Constitution, and which would ensure the all-round development of the child, building on the child's knowledge, potentiality and talent and making the child free of fear, trauma and anxiety through a system of child friendly and child centred learning.

(Ministry of HRD, 2019)

ROI for Governments in Education

The data from OECD countries clearly point out that educated people (a) pay more taxes and make social contributions (b) require lesser social support and monetary benefit (c) don't need unemployment benefits and subsidies from government schemes and the public net financial returns across OECD countries are about US$ 135600 for a man who had attained tertiary education and US$72100 for a women. "*In this analysis, the costs include direct public costs for supporting education and foregone taxes on earnings, while the benefits are calculated using income tax, social contributions, social transfers and unemployment benefits*" (OECD, 2018, p. 105), but for governments of developing countries, it is a tough call, given the competing priorities in addressing the urban-rural divide, attracting private investment, providing investment for infrastructure and taking care of the health of the poor and the elderly, and other social mandates. So, the decision makers have to consider a host of issues before they can allocate budgets for education, research and development.

On the ROI concept, I would look at it from a different approach. It cannot be just one metrics, but I would propose a much broader metrics on Benefit on Investment (BOI) or Value on Investment (VOI), where the ROI forms just a subset. Considering the reduced crime rate, overall global competitiveness of the nation, peace and progress in society, it makes sense for any Finance Minister to understand the importance of investing in education compared to all other sectors as this – (education), to me, appears to be an overarching sector for development.

EDUCATION AND SDGS

"SDG 4 and its associated targets set an ambitious agenda which emphasise quality learning and equity in education alongside the more traditional indicators of access and participation. In doing so, it challenges every country in the world to improve it's education system and marks a significant departure from previous global education goals and targets, such as the Millennium Development Goals, which were not as far-reaching and focused more on access and participation. The analysis takes into account this larger scope and reports on equity levels in the areas of participation, skills acquisition and resources".

"The 2030 Agenda for Sustainable Development widens the focus to education levels outside the traditional frame of compulsory education, including early childhood education and care (indicator 4.2.2), secondary, post secondary and tertiary vocational education (indicator 4.3.3) and adult education (indicator 4.3.1). Ensuring inclusive quality education at these levels remains challenging for most OECD member and partner countries" (OECD 2018 pg. 28-9). India needs to ensure the same for education at every level to achieve the targets set in SDGs.

TABLE 28.11: SDG Indicators for Target 4.5

Target 4.5: By 2030, eliminate gender disparities in education and ensure access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations.	
Indicator	***Definition***

4.5.1 (Global)	Parity indices (female/male, rural/urban, bottom/top wealth quintiles and others, such as disability status, indigenous peoples and conflict-affected, as data become available) for all education indicators on this list that can be disaggregated
4.5.2	Percentage of students in primary education whose first or home language is the language of instruction
4.5.3	Extent to which explicit formula-based policies reallocate education resources to disadvantaged populations
4.5.4	Percentage of total aid to education allocated to least developed countries
4.5.5	Education expenditure per student by level of education and source of funding

29

Emerging Technologies and the Future of Jobs

Emerging Technologies (Internet, IOT, Automation – Robotics-Drones, Machine Learning, Artificial Intelligence, Augmented & Virtual Reality) and impact on Workplace and Jobs

Use of technology has gained momentum and the horizons, integration and role of technology in everyday professional and personal lives has undergone drastic change, and moved from periphery to the core. We need to look at various facets also, then conclude and decide about the role of technology in education and what our education system needs to do.

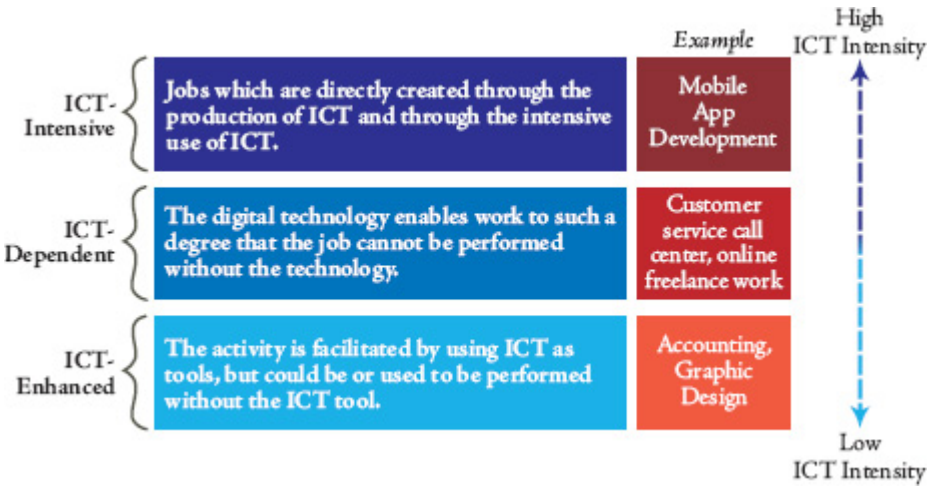
According to a study by the Economist Corporate Network (ECN) and Hays Group (Economist, 2018), which covered about 500 business leaders in Asia Pacific, what comes out is that full impact of technology adoption will be felt in the next five years. So on one side, we will see an improvement in productivity and efficiency; and on the other side, the organisations would not be equipped to skill the workforce to meet up with the emerging scenario. Also, there is a general consensus amongst the business leaders of the need for a greater collaboration amongst businesses, governments and academia. People's skill, followed by soft skills, will remain the most crucial skill for the future.

Workplace will become workspace and jobs will become tasks!

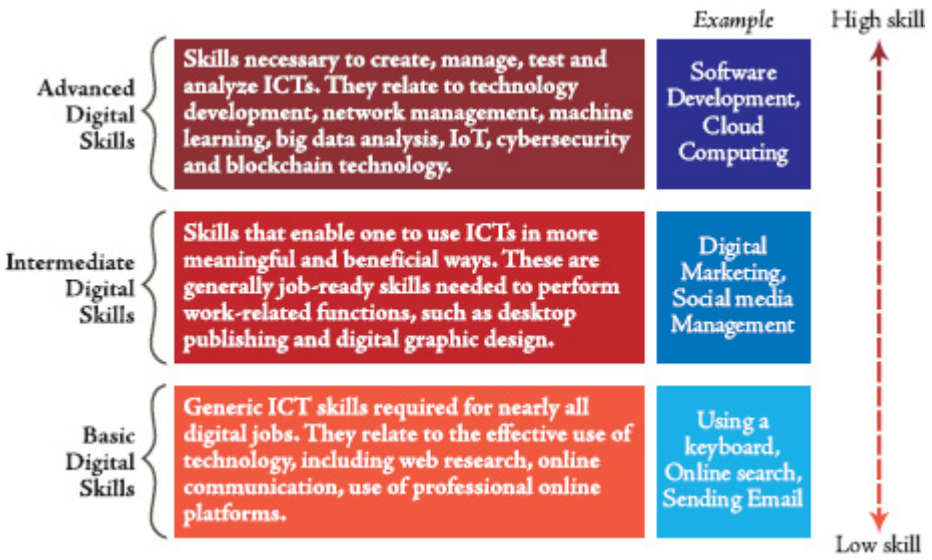
Also, though not yet universally applicable across sectors and regions, the threat to jobs is real. Also, according to this report, there is a shortage of

faculty for teaching machine learning and data analytics and education is not able to catch up with the trends, which is partly due to a multi-stakeholder engagement (Economist, 2018).

The nature of work is changing and if we look at the digital work and skills, it's undergoing an evolution, which is revolutionary.



■ **FIGURE 29.1** *Types of digital work, (World Bank, 2018, p. 13)*



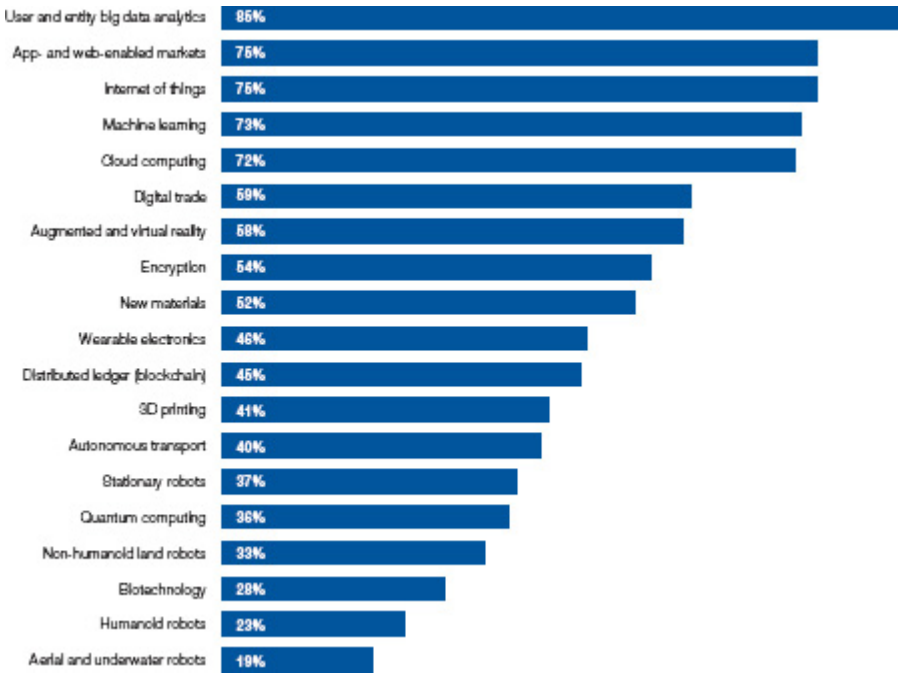
■ **FIGURE 29.2** *Types of digital skills, (World Bank, 2018, p. 14)*

According to a report (The Future of Jobs Report 2018) by the World Economic Forum (WEF), about 85 percent of the respondent companies

surveyed are going to accelerate the adoption of technology with regards to big data analytics in the next three years. Also, in the next 3 years, 59% of the employers surveyed for the report of WEF stated that they will significantly modify the way they produce and distribute, and nearly half of them will change their geographical base for operations. Availability of skilled local talent will be key to the companies choosing their geographical location. More importantly, about half of the companies surveyed believe that automation will lead to reduction in their full time workers in the next three years, and also, automation will lead to creation of new roles and hiring more staff in productivity enhancing roles.

There will be a significant re-orientation when it comes to man and machine and currently, 29% of the tasks across 12 industries (covered in the report) were being performed by the machines, which will increase to 42% in the next three years. Machines, in future, will share work related to reasoning, decision making, administering and looking for and receiving job related information. In the next three years, skills required to perform most jobs will change substantially and about 54% of the employees will require reskilling and upskilling. Also, the same report states that the companies are going to adopt the following three strategies to address the emerging challenge; (a) hire new people with the desired skills, (b) automate tasks completely, (c) re-train existing employees (World Economic Forum, 2018). So, even if we see from the strategic standpoint, retraining people with new skills is one of the three strategies. The report clearly mentions about the role of policy makers, regulators and educators in making a difference in agile learners for future workforce and also, updating the labour policy to match the needs of the fourth industrial revolution. The findings of the report indicate that in the next three years, the deployment of technology may free up workers from the majority of data processing and information search tasks (World Economic Forum, 2018, p. 3).

Let us look at technologies by proportion of companies likely to adopt them by 2022 (projected) (World Economic Forum, 2018, p. 7).



Source: Future of Jobs Survey 2018, World Economic Forum.

■ **FIGURE 29.3** *Technologies by proportion of companies likely to adopt them by 2022 (projected)*

Job profiles are changing faster than we can think. By the time students of today enter the job market, 90 percent of the jobs would need a different level of skillset or those jobs would have ceased to exist and hence, we need to look at the future of jobs.



■ **FIGURE 29.4** *Expected average reskilling needs across companies, by share of employees, 2018–2022*

Table 29.1: Examples of stable, new and redundant roles: all industries

The Future of Jobs Report 2018

Stable Roles	*New Roles*	*Redundant Roles*
Managing Directors and Chief Executives	Data Analysts and Scientists*	Data Entry Clerks
General and Operations Managers*	AI and Machine Learning Specialists	Accounting, Bookkeeping and Payroll Clerks
Software and Applications Developers and Analysts*	General and Operations Managers*	Administrative and Executive Secretaries
Data Analysts and Scientists*	Big Data Specialists	Assembly and Factory Workers
Sales and Marketing Professionals*	Digital Transformation Specialists	Client Information and Customer Service Workers*
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Sales and Marketing Professionals*	Business Services and Administration Managers
Human Resources Specialists	New Technology Specialists	Accountants and Auditors
Financial and Investment Advisers	Organisational Development Specialists*	Material-Recording and Stock-Keeping Clerks
Database and Network Professionals	Software and Applications Developers and Analysts*	General and Operations Managers*
Supply Chain and Logistics Specialists	Information Technology Services	Postal Service Clerks
Risk Management Specialists	Process Automation Specialists	Financial Analysts
Information Security Analysts*	Innovation Professionals	Cashiers and Ticket Clerks
Management and Organisation Analysts	Information Security Analysts*	Mechanics and Machinery Repairers
Electrotechnology Engineers	Ecommerce and Social Media Specialists	Telemarketers
Organisational Development Specialists*	User Experience and Human-Machine Interaction Designers	Electronics and Telecommunications Installers and Repairers
Chemical Processing Plant Operators	Training and Development Specialists	Bank Tellers and Related Clerks
University and Higher Education Teachers	Robotics Specialists and Engineers	Car, Van and Motorcycle Drivers
Compliance Officers	People and Culture Specialists	Sales and Purchasing Agents and Brokers
Energy and Petroleum Engineers	Client Information and Customer Service Workers*	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers
Robotics Specialists and Engineers	Service and Solutions Designers	Statistical, Finance and Insurance Clerks
Petroleum and Natural Gas Refining Plant Operators		Lawyers

	Digital Marketing and Strategy Specialists	

Source: Future of Jobs Survey 2018, World Economic Forum.

Note: Roles marked with * appear across multiple columns. This reflects the fact that they might be seeing stable or declining demand across one industry but be in demand in another. (World Economic Forum, 2018, p. 12)

Let us now compare the skills in demand in 2018 versus the ones which will be in demand in 2022, and we find that innovation and technology will be in greatest demand.

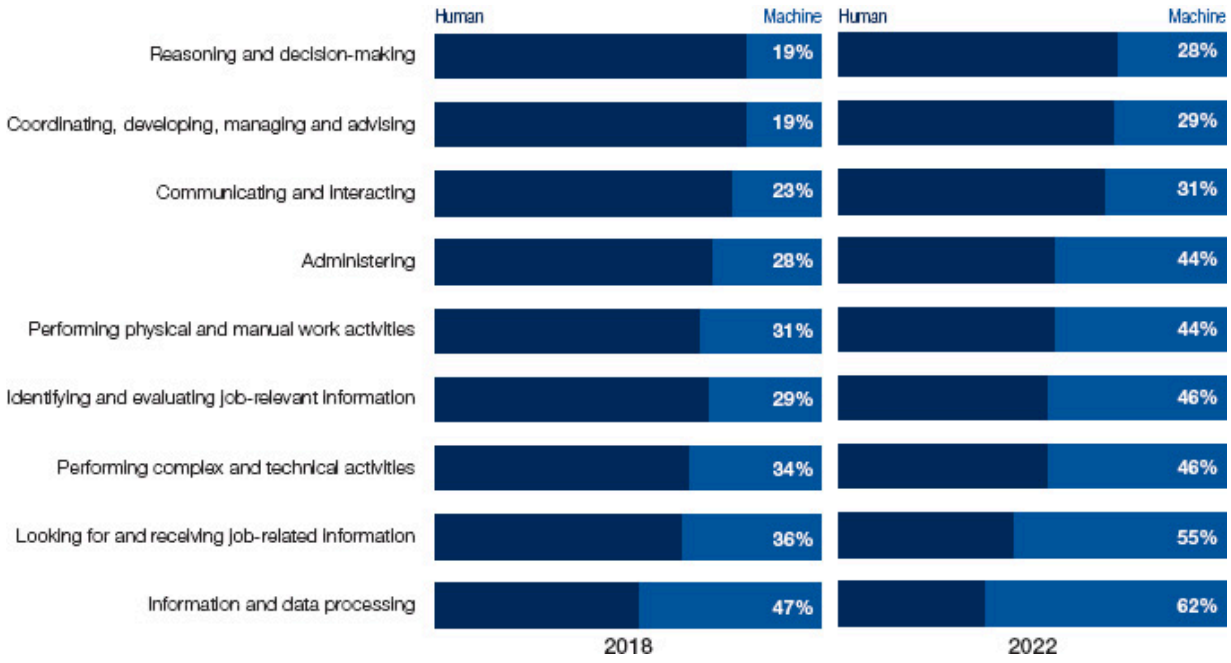
TABLE 29.2: Comparing skills demand, 2018 vs. 2022, top ten

Today, 2018	*Trending, 2022*	*Declining, 2022*
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problemsolving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problemsolving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Source: Future of Jobs Survey 2018, World Economic Forum.

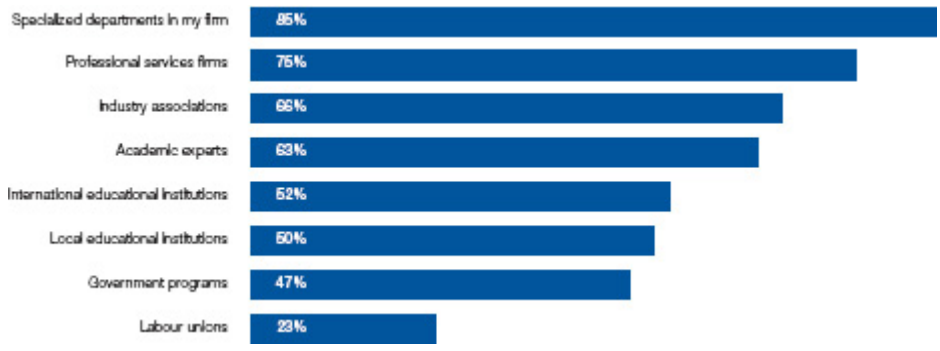
The most important aspect that the education system for GenNext will need to address is not the literacy-illiteracy gap, but the human-machine competency – that is the 'Man hours' vs 'Machine hours'. Machines will increasingly put more 'machine hours' and reduce the 'man hours'. Currently, machines and algorithms do 36% of the collective hours spent on administrative tasks in financial services and investor sector, but in the next

three years, this will increase to 61% (World Economic Forum, 2018, p. 16).



■ **FIGURE 29.5** *Ratio of human-machine working hours, 2018 vs. 2022 (projected)*

So the role of stakeholders will need to undergo a paradigm shift in transitioning the work force in this tech-era and this can be judged from the figure below.



Source: Future of Jobs Survey 2018, World Economic Forum.

■ **FIGURE 29.6** *Preferred partners in managing the integration of new technologies and workforce transition*

In 2015, 500,000 new jobs existed, but less than 40,000 computer science graduates created a huge shortage in the United States (Accenture, 2019). Such skill shortages cause economic loss and pull back the economy.

Technology adoption by industry and effects on the workforce by industry is a clear indication that needs of education and skills development will have to undergo a 180 degree shift immediately. At least 50 percent of the workforce will require re-skilling and in some industries like aviation, travel and tourism, the re-skilling may be needed by about 68% of the workforce.

Also, we can see that primary reason for job location decisions across industries in the next three years will be driven by the considerations of talent availability.

TABLE 29.3: Factors determining job location decisions, 2018–2022, by industry

Industry	Primary	Secondary	Tertiary
Overall	**Talent availability**	Labour cost	Production cost
Automotive, Aerospace, Supply Chain & Transport	**Talent availability**	Labour cost	Quality of the supply chain
Aviation, Travel & Tourism	**Talent availability**	Organization HQ	Labour cost
Chemistry, Advanced Materials & Biotechnology	**Talent availability**	Production cost	Labour cost
Consumer	Labour cost	**Talent availability**	Quality of the supply chain
Energy Utilities & Technologies	**Talent availability**	Labour cost	Production cost
Financial Services & Investors	**Talent availability**	Labour cost	Organization HQ
Global Health & Healthcare	**Talent availability**	Labour cost	Production cost
Information & Communication Technologies	**Talent availability**	Labour cost	Geographic concentration
Infrastructure	Labour cost	**Talent availability**	Production cost
Mining & Metals	Labour cost	Production cost	**Talent availability**
Oil & Gas	**Talent availability**	Production cost	Labour cost
Professional Services	Labour cost	**Talent availability**	Geographic concentration

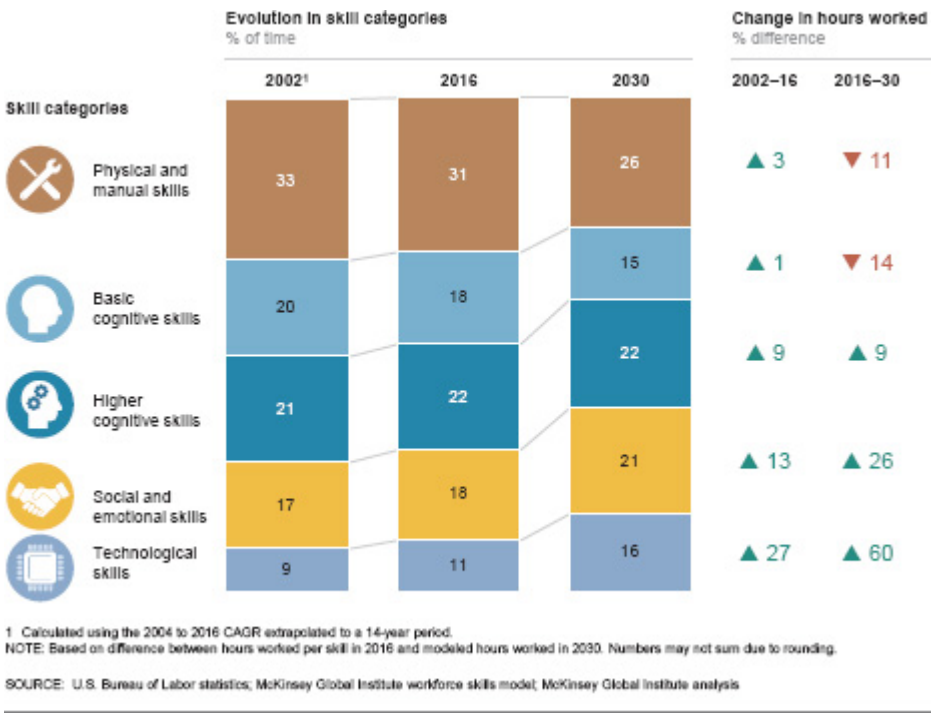
Source: Future of Jobs Survey 2018, World Economic Forum.

According to a report by Accenture, it is time to reimagine the workforce development, and according to the report; *'Earlier the individuals develop these skills and build the right habits, mindsets and neural pathways, the greater the likelihood of success. At the same time, the linear career paths of the past are giving way to a more dynamic trajectory. Future generations can expect to navigate multiple jobs, including many that have not been invented. A growth mindset, characterised by resilience, adaptability and love of learning, underpins all other skills needed for job seekers and entrepreneurs to successfully navigate the changing world of*

work'. The worst part of the transition would be, that the people who are already facing hardships, will be affected (Accenture).

McKinsey, rated amongst the top consulting firms did a study and quantified 25 core work skills today, and in future, for the USA and for five European countries, with a focus on five sectors: banking and insurance, energy and mining, healthcare, manufacturing, and retail. Among the key findings the following observations were included:

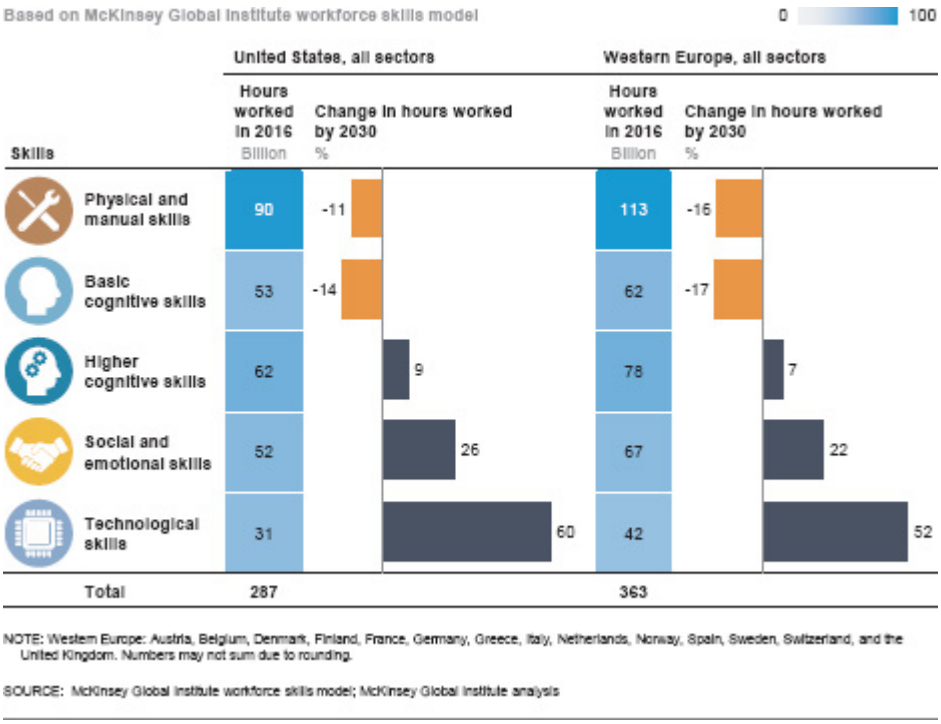
- Automation will lead to more changes than we have witnessed in the past fifteen years.
- Technological skills will witness strongest growth.
- Demand for the basic cognitive skills and manual skills will decrease, with healthcare being the only exception where demand for physical skills will increase.
- France faces a shortage of 80,000 workers in IT & Electronics by 2020.
- It is estimated that in the USA alone, there will be a short-term shortage of 250,000 data scientists.



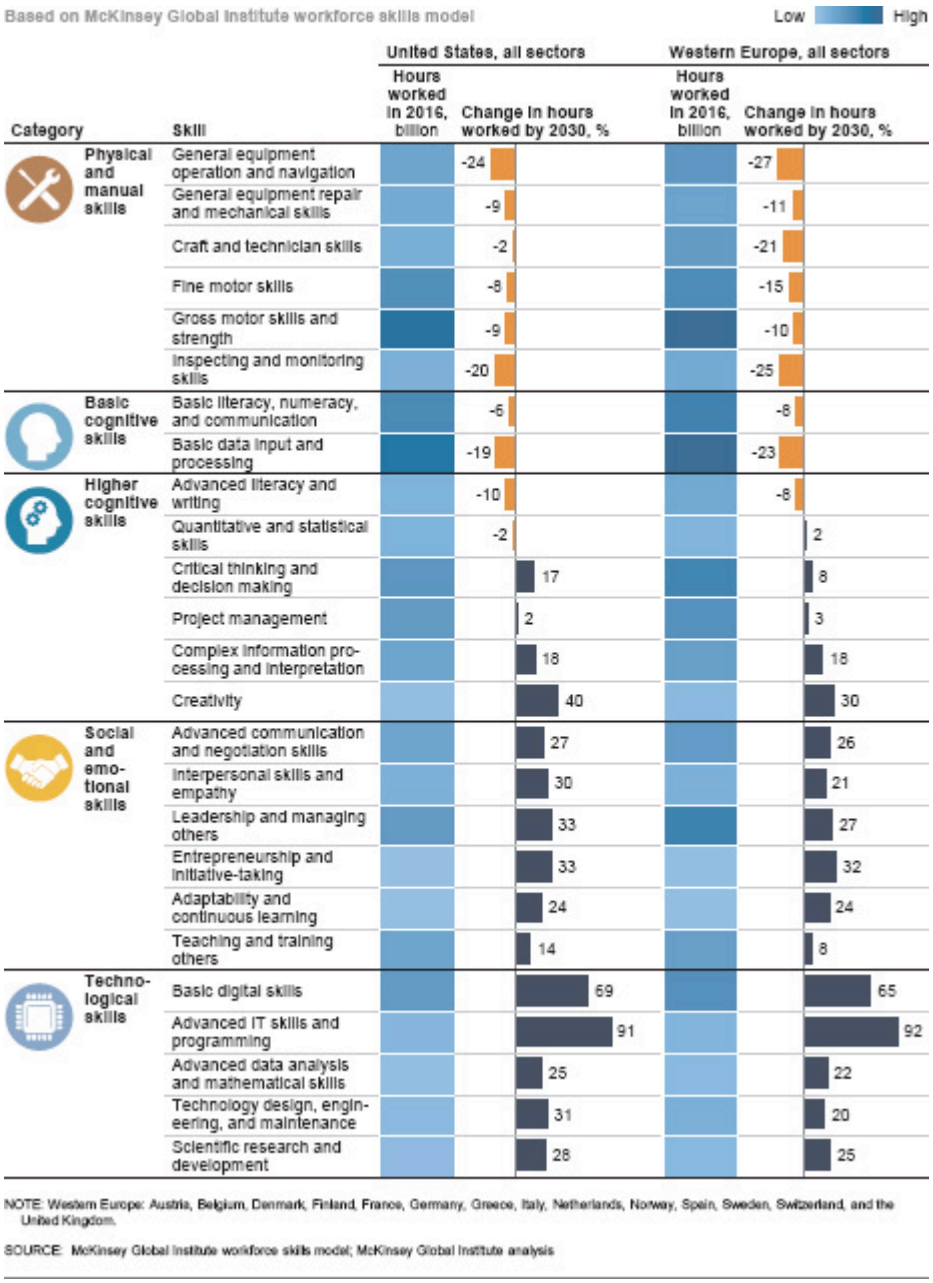
■ FIGURE 29.7

- In 2016, a British Parliamentary report found that 23 percent of the UK population lacked basic digital skills, when about 90 percent of the new jobs require them.

According to this report, automation and AI will accelerate the skill shifts; See Figures 29.8 to 29.11.

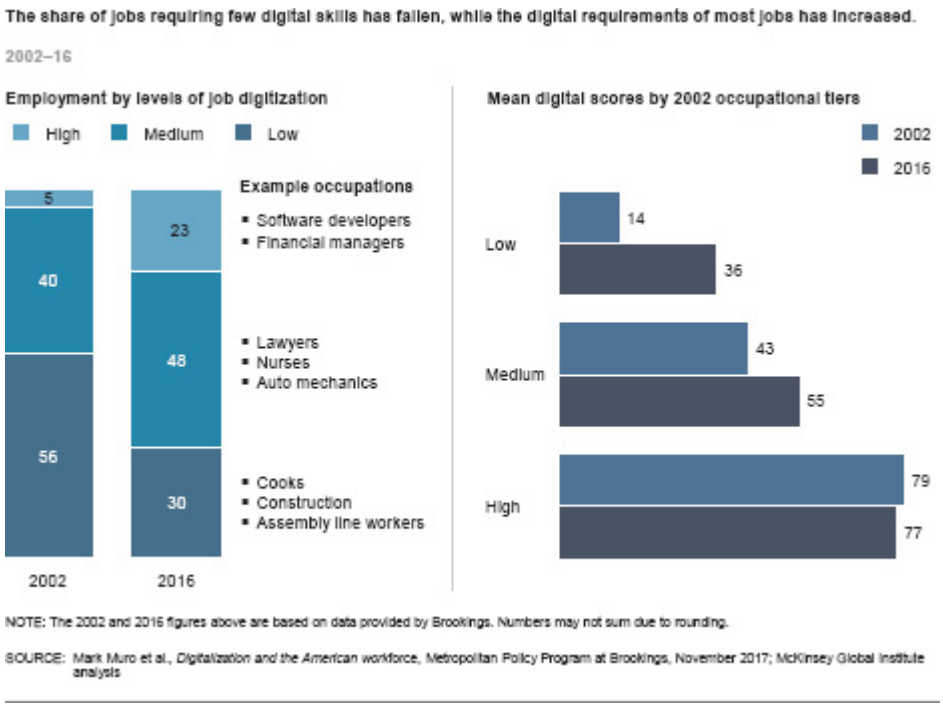


■ FIGURE 29.8

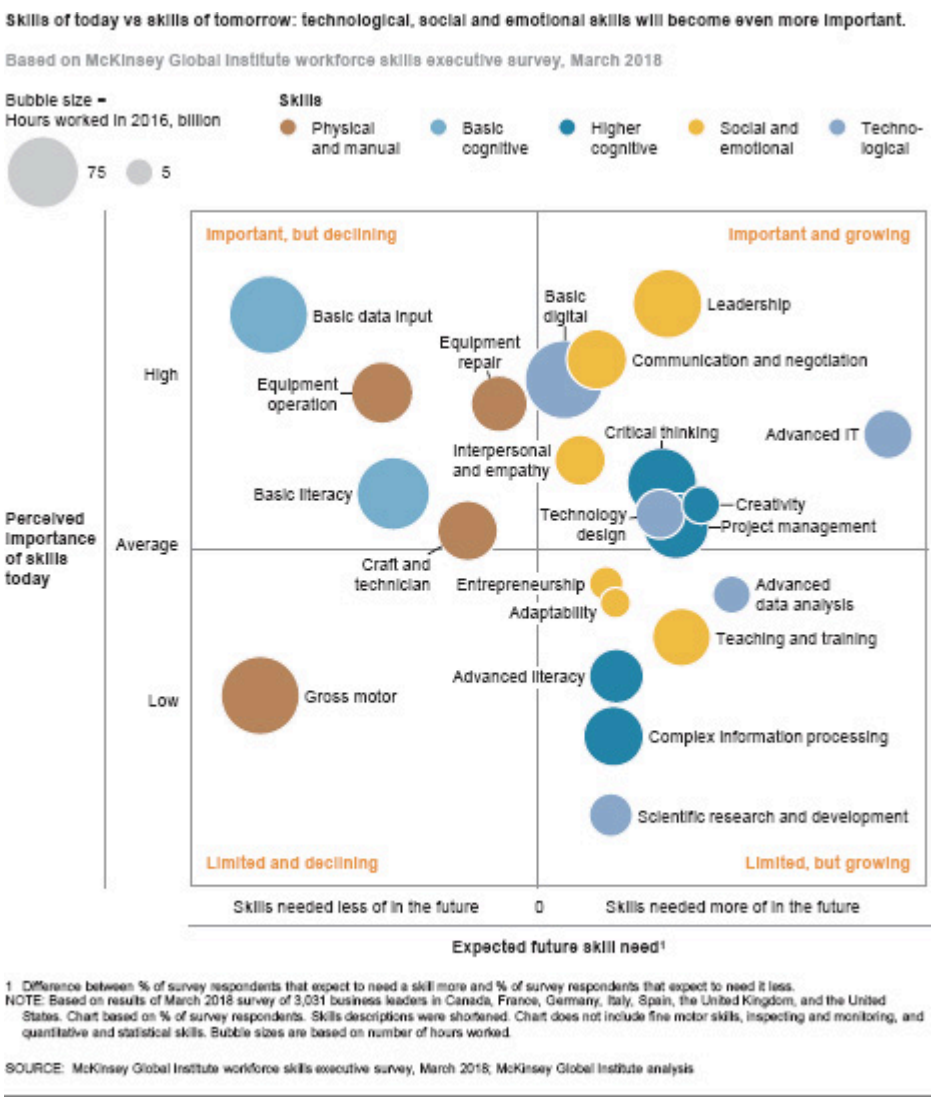


■ **FIGURE 29.9**

Future jobs scenario in various sectors based on the report (McKinsey Global Institute, 2017, p. 10)


The share of jobs requiring few digital skills has fallen, while the digital requirements of most jobs has increased.
2002–16
Employment by levels of job digitization
High
Medium
Low
5
40
56
23
48
30
2002
2016
Example occupations
Software developers
Financial managers
Lawyers
Nurses
Auto mechanics
Cooks
Construction
Assembly line workers
Mean digital scores by 2002 occupational tiers
2002
2016
Low
14
36
Medium
43
55
High
79
77
NOTE: The 2002 and 2016 figures above are based on data provided by Brookings. Numbers may not sum due to rounding.
SOURCE: Mark Muro et al., Digitalization and the American workforce, Metropolitan Policy Program at Brookings, November 2017; McKinsey Global Institute analysis

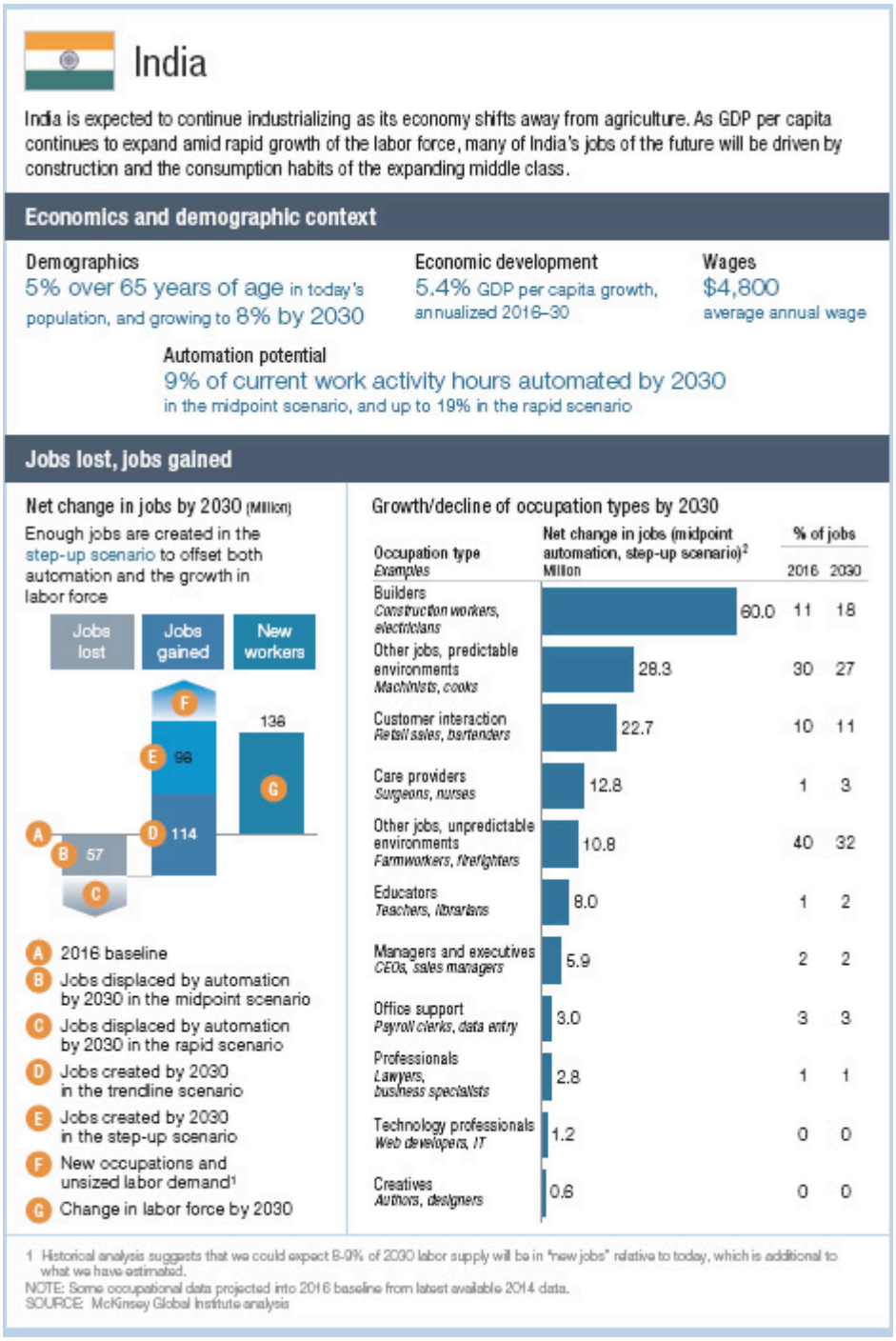
■ **FIGURE 29.10**



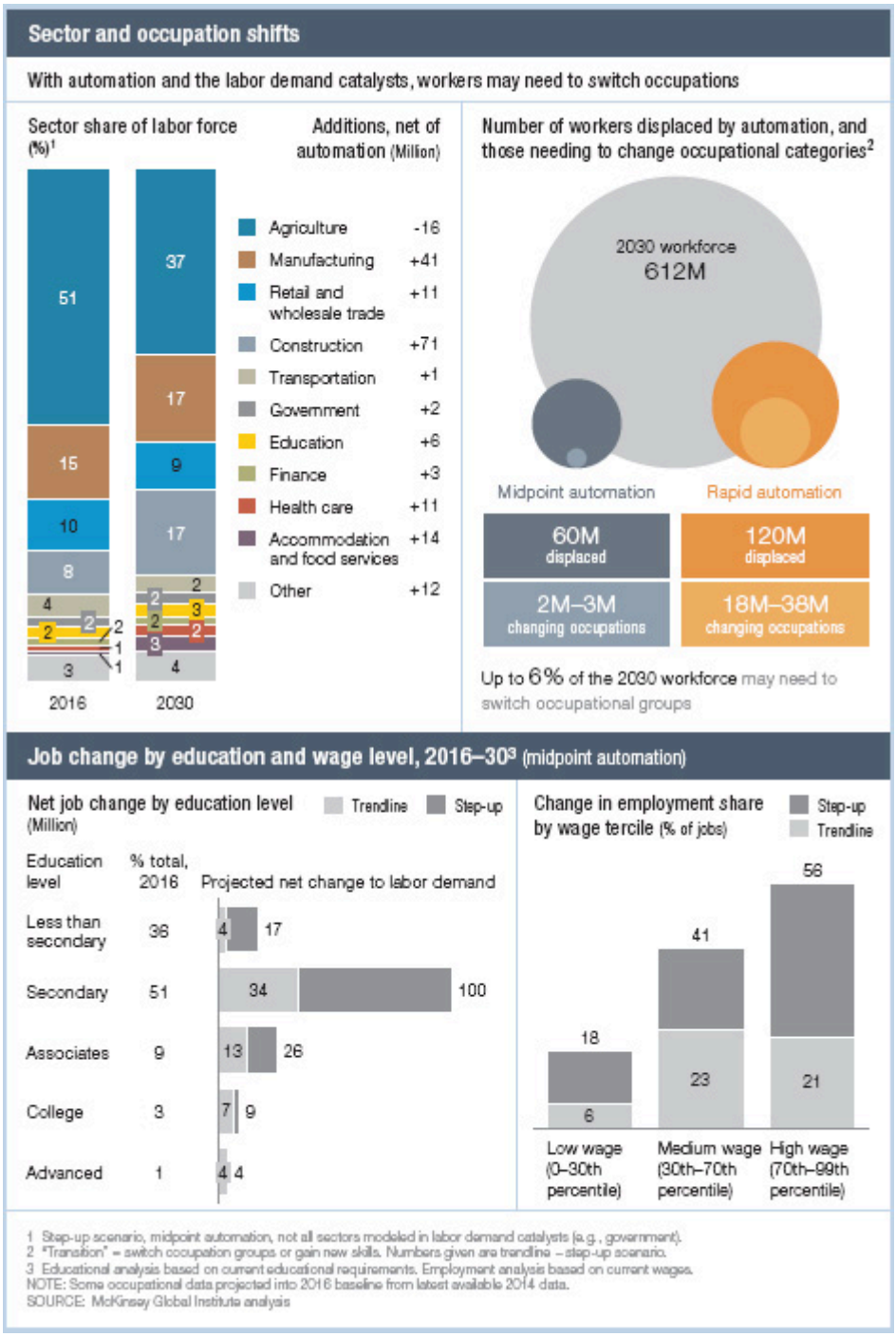
■ **FIGURE 29.11**

The report from McKinsey on job transitions states that ; between 75 million to 375 million people may need to switch occupations by 2030. The report covers 46 countries, representing about 90 percent of the global GDP.

If we go by the findings of the report (McKinsey Global Institute, 2017, p. 96); by 2030, Indian labour force will be 612 million, and about 6 percent of the labour force, according to this report, will need to switch occupations.


India
India is expected to continue industrializing as its economy shifts away from agriculture. As GDP per capita continues to expand amid rapid growth of the labor force, many of India's jobs of the future will be driven by construction and the consumption habits of the expanding middle class.
Economics and demographic context
Demographics
5% over 65 years of age in today's population, and growing to 8% by 2030
Economic development
5.4% GDP per capita growth, annualized 2016–30
Wages
$4,800
average annual wage
Automation potential
9% of current work activity hours automated by 2030
in the midpoint scenario, and up to 19% in the rapid scenario
Jobs lost, jobs gained
Net change in jobs by 2030 (Million)
Enough jobs are created in the step-up scenario to offset both automation and the growth in labor force
Jobs lost
Jobs gained
New workers
F
E 96
138
G
A
B 57
D 114
C
A 2016 baseline
B Jobs displaced by automation by 2030 in the midpoint scenario
C Jobs displaced by automation by 2030 in the rapid scenario
D Jobs created by 2030 in the trendline scenario
E Jobs created by 2030 in the step-up scenario
F New occupations and unsized labor demand1
G Change in labor force by 2030
Growth/decline of occupation types by 2030
Occupation type
Examples
Net change in jobs (midpoint automation, step-up scenario)2
Million
% of jobs
2016
2030
Builders
Construction workers, electricians
60.0
11
18
Other jobs, predictable environments
Machinists, cooks
28.3
30
27
Customer interaction
Retail sales, bartenders
22.7
10
11
Care providers
Surgeons, nurses
12.8
1
3
Other jobs, unpredictable environments
Farmworkers, firefighters
10.8
40
32
Educators
Teachers, librarians
8.0
1
2
Managers and executives
CEOs, sales managers
5.9
2
2
Office support
Payroll clerks, data entry
3.0
3
3
Professionals
Lawyers, business specialists
2.8
1
1
Technology professionals
Web developers, IT
1.2
0
0
Creatives
Authors, designers
0.6
0
0
1 Historical analysis suggests that we could expect 8-9% of 2030 labor supply will be in "new jobs" relative to today, which is additional to what we have estimated.
NOTE: Some occupational data projected into 2016 baseline from latest available 2014 data.
SOURCE: McKinsey Global Institute analysis

■ **FIGURE 29.12**



■ FIGURE 29.13

This report – 'Digital jobs for Youth' (World Bank, 2018), talks about the already lower share of women in workforce, and that women will feel the effects of automation more acutely when it comes to competing for digital jobs. Also, the youth unemployment rate is about 300 percent more

than the unemployment rates for adults (those aged over 25 years) (World Bank, 2018, p. 4). This is a worrisome thing, and it clearly points to the failure of planning in the country's education system to have accurately forecasted the change and prepared their countries for the imminent changes.

TABLE 29.4: Youth Unemployment Rates and Labour Force Size

Youth Unemployment Rate (%)					
	2015	*2016*	*2017*	*2018**	*2019**
World	12.4	12.6	12.6	12.5	12.5
High Income Countries	14.3	13.2	12	11.2	11.1
Upper-Middle Income Countries	13.8	15	15.4	15.1	15.1
Lower-Middle Income Countries	11.8	12	12.1	12.2	12.3
Low Income Countries	9.2	9.3	9.2	9.2	9.3
Youth Labor Force (Millions)					
	2015	*2016*	*2017*	*2018**	*2019**
World	522.7	517.2	513.8	511.2	509.3
High Income Countries	64.9	64.9	64.1	63.2	62.3
Upper-Middle Income Countries	169.8	162.8	157.8	153.7	150.2
Lower-Middle Income Countries	209.3	208.8	208.8	208.7	208.7
Low Income Countries	78.8	80.7	83.1	85.6	88.1

* Data for 2015-2017 are estimates while data for 2018-2019 are projections. *Source:* ILOSTAT, http://www.ilo.org/ilostat/.

Also, according to the same report, approximately 22% of the young are in NEET category (Not in Employment, Education or Training). For females, the NEET rate is estimated to be 34.4%.

According to an ILO (International Labour Organisation) report (World Bank, 2018, p. 5), about 10.6 percent of the youth aged above 25 are living in *'working poverty'* (earning less than USD 1.90 per day in 2017), and about 17% of the employed youth are living below the threshold of extreme poverty. According to this report, *"long-term unemployment amongst youth have been found to aggravate civil unrest and domestic security issue leading to outbreaks of low intensity conflicts like protests and riots or even more organised, political upheaval and armed conflicts".*

Trends indicate that ICT will not become a major employment creator in Lower and Middle Income Countries (LMICs) and India is a LMIC (World Bank, 2018, p. 20). But if we look at China; Alibaba created over 36 million jobs in 2017 (World Bank, 2018, p. 29), which means that besides India

having to focus on delivering the education (digital skills and empowerment), it will also have to look at expanding its middle class, and focussing on quality with regards to MSMEs, to leverage technology to create jobs.

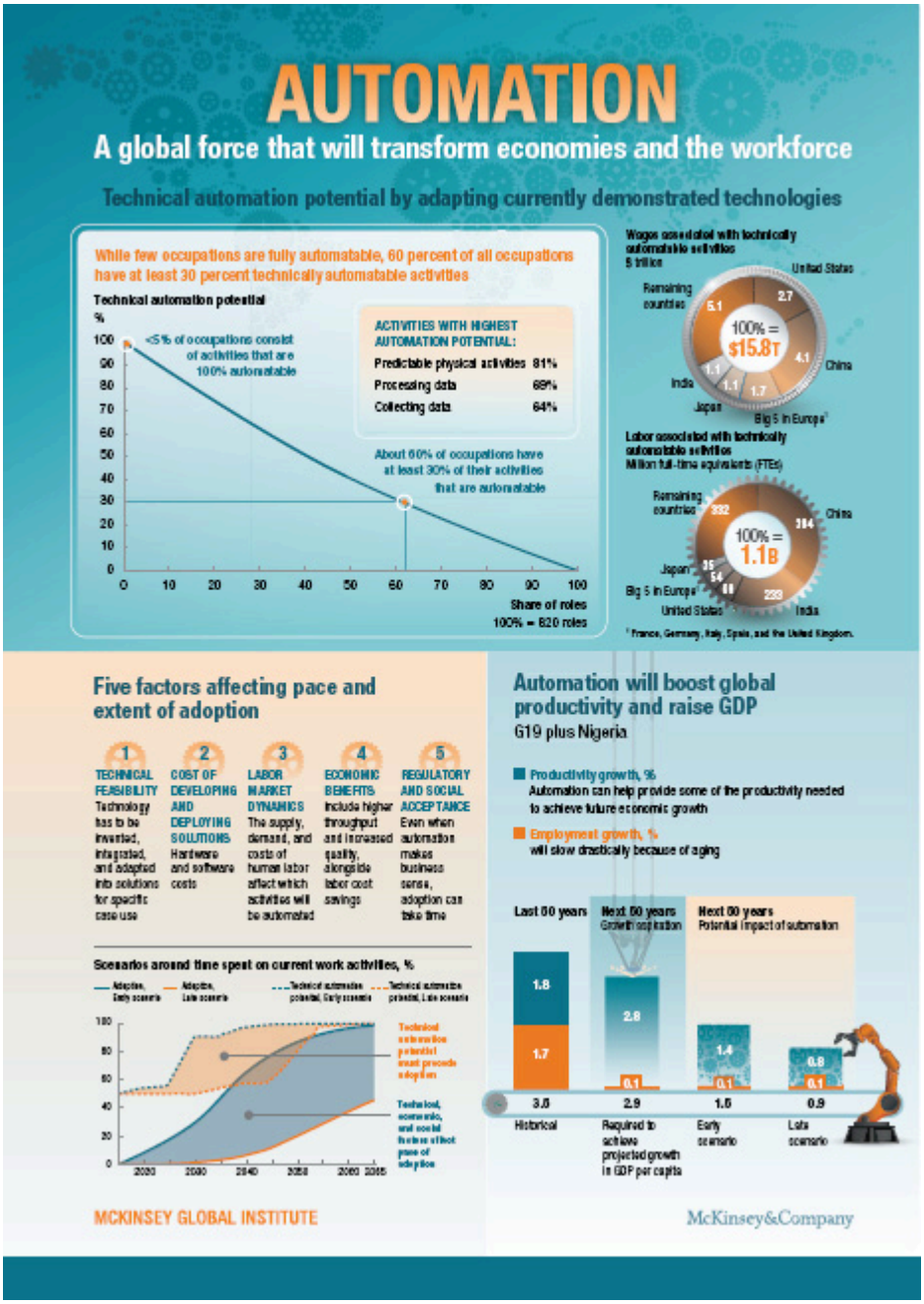
According to a study – 'Burning Glass Technologies', middle class jobs, with a requirement of digital skills, are outpacing those which do not require digital skills;

- 80 percent of the middle skills jobs require digital skills and spreadsheets, and word processing proficiency has become a baseline requirement for about 78 percent of the middle skill opportunity.
- Jobs which are digital skill intensive are growing 2.5 times more rapidly than the middle class jobs.
- Jobs which are digitally intensive pay about 18 percent higher wages on an average.

(Burning Glass Technologies, 2015, p. 1)

According to the report, 'A Future That Works: Automation, Employment and Productivity' (Mckinsey Global Institute, 2017);

- About 50 percent of the activities for which people are paid about $16 trillion in the global economy can be potentially automated by using technology
- About 60 percent of all occupations have at least 30 percent constituent which can be automated, and more will follow with time.
- 5 percent of the occupations can become redundant and can fully go to technology with automation.
- China, India, Japan and the United States have about 50 percent of the total wages and almost two thirds of the jobs which can be automated, and automation will touch about 1.1 billion people across these four countries. 700 million will be affected across China and India, 54 million full-time employees will be affected in Europe (across France, Germany, Italy, Spain and the U.K.) (Mckinsey Global Institute, 2017, p. 8).



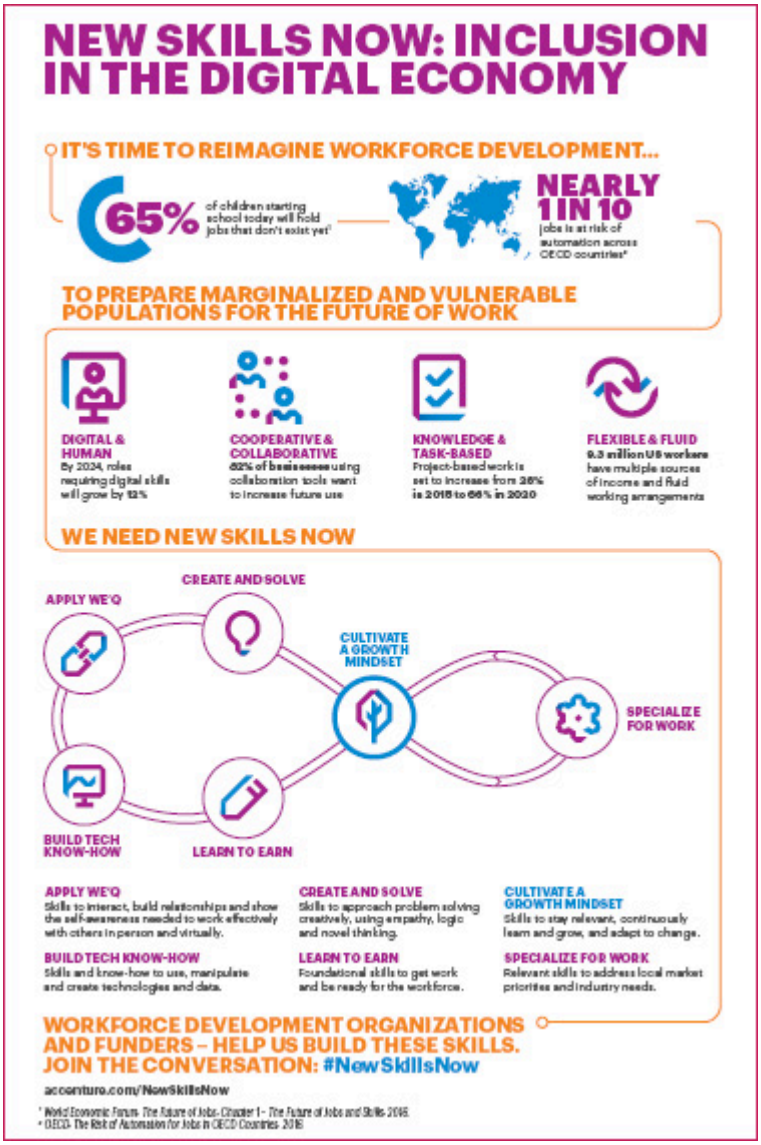
■ **FIGURE 29.14**

While few occupations are fully automatable, 60 percent of all occupations have at least 30 percent technically automatable activities.

According to the PEW Research Center, the analysis of the employment data shows that the job categories with highest growth tend to require higher social (interpersonal, communication or management skills),

analytical (critical thinking,) and technical skills (computer usage) (Pew Research Center, 2016).

It is clear that the students of today will be having jobs which don't exist today, and this makes our goals for education and skills absolutely clear and futuristic, and we need to start working now. The below mentioned illustrates the future of work and the digital economy.



(Accenture, 2017, p. 4)

■ **FIGURE 29.15**

79 percent of the executives surveyed by Accenture for a research believe that the future of workforce will be defined by projects, rather than job functions (Sloman & Thomas, 2016, p. 3).

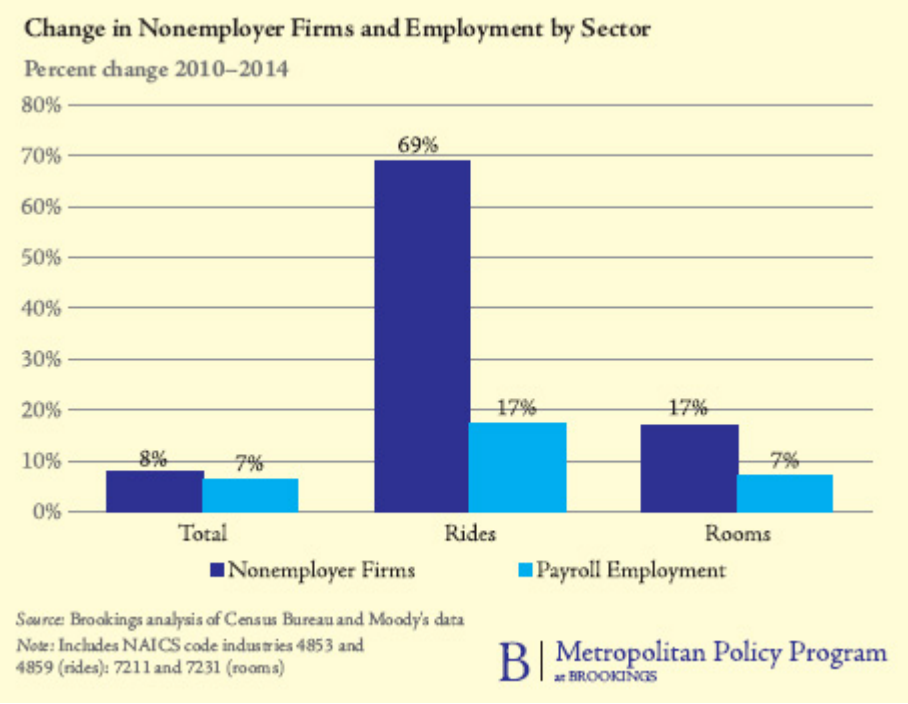
Also, *organisations are making more investments in Artificial Intelligence related technologies for the past two years – 78 percent more in machine learning and 77 percent more in deep learning and embedded Artificial Intelligence solutions* (Sloman & Thomas, 2016, p. 4).

58 percent of the executives felt that technology improved communications by allowing them to connect with a team, or the broader organisation, easy and quickly (Sloman & Thomas, 2016, p. 5).

According to Eric Schmidt, Executive Chairman of Google's parent company – Alphabet, and Jonathan Rosenberg, advisor to CEO, Larry Page, '*data analytics will be incredibly important for this generation of young people'* (CNBC, 2017).

Education and changing nature of jobs and employment:

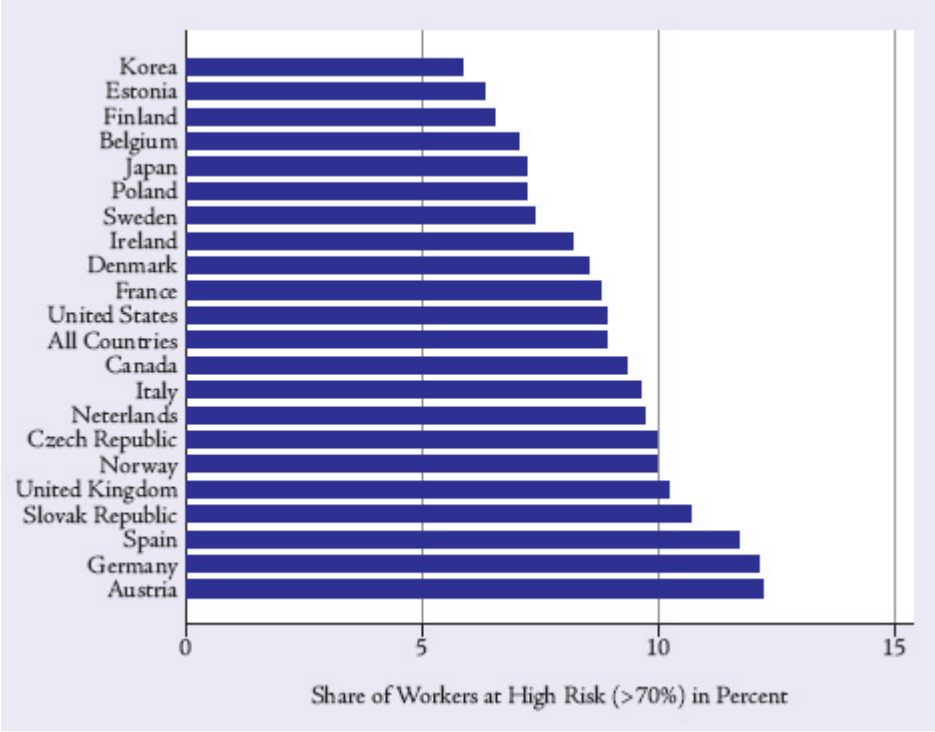
Non-employer firms (firms with network of contractors and freelance individuals) are growing faster than we can think and it could change payroll employment in a major way, but are mainly concentrated in major metros currently and Uber, Grab, Lfyt and Airbnb are examples.



■ FIGURE 29.16

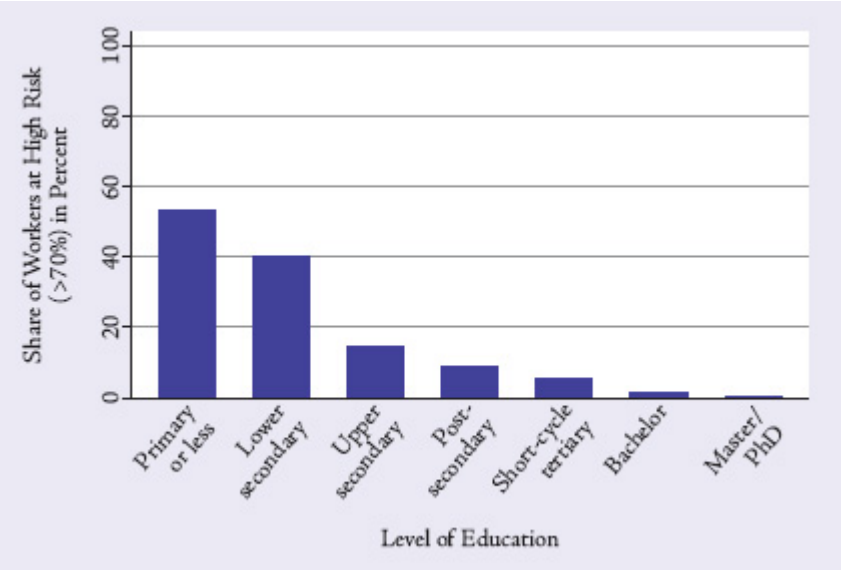
Non-employment firms which were about 15 million in 1997 have increased to 24 million in 2014, and we can compare this to payroll based employment, which has gone up from 129 million in 1997 to 145 million in 2014 (Hathway & Muro, 2016).

In a working paper funded by OECD titled, 'The Risk of Automation for Jobs in OECD Countries: The main conclusion of the Comparative Analysis', the main inference is that, about 9% of the jobs are automatable. Also, low qualified workers will be most affected (Arntz, Gregory, & Zierahn, 2016, p. 4). The paper also quotes that in the next decade or two, about 47% of the workers in the United States would be in occupations which may be performed by computers or algorithms! Various other papers estimate that 35% jobs in Finland and 59% jobs in Germany are automatable. Overall, across Europe, between 45-60 percent jobs have the highest threat to automation. Also, the jobs with high educational job requirements are less likely to be automated, than the jobs which require interpersonal skills and team working (Arntz, Gregory, & Zierahn, 2016, p. 14).

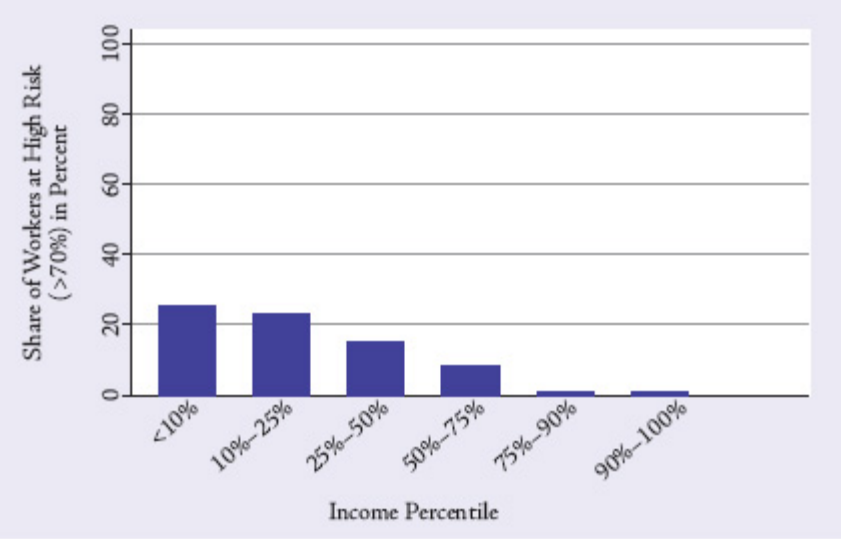


Source: Authors' calculation based on the Survey of Adult Skills (PIAAC) (2012)

■ **FIGURE 29.17** *Share of Workers with High Automatibility by OECD Countires*



■ **FIGURE 29.18** *Share of Workers with High Automatability by Education*



(Arntz, Gregory, & Zierahn, 2016, p. 20)

■ **FIGURE 29.19** *Share of Workers with High Automatability by Income*

If we look at India, 69 percent of the jobs are under threat due to automation (Gupta, Your Vote is Not Enough, 2019, p. 10), and if we add

the unplanned growth in cities and rural India, the number could well touch 80 percent or more !

India's digital economy has the potential to touch US $1 trillion by 2025 (Deloitte – CII, 2018, p. 6), and this has important implication for the education system which will have to transform itself from the current pace to act as a bridge to make it happen. In essence, the education system will have to create a workforce of tomorrow; a workforce which has an agile mindset, fertile enough to assimilate and cultivate newer thinking, and with the skills needed for the changing dynamics of the market and sectors.

It is interesting to learn from history on why America leaves every country behind on economy and growth. 56 years ago, President Johnson created the National Commission on Technology, Automation and the Economic Progress on August 19, 1964, which led to the report which was released in February 1966, 'Report of the National Commission on Technology, Automation and Economic Progress' titled 'Technology and the American Economy'.

I have done extensive research and looked at key global reports, and a few things are emerging as a common thread which reinforce my belief that the education system of India (and perhaps every other country) will have to radically transform to meet the emerging and merging needs. To me, a few things stand out clearly, and clearly set the agenda for the education;

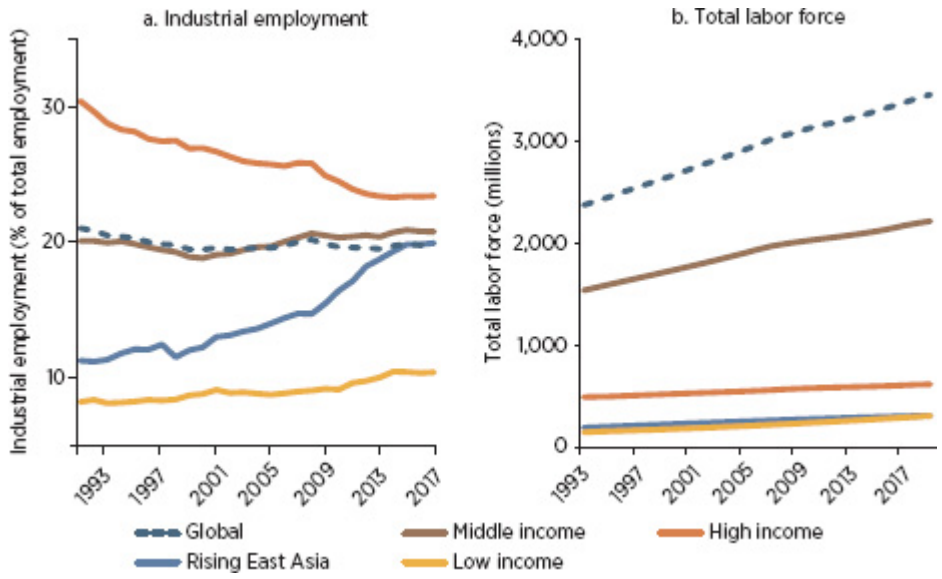
- We have no clue about the jobs that will get created in future. Majority of the jobs that undergrads are doing today will either drastically get transformed or get eliminated. Routine jobs will become redundant
- All organisation and jobs will use digital tools and they will be integral to all functions
- New jobs will get created
- Automation will lead to job loss
- Future of jobs will need ABCD – Agile & Adventurous; Beginner, Bold & Builder; Collaborative; & Digital
- There will be a churn in the job market and transition with re-skilling and upskilling will help people to move on to newer jobs

- Education and skilling system need to transition faster (though we are already in transition phase)
- Countries – small, medium or large, will witness an impact of new jobs being created and routine jobs being lost to automation
- Gender neutral labour force participation should be considered

In my analysis across sectors, due to technology adoption and over focus on profits and productivity, people are going to be left out. So, the harsh fact is that, there will be a net loss of jobs across sectors and across nations.

"Machinery does not just act as a superior competitor to the worker, always on the pint of making him superfluous. It is the most powerful weapon for suppressing strikes"; John Maynard Keynes said in 1930. (World Bank, 2019, p. 2). If it was today, he would have written, 'AI & Automation' will replace humans.

Two major transitions are happening during this transformative time. First, new 'doers' are getting added through AI & Automation; and second, some of the old 'routine' and even 'high specialisation' jobs are being taken over by technology. Harrier motor plant in Pune has automated 90 percent of the manufacturing process (Gupta, Your Vote is Not Enough, 2019, p. 27). For smaller countries, a 5-10 percent displacement is fine, but for a large country like India, it is a massive shift, and our education system not only failed to lead this change, but failed terribly in forecasting and planning for this change. I addressed the Internet Governance Forum (IGF) hosted by the United Nations in Nov, 2018 at Paris and again at Berlin in November 2019, and asked them to come out with a report on 'Internet & Job Creation'. Even if IGF shies on coming out with such a report, every nation must come out with a report on leveraging digital technologies for job substitution and job creation, both.



Source: WDR 2019 team, based on World Bank's World Development Indicators (database).

Note: "Rising East Asia" includes Cambodia, Indonesia, the Lao People's Democratic Republic, Mongolia, Myanmar, the Philippines, Thailand, and Vietnam.

■ **FIGURE 29.20** *Industrial jobs are falling in the West and rising in the East, but the total labor force has been increasing across the globe*

According to the Word Development Report, in the west (developed world), the jobs are transitioning from manufacturing to services, while in the east, the jobs in industrial sector (primarily manufacturing) are increasing. (World Bank, 2019). The education system needs to address this shift, and the core competence to be developed through education is a mindset of continuous learning to predict, prepare and adapt to the needs of the VUCA world (Volatile, Uncertain, Complex & Ambiguous).

All of us are growing old with every passing year, but some of us 'grow up' due to our acquiring more knowledge and skills, and this makes a difference between growing old and growing up. To run your family and being able to afford the basic necessities of life (food, clothes, house with electricity & water, healthcare, education and entertainment), one will need life-long reskilling and knowledge updation. Schooling and degrees wouldn't be enough going forward.

30

Abbreviations Used

ISCED (International Standard Classification of Education) - ISCED is the ref-erence classification for organising education programmes and related qualifica-tions by education levels and fields.

TABLE 29.1: Education levels under the ISCED-2011 Classification

Terms used in this publication	
Early childhood education Refers to early childhood programmes that have an intentional education component and aim to develop cognitive, physical and socio-emotional skills necessary for participation in school and society. Programmes at this level are often differentiated by age.	ISCED 0 (sub-categories: 01 for early childhood educational development and 02 for pre-primary education)
Primary education Designed to provide a sound basic education in reading, writing and mathematics and a basic understanding of some other subjects. Entry age: between 5 and 7. Typical duration: 6 years.	ISCED 1
Lower secondary education Completes provision of basic education, usually in a more subject-oriented way with more specialist teachers. Programmes may differ by orientation, general or vocational, though this is less common than at upper secondary level. Entry follows completion of primary education and typical duration is 3 years. In some countries, the end of this level marks the end of compulsory education.	ISCED 2
Upper secondary education Stronger specialisation than at lower secondary level. Programmes offered are differentiated by orientation: general or vocational. Typical duration is 3 years.	ISCED 3
Post-secondary non-tertiary education Serves to broaden rather than deepen the knowledge, skills and competencies gained in upper secondary level. Programmes may be designed to increase options for participants in the labour market, for further studies at tertiary level, or both. Usually, programmes at this level are vocationally oriented.	ISCED 4

Short-cycle tertiary education Often designed to provide participants with professional knowledge, skills and competencies. Typically, they are practically based, occupation-specific and prepare students to enter the labour market directly. They may also provide a pathway to other tertiary education programmes (ISCED levels 6 or 7). The minimum duration is 2 years.	ISCED 5
Bachelor's or equivalent level Designed to provide participants with intermediate academic and/or professional knowledge, skills and competencies, leading to a first degree or equivalent qualification. Typical duration: 3-4 years full-time study.	ISCED 6
Master's or equivalent level Stronger specialisation and more complex content than bachelor's level. Designed to provide participants with advanced academic and/or professional knowledge. May have a substantial research component. Programmes of at least five years' duration preparing for a long first degree/qualification are included at this level if they are equivalent to a master's level programmes in terms of their complexity and content.	ISCED 7
Doctoral or equivalent level Designed to lead to an advanced research qualification. Programmes at this level are devoted to advanced study and original research, and exist in both academic and professional fields.	ISCED 8

Education at a Glance 2019 © OECD 2019

OECD: The Organisation for Economic Co-operation and Development. OCED was established in 1961 as a forum for governments to share experiences and seek solutions to common economic and social problems. About 50 industrialised and emerging-economy **countries** have joined the **OECD** as **members** or adherents.

NEET Neither employed nor in education or training.

Active population (labour force) is the total number of employed and unemployed persons, in accordance with the definition in the Labour Force Survey.

Age groups: Adults refer to 25-64 year-olds; **Younger adults** refer to 25-34 year-olds; and **Older adults** refer to 55-64 year-olds.

Unemployed individuals are those who, during the survey reference week, were without work, actively seeking employment, and currently available to start work.

The unemployment rate refers to unemployed persons as a percentage of the labour force (i.e. the number of unemployed people is divided by the sum of employed and unemployed people).

The **working-age population** is the total population aged 25-64.

Educational attainment refers to the highest level of education attained by a person (OECD, 2018, p. 80).

The calculation of the financial returns, or the net present value (NPV), of education corresponds to a cost- benefit analysis that converts future expected flows into a present value by using a discount rate. The discount rate takes into account the fact that money tomorrow is worth less than money today, and must therefore be "discounted" at a specific rate to find its current worth. The choice of the discount rate is challenging, and it will make a considerable difference when analysing the returns to long-term investments, as is the case with investment in education (OECD, 2018, p. 108).

Early childhood education and care (ECEC)

NER – Net Enrolment Rate

NEP – National Education Policy

ICT – Information and Communication Technology

PIAAC – Program for the International Assessment of Adult Competencies

PPP – Purchasing Power Parity SE – Standard Error

STEM – Science, Technology, Engineering and Mathematics UIS – UNESCO Institute of Statistics

UOE – Data collection managed by the three organisations, UNESCO, OECD and Eurostat

MSME's – Ministry of Micro, Small and Medium Enterprises

IMF– International Monetary Fund

31

Definitions

Definition of education *"Education is the process by which society — through schools, colleges, universities and other institutions — deliberately transmits its cultural heritage and its accumulated knowledge, values and skills to each generation"* (European Commission, 2019).

Attention: A limited-capacity cognitive resource that directs and maintains focus on a specific stimulus.

Bottom-up processing: Information processing that begins and ends with the stimulus: you focus on the information coming from whatever you are trying to perceive, and you try to understand it just by piecing this information together.

Cognitive load: The amount of information requiring our attention; the demands on working memory of processing information.

Cognitive impairment is when a person has trouble remembering, learning new things, concentrating, or making decisions that affect their everyday life. Cognitive impairment ranges from mild to severe. With mild impairment, people may begin to notice changes in cognitive functions, but still be able to do their everyday activities. Severe levels of impairment can lead to losing the ability to understand the meaning or importance of something and the ability to talk or write, resulting in the inability to live independently (CDC, 2011).

Cognitive psychology: The study of the mind, including processes such as perception, attention and memory.

Dual coding: Combining words with visuals.

Elaboration: Adding details to memories and integrating new information with existing knowledge.

Elaborative interrogation: Specific method of elaboration where you ask yourself questions about how and why things work, and then produce the answers to those questions.

Encoding: The process by which information moves from short-term memory to long-term memory.

Working memory: A theory developed from short-term memory and made up of three key processes: the phonological loop, the visuospatial sketchpad and the central executive. It allows us to hold information for a short time, manipulate it, and send it to/from long-term memory.

IMF: International Monetary Fund.

Long-term memory: Theoretically, an unlimited capacity process that retains information and skills over time. It typically involves four stages: encoding, consolidation, storage and retrieval (Weinstein, Sumeracki, & Caviglioli, pp. 159-161).

Psychometry: The supposed ability to discover facts about an event or person by touching inanimate objects associated with them.

Psychometrics: The science of measuring mental capacities and processes.

Human Capital Index (HCI): The HCI database provides data at the country level for each of the components of the Human Capital Index as well as for the overall index, disaggregated by gender. The index measures the amount of human capital that a child born today can expect to attain by age 18, given the risks of poor health and poor education that prevail in the country where s/he lives. It is designed to highlight how improvements in current health and education outcomes shape the productivity of the next generation of workers, assuming that children born today experience over the next 18 years the educational opportunities and health risks that children in this age range currently face (World Bank, 2018).

Table 31.1:Which Generation are You?

Generation Name	*Births Start*	*Births End*	*Youngest Age Today**	*Oldest Age Today**
The Lost Generation The Generation of 1914	1890	1915	105	130
The Interbellum Generation	1901	1913	107	119
The Greatest Generation	1910	1924	96	110
The Silent Generation	1925	1945	75	95
Baby Boomer Generation	1946	1964	56	74
Generation X (Baby Bust)	1965	1979	41	55
Xennials	1975	1985	35	45
Millennials Generation Y, Gen Next	1980	1994	26	40
iGen/Gen Z	1995	2012	8	25
Gen Alpha	2013	2025	1	7

(*age if still alive today)

Note: Dates are approximate and there is some overlap because there are no standard definitions for when a generation begins and ends. See the section below about why this overlap.

Source: https://www.careerplanner.com/Career-Articles/Generations.cfm

32

Acknowledgement

Firstly, I must thank my parents, who were teachers and whom – their students loved a lot. I dedicate this book to my mother Dr. Sarojini Devi Gupta, a teacher who always inspired her students. Then my schooling, which was a great experience, although I don't remember much of what I studied.

I am thankful to Prof. Murli Manohar Joshi who gave me an opportunity to draft two election manifesto of BJP and guided me on how to draft policies for a nation and across sectors. He is my guru who brought me to policy making, and I fall short of words to thank him for all his guidance. I am thankful to Mr. J.P. Nadda for giving me a free hand to work on the National Health Policy, and other assignments in the government. I am thankful to United Nations, World Economic Forum, ITU, WHO and the government of various countries which have invited me over the past two decades and given me an exposure which opened my eyes to the islands of excellence. I am thankful to Prime Minister Narendra Modi and Mr. Prakash Javadekar, Union Minister for HRD, for giving me a chance to be amongst the nine members tasked to draft the New Education Policy for India and this assignment was an eye opener in itself.

I wouldn't have authored a book if Kavita Tate (Nadkarni) would not have pushed me about two decades ago to write columns and if Mr. Rohit Kumar (Former MD, Elsevier, India) would not have asked me to author my first book.

This book has reached your hand due to the vision of Dr. Lalit Singh and his wonderful team (Mr. Deepak Singh, Ms. Jyoti Nagpal, Ms. Shreya Soni, Mr. Gagan Gusai, Ms. Shukti Mukherjee and others at McGraw-Hill) who worked with my timelines and had enough patience to bear me all throughout. Lalit has been a common personality in two of my books. He

was instrumental in my book on healthcare and now again, played a key role in this book on education.

I am indebted to students (my real gurus), parents, teachers who interacted with me on this important issue of education, and my friends from across the world who helped me get a survey done on education.

Most importantly, Kopal and Happy (Reyansh) who gave up their weekend schedules for outings and many other pleasures and free times to see that the book was attended to, and helping me avoid mistakes which could have been more than they are ! Special thanks to Arunim Gupta for putting together the graphs on global and regional data, Kopal Gupta for critical review and Mevish P. Vaishnav for proof reading.

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"If your plan is for one year, plant rice. If your plan is for ten years, plant trees. If your plan is for one hundred years, educate children."

—widely attributed to Confucius