



ACCESSING EDUCATION

technology's potential
for divergence and
convergence





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This policy brief was put together with research compiled for the NHDR of 2016. With the onset of COVID-19 – this policy brief drew information from the 2016 research, 2020 HDRO Publication on COVID-19 & Human Development, and the UN Advisory Paper. The findings of this paper were subsequently discussed at a policy dialogue featuring, academics, experts and other development practitioners. The 2016 research was carried out by a team consisting of prominent academics, and this policy brief was put together by Ajith De Alwis.

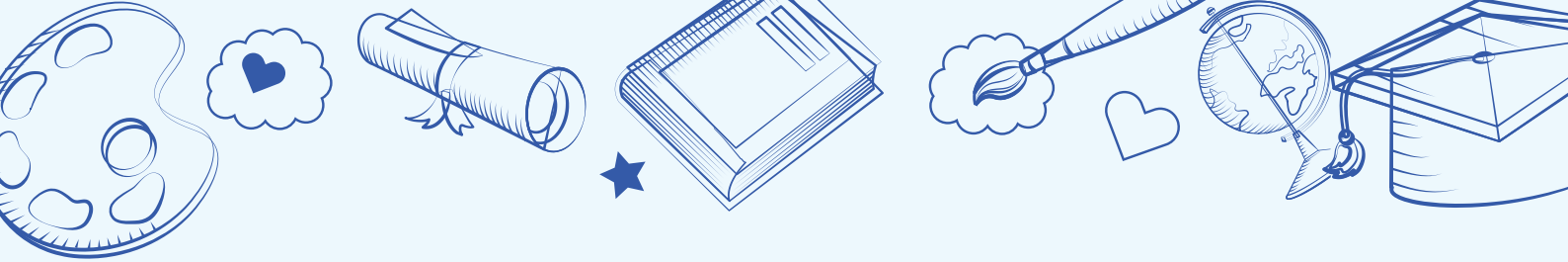
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Table of Contents

EXECUTIVE SUMMARY	05
REDUCING INEQUALITIES: REACHING EVERY SRI LANKAN STUDENT	08
Introduction	08
Industry 4.0 and Education 4.0: An emergent need	10
SDG 4 and the Education's role in Sustainable Development	28
STEM Education for Economic Growth	30
COVID-19 and Education	36
Pathways for EduTech in Sri Lanka in creating access	38
CONCLUSIONS	41
REFERENCES	43
APPENDIX A	45
APPENDIX B	47
APPENDIX C	55

List of Abbreviations

SDG	Sustainable Development Goals
STEM	Science, Technology, Engineering, and Mathematics
STEAM	Science, Technology, Engineering and Math
PTF	Presidential Task Force
ICTA	Information and Communication Technology Agency
MOOCS	Massive Open Online Course
SL	Sri Lanka
BPO	Business Process Outsourcing
WEF	World Economic Forum
GDP	Gross Domestic Production
TVET	Technical and Vocational Education and Training
SLNHDR	Sri Lanka National Human Development Report
HDI	Human Development Index
UNICEF	United Nations International Children's Emergency Fund
ERP	Enterprise Resource Planning
SEN	Special Educational Needs
PIM	Postgraduate Institute of Management
CB	Central Bank
VLE	Virtual Learning Environments
TRC	Truth and Reconciliation Commission
WIDE	World Inequality Database in Education



EXECUTIVE SUMMARY

The policy advocacy paper discusses the challenges to equity in education in Sri Lanka, with an eye on global developments. Equity via technology adaptation and deployment is an option that can be considered today. The nature of industrial revolutions taking place within the country, as well as the emerging globalization impacts of Industry 4.0, are evaluated in identifying the pathways for education in Sri Lanka. The significant differences that exist and their long-term impacts, if not addressed are presented. From an SDG mind set, it is seen that Sri Lanka appears to be performing quite well in the area of quality education as per current assessments, which is embodied in SDG 4. **However, this external assessment, together with microdata, indicates that the importance placed on SDG 4 is still insufficient and requires that different practices are adopted by the country.** At present, the Sri Lankan education system is not producing young people who are geared for tomorrow's world of work, and this divergence needs to be understood and attended to.

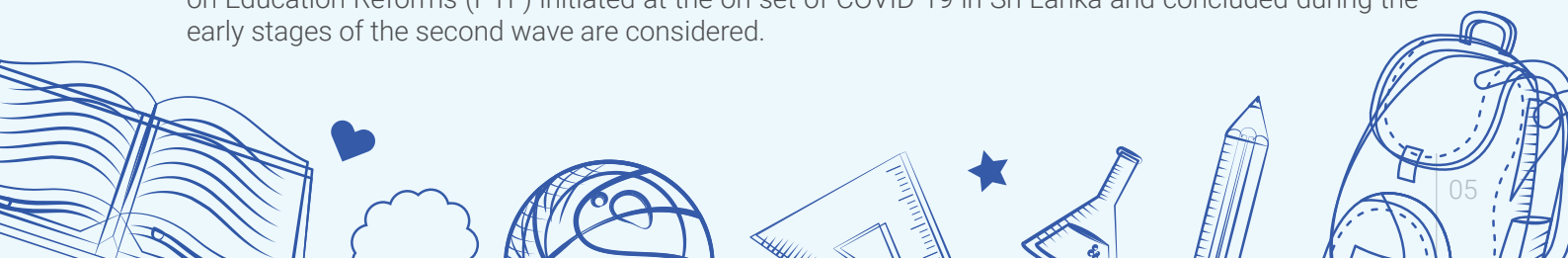
The paper takes on an advocacy role in policy. Initially, the discussion is on education in Sri Lanka, with a specific focus on education systems and processes, resource allocations, and performance. The contribution to economic development is discussed, whereby the issue of education's inability in its current trajectory to contribute sufficiently to the economy is presented.

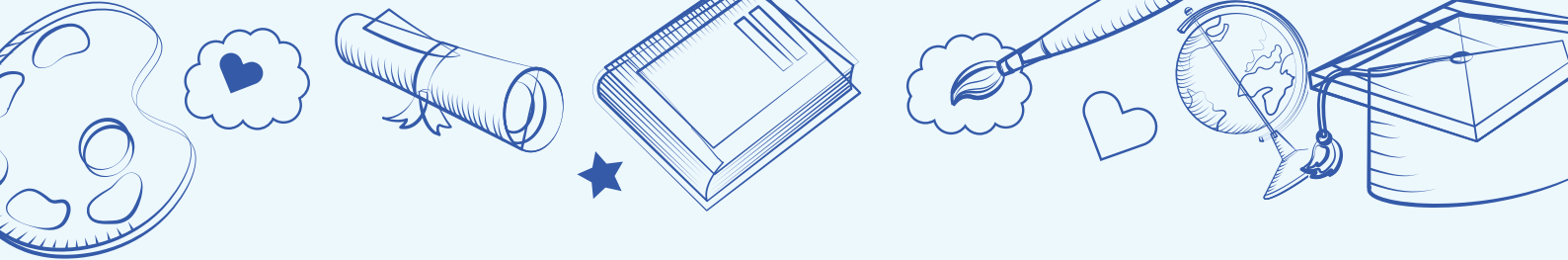
The scope of the policy paper is to provide key inputs to facilitate a dialogue and contribute to further policy development pertaining to education and related areas in Sri Lanka. Currently, it is inconceivable for the discussion to not have COVID-19 factored in. The pandemic is quite likely to ensure lasting change in the education system and is also accelerating the adoption of technologies in their broadest sense, as the way forward for service delivery. The key issue then is how to understand the changes forced upon the education system to be more meaningful and of value, overall.

The specific objective of the present policy advocacy paper is to provide a concise account of the present state of education in Sri Lanka in terms of achievements and challenges, while being aware of the sweeping changes taking place globally. The 21st century has imposed on us a set of desired skill sets from a student, and these appear to be non-negotiable. Traditional existing mechanisms and frameworks are quite unlikely to deliver on these expectations. Change demands significant investments, and what is observed is that this element is missing. Thus, there is a significant need to understand the importance of focused investments in education.

Industry 4.0 has developed its own Education 4.0 to cater to its needs. 'EduTech' is a technology sector that is growing tremendously in supporting these needs, which has also resulted in an EduTech equity gap. The awareness of this industry is almost absent, and the situation demands urgent attention. This review is carried out by an individual in the system that is more attuned to technology than an educationist. Hence, some reconciliation may be needed, but that is hopefully a discourse that would be stimulated by the presentation.

The COVID-19 pandemic has certainly demonstrated the resilience of the education system as well. The digital gap existing within public and private sector education systems and along rural and urban divides has been demonstrated. The pandemic has pushed for adaptation of technology options which would have been otherwise delayed for many years, while simultaneously exposing the systemic weaknesses. The jolt could well be handled with innovation. The final recommendations of the Presidential Taskforce on Education Reforms (PTF) initiated at the on-set of COVID-19 in Sri Lanka and concluded during the early stages of the second wave are considered.





The policy imperatives identified are presented below:

1. The acceptance of Education: Education and Education as a national policy principle is important and should be supported with investments.
2. The education system should be open for technology adoption and innovation. The higher education system is quite likely to change forever post-COVID and agility in decision making in the education space should be ensured.
3. The SDG 4 assessments for Sri Lanka have indicated the best country performance from all SDGs. However, this evaluation while accepted should not be taken to mean that all is well and progressing. SDG 4 evaluation should be understood in its context.
4. Inequity and inequalities exist due to allowing multiple systems to run with different objectives and harmonization in policy is important in addressing these issues.
5. The country must take immediate steps in support of STEM education as future work-opportunities stem from STEM. An imperative for STEM education is identified and action is necessary. The STEAM approach of the most recent PTF recommendations is quite important in moving forward.
6. Policy should converge to ensure the delivery of the education reforms identified under the Vistas of Prosperity and Splendour. PTF recommendations address the comprehensive review and direct policy reviews necessary.
7. Education service provision, teaching etc. must be significantly upgraded. Teaching is under-resourced, and skills imparted to teachers should receive more intense attention.
8. Education 4.0 arising from and to cater to Industry 4.0 has to be factored into educational investments.
9. EduTech entrepreneurs should be recognized and partnered with to bring about equity and establishing partnerships are recommended. Education as an industry segment should be strengthened to better serve the nation. While some organizations are reaching out and finding acceptance externally, locally there is no level playing field for these EduTech entrepreneurs, due to adherence to archaic rules.
10. Industry 4.0 Technologies have a significant role to play in addressing inequalities and this knowledge should be factored in education governance. Virtual reality and Augmented reality enable experiential learning from anywhere provided the foundation infrastructure is available.
11. It is recommended that innovation in education is encouraged both in teaching, learning and in testing and evaluations.
12. A broader review of education in Sri Lanka going beyond simply digital technologies was presented to push the concept of ignorance of the dynamics in education and society to be understood and to be factored into decision making.
13. Both digitization and the national education system digitalization have to be supported as a matter of priority. The policies of ICTA in ensuring fiberisation of all schools across the island is a positive development.
14. A conclusion that reaching every Sri Lankan student will require a clear leadership effort.





REDUCING INEQUALITIES: REACHING EVERY SRI LANKAN STUDENT

Introduction

Education is and always will be the most important factor in enabling the young to be the next generation of leaders. Education has the power to be a great equalizer. The power of education had been expressed by many a leader (Table 1), and some have also highlighted the core need of the fundamental process and its evolutionary significance with time. While education and skills empower youth today and fashion the future, this, in turn, influences the methods of education of that time. The value of the process has never changed but the "How" is evolving. Education is a social leveler and its lack of reach and costs, and quality variations are what contribute to the inequity. Infusing technologies with education in a socially responsible manner would ensure convergence.

Quotes worth thinking about in reforming education policy and the related approach

“
Education is the most powerful weapon that we can use to change the world
Nelson Mandela
”

“
Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is most important
Bill Gates
”

“
If we teach today as we taught yesterday, we rob our children of tomorrow
John Dewey
”

“

The literate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn

Alvin Toffler

”

“

The principal goal of education is to create men who are capable of doing new things, not simply of repeating what other generations have done – men who are creative, inventive and discoverers

Jean Piaget

”

“

The purpose of education is not an instrumentalist 'skilling' to produce biddable masses for current economic and political system to exploit. Its purpose is transformative to imbue everyone with broad human values and critical thinking abilities. Only then can we overcome the confines of race, caste, gender and other prejudices, resonate with our environment and become politically aware and active citizens

Sharachchandra Lele

”

“

Technology will never replace great teachers, but in the hands of great teachers, it's transformational

George Couros

”

“

One who opens a door of a school closes a door of a prison

Victor Hugo

”

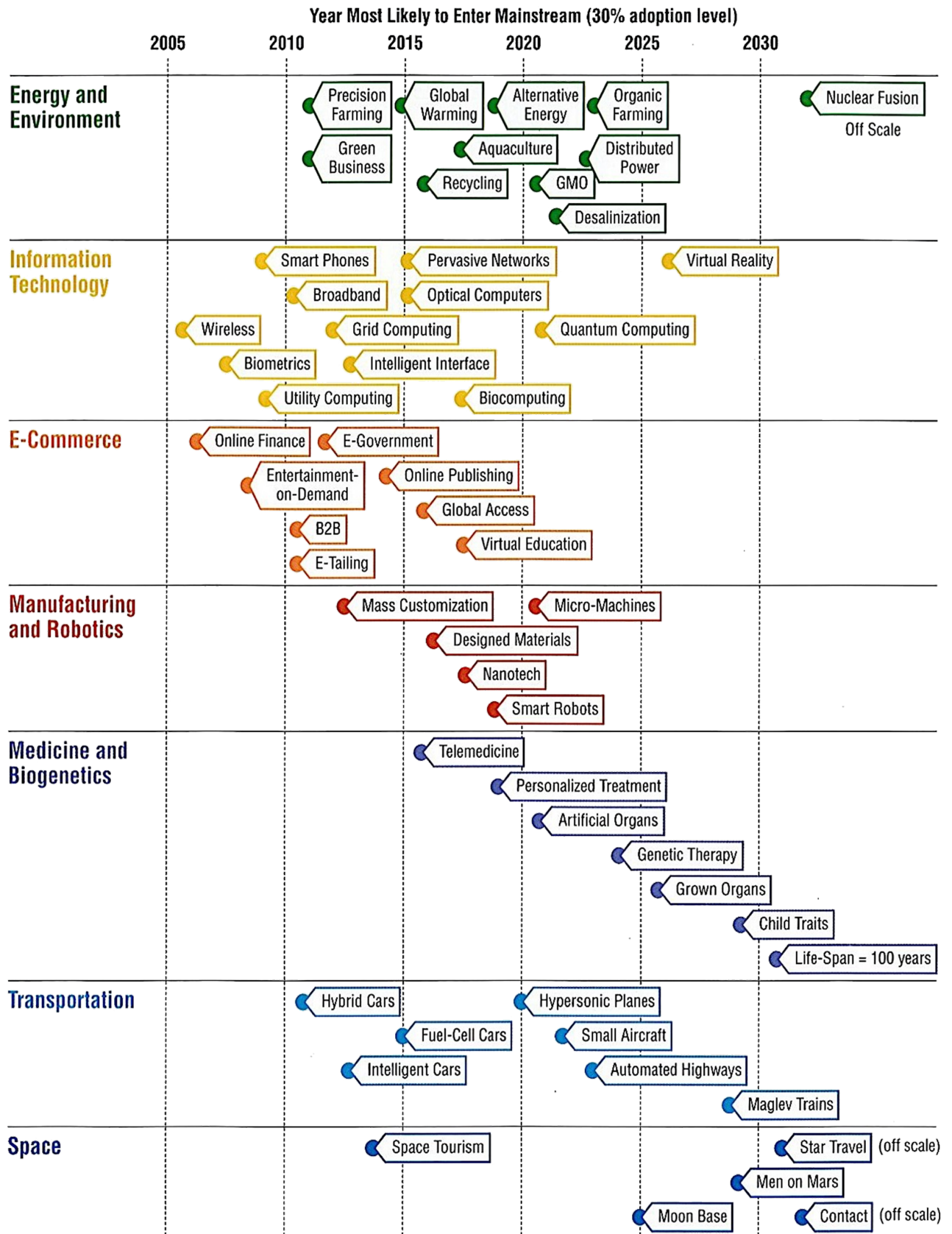
Education can be described as the nexus of learning, training, vocational training, developing skills, impacting attitudes, and the continuous professional development of all age groups. Education also means preparing young people of today for the world of work of tomorrow. Traditionally, the formal education process starts with pre-school education and then moves across primary, secondary, tertiary, vocational, and professional education. The process is time-consuming and resource intensive. Output is what is truly valued by society; all efforts are usually carried out with that end objective in mind. It is important to note that from both a quality-of-life perspective and sustainable development of a nation, education is the most powerful intervention; the empowerment that education brings to a human being is unique. Another element to be understood is the economic theory pertaining to endogenous growth models, with human capital as one of the most important factors of production. With human capital, knowledge becomes a factor of production (Paul Romer, 2019 Nobel Laureate on Economics). This policy prescription pushes for change and a realignment of principles with these understandings.

Industry 4.0 and Education 4.0: An emergent need

Industry 4.0 has been a summation of an expression coined by Claus Schwab, CEO of the World Economic Forum. The summation is essentially over a suite of technologies and their integration that is now being expressed as a new cyber-physical systems reality that is defining the new manufacturing environment. Technology growth and diversification have been accelerating and is coupled with knowledge explosion

Forecasting technology breakthroughs is not an easy task, but it has been an on-going exercise. The expectation is that through this type of exercise you will not be caught off-guard. One must be sensitive to these forecasting efforts, as ignorance would result in becoming irrelevant with time. An earlier forecasting exercise is shown to indicate how forecasting has actually been realized. It also indicates what is prophesied to happen between 2021-2030.

Figure 1: Technology Forecast – Futuring of Technologies



Except perhaps for Bill Gates, the pandemic in 2020 was not a risk assessed as usual and presented by the WEF every year. In this tech forecasting, virtual education had been identified to be a mainstream activity in 2016-17 period. Technology was readily available as the pandemic unraveled. MOOCs and distance learning programs were present. The pandemic lockdowns did indeed witness huge surges in popularity of these offers and the amount of additional learnings pursued were instructive. Technology availability to support the additional elements of engagement is also noticeable – SL children studying in US universities who have gained entry are entering the virtual world of study in the evening and continuing till the next morning. Catching up on sleep starts in the morning, creating a totally warped life and screen time. What that may lead to in the medium to long run is a question that awaits answers. However, in working life such practices have been present with the off-shoring of work - a practice that has been criticized by Arundhati Roy, yet embraced by many simply based on the monetary rewards. Sri Lanka has been rated highly as an outsourcing destination, especially concerning ICT BPOs. The ICTA has continuously emphasized the lack of graduates in these fields coming out from the Sri Lankan education system. However, as technology marches on, these jobs are now considered threatened as well. Chat Bots and algorithms generating code are making some positions obsolete. This indicates the nature of technology – a job killer! However, technology replaces some jobs but reinstates new ones and there is a need for unlearning and learning skills prevailing within.

The list of job titles for 2030 from The Futurist is interesting and is clear evidence of the evolution in job spaces. This indicates that what one teaches as per the curriculum is quite likely to be outdated soon. Hence the requirement is not to concentrate on knowledge, but on skills and to develop an innate ability to unlearn and learn. How the education system can support the transfer of knowledge to skills and develop or enable hyper-skilled individuals is a question that needs answering in realizing equity and equality in the future.

Table 1: 70 Jobs for 2030 (The Futurist, Jan-Feb, 2011)

The List: 70 Jobs for 2030		
Exobotanist	Extinction Revivalist	Exozoologist
Amnesia Surgeon	Financial Technologist	Smart Car Interior Designer
Astro-banker	Future-guide	Smart Road Designer/Engineer
Astro-clergy	Global Sourcing Manager	Smart Road Sensor Control Monitor/Analyst
Astro-doctor	Global System Architect	Space Junk Hauler
Astro-farmer	Grassroots Researcher	Space Junk Recycler
Astro-lawyer	Gravity Puller	Space Resource Reclaimer
Astro-psychologist	Green Career Coach	Advertisement Sales Representative
Astro-teacher	Clinical Choral Consultant	Talent Aggregator
Augmented Reality Architect	Helodeck Trainer	Autonomous Vehicle Operator
Telecop	Mobile Biomass Trainer	Terabyter (Lifelogger)
Time Hacker	Office Concierge	Avatar Relationship Manager
Bio-botic Physician	Online Community Organizer	Transhumanist Consultant
Bio-botist Assistant	Organizational quartermaster	Chef-farmer (agri – restaurateur)
Bioregenerative Integrator	Personal Brand Manager	Universal Ethics Proclaimer
Brain Quant	Personal Care Coordinator	Unmanned Cargo Vehicle Operator
Wiki Writer	Plant Psychologists	Brain Signal Decoder (mind reader)
Tree-Jacker	Post-normal Jobs Counsellor	Energy Harvester
Chief Experience Officer	Rationator Police	Environmental Health Nurse
Healer	Residence Technician	Alternative Currency Banker
Clone Rancher	Robot Polisher	Seed Capitalist
Digital Archaeologist	Robotic Earthworm Driver	Sensuality Simulator
Digital Identity Planner	Robotician	Smart Car Interior
Drone Dispatcher	Space Sweeper	

If the education system understands the need for change and adapts accordingly, the opportunities are quite positive. WEF's Future of Jobs report for 2020, indicates that 85 million jobs may be displaced due to machines taking over by 2025. However, 97 million new roles may emerge, which is higher than the number displaced. However, these are the jobs of the future and offer better opportunities to those at entry-level provided they are up to the task. WEF has listed 08 critical characteristics in Education 4.0: global citizenship skills, innovation, and creativity skills, technology skills, inter personnel skills, personalized and self-paced learning, problem-based and collaboration learning, and lifelong and student-driven learning. The 'classroom' for creating this skilled individual is different from the 'classroom' of today.

Technology is connecting as never before. Emerging technology such as augmented reality and virtual realities can transform education. The possibilities should be exercised, and it is this application that brings change. Once known, the drive to enable such practices should be presented. This requires investment. In a period of scarce resources, how priorities in terms of spending available money are formulated speaks volumes with regard to leadership.

Currently, 4 industrial revolutions are shaping society: Nanotechnology, biotechnology, information technology, and neurotechnology. As Industry 4.0 – the cyber-physical transformation is sweeping the world. In Japan, the concept followed is Society 5.0. Industrial revolutions reflect disruptive introductions, changing the nature of society. One consequence is the impact on workforce skills and knowledge, and thereby the structure and mechanisms of the education system. The impacts of such transformations are significant and one essential aspect that must be understood is that the dynamics of change are significant, and the world of work is changing at an increasing pace.

When rapid technological advances are being made elsewhere, if they are not reflected internally, there is a definite underserving of the entire community. The 21st century is continuously being redefined by technology and it is imperative that the process of education is aligned with these technologies.

In addressing inequalities, there is a need to consider the current trends in the global environment while understanding the local picture in detail.

A critical view of the Sri Lankan Education System

Education in Sri Lanka can be traced over the past 2300 years, and in that context, it is an institutional concept citizens can be proud of. In the post-colonial era after independence, Sri Lanka demonstrated some solid education outcomes even rivaling that of developed economies, as a result of multiple policy initiatives along with targeted state investments. Completion rates in primary and secondary education and demonstrated gender parity have been quite impressive thus far, and the country's achievements in the MDGs can be traced back to its education system. However, the developments over the subsequent years, especially in our current context, have been lagging, feeding into inequities. Ariyaratne (2009) indicated that, even in universities, only the fundamentals of subjects are taught with set syllabi and fixed timetables. This is an aspect of inequity – one among many – which needs addressing.

Sri Lanka has one of the lowest rates of public education spending among MICs, and the education system data is presented along with actual and planned investments. The overall expenditure is known to be around 1.5% GDP, which is insufficient to turn around an ailing system. The budget allocation for education in 2021 is LKR 306 billion and LKR 162 billion from this has been earmarked for provincial schools. However, it has been revealed that at primary and secondary levels, 95% of the allocation is usually consumed by the payment of salaries. This figure begs for an explanation on how the system can realize any meaningful growth. Related to this is the poor allocation of resources to Research and Development (R&D). R&D allocation is currently hovering at around 1% of GDP, which is another one of the lowest allocations when considering countries of similar economic status.

Figure 2: The Structure of the National Education System and Tertiary Education Participation at University Degree Programs

Policy Dialogue #12: Inequities in Funding Schools

Posted on February 8, 2021

A policy dialogue on “Inequities in funding schools” was held by the Education Forum Sri Lanka (EFSL) on February 13th, 2021, via Zoom.

LINKS:
Full Video: PD#12, 2 hours 30 minutes

OVERVIEW:

A major issue for parents in Sri Lanka today is access to a popular school for their child. The competition for admission to Grade one in a few select popular schools, the recent uproar over the raising of the cut-off mark for admission at grade 6 to the same set of schools are cases in point. What makes a school popular or attractive to parents? What does it take financially to maintain an attractive school? These are some of the basic questions that we wanted to address in our policy dialogue on inequities in school funding. The three panelists represented three different levels of education administration -i.e. School Level, Provincial Level and Line Ministry Level giving the participants a good overview of the situation.

School level Mr. W.A. Janaka, the principal of Sri Rahula Vidyalaya in Bellummahara gave a detailed description of what it takes to maintain an attractive school. His school is a Type 2 school or a school with Grades 1-11 only. There are 350 children in the school. He has a staff of 20 teachers, three development officers and two non-academic staff members. Apart from academic cadre of 20 and a non-academic cadre of 5, he receives about Rs: 20,000 from the provincial fund to cover essential payments such as electricity, telephone security, etc. All essential payments are not covered by the government. For example, per funding formula his school gets only Rs: 800 to cover electricity costs but the actual cost is around 2000. The annual budget for the school is averaged at Rs: 247,000. The government grant received through the provincial fund is about 5-8% of the total. The qualitative input grant from the provincial fund which depends on an application submitted by principal and other ad hoc inputs constitutes 37%-13% of the budget for miscellaneous inputs from the government. The biggest component is money raised by the School Development Society (SDS) and parent contributions. It ranges from 58%-79% in 2019-2020.

Expenditures, Belummahara Sri Rahula Kanishta Vidyalaya

	2019	2020
Government grants	5%	8%
Miscellaneous other inputs from government	37%	13%
SDS/Parent contributions	58%	79%
TOTAL Expenditure	263,447	231,463

Since taking up his appointment three years ago he realized the school needs extra-curricular activities to complete the learning experience of the students. Now the school has a Chess club, a School band, Cricket, Karate, Swimming, Scouting and an Environmental Club. Altogether it takes him an additional Rs: 320,000 to maintain these programs and other maintenance activities. The money is raised through the School Development Society. Their trust in him is the main factor that makes such fund-raising possible. Some other programs include Aruna Buddhi Prabha (Morning Wisdom) running from 5-630 AM on weekdays and 5-8 AM on weekends, and Nisha Buddhi Prabha (Evening Wisdom) running from 6-10 pm on weekdays for additional study sessions for children. A designated teacher oversees each session. A morning meal is also provided by the parents for the children. We estimate that school raises and spends about Rs: 1,400 for student development. During his short tenure the principal has been able to raise funds from parents and well-wishers for capital projects too. Public address system (150,000), Student leader jackets (150,000), Playground (150,000), CCTV camera system (300,000), School wall Â (500,000), Smart Board (Rs: 250,000), School boundary wall (500,000), Smart classroom (500,000), Flag base (850,000) and Peo TV system (950,00) for more than 3.5 million rupees in million in capital expenditures. According to a member of the Royal Union, the Old Students Association of Royal College, the operations budget of the college can come to 100 -200 million budgets. With 8000+ enrolment rate the amount spent on a student can be from 12,500 to 25,000 rupees. In sum, the government only pays for salaries and some portions of essential expenditures. Schools must secure unmet costs for essentials like electricity and for extra-curricular work and other student development activities. Annual per-student spending for essentials and student development can vary greatly from a few 100 rupees to, to about Rs: 700 in a school like Sri Rahula KV and Rs: 10,000 or more in a school like Royal College. No wonder some schools are more popular than others.

Provincial level

There is bound to be quite a bit of variation across schools regarding per capita spending on student development because it is doubtful all principals would be as committed as Mr. Janaka and all school communities would be able to support their school to the same extent. Despite claims for free education, in Sri Lanka we essentially have a school system which gives widely varying learning experiences for students depending on the income level of the parents. How can we minimize the differences in the learning experience of the students? Mr. K. Suwarnarajh, former President of National College of Education, Vavuniya, gave some ideas as to how the state can make school funding more equitable. He noted that schools receive funding from the following sources Government Funds (Provincial fund; and Special projects and Grants from the Central Government)

- Non-governmental (Parent, well-wishers, old students' associations, NGOs)
- Income received from school, land & buildings

The fund received from parents, well-wishers, and old student association depends on (1) The affection & loyalty with the school, (2) the Economic condition of the school society (3) Number of old students (4) The principals' leadership in raising funds & utilization of the funds received by the school. The schools in the Northern Province are of three types according to the strength of the old students' associations – those that receive funds from 1) Local and foreign sources; (2) Local sources only (3) Little to no funding. Most schools are in the third category. Expenditure at school level is of two types operational and developmental. Operational essentials include electricity, telephone, cleaning, maintenance & security. Development expenditures include

curriculum implementation, physical resource development, teacher development, student development, library development and co-curricular activities. Funding from Old Students' Association funds can be limiting because they either fund to popularize their old student association name or develop certain areas according to their desires. In some rare cases the school principal determines the needs. Another limitation of non-governmental funding is that these funds are usually directed at physical developments. The funding for the students' leadership development or teacher's development is very less. Mr. Suwarnarajah suggests the following to make the funding for student development more equitable:

- A trust should be established at provincial level
- NGOs should be encouraged to donate to this fund
- The trust should assess the needs of the school and make grants as needed
- Principals should be trained to prepare project proposals and reports.

There is bound to be quite a bit of variation across schools in regard to per capita spending on student development because it is doubtful all principals

Line Ministry Level

Dr. Madhura Wehelle, Additional Secretary for Policy and Planning, presented the budget process at the Ministry. The education allocation for 2021 is 306 billions of which 162 billion is designated for the provincial schools. She was not able to give an exact number for expenditure on 373 national schools, because of the complexity of the budget with allocations distributed across the line ministry and four state ministries. She invited researchers at the forum to do an in-depth analysis of education funding. The other key information that she shared is that 95% of education spending is for salaries. This is a clue as to why there is no money for student development. Our school education system is essentially a mechanism for providing employment.

Source : <https://educationforum.lk/2021/02/policy-dialogue-12-inequities-in-funding-schools/>

Table 2: Expenditure on Education 2013-2020

EXPENDITURE ON EDUCATION: 2013 - 2020

(Rs. Million)

Nature of the cost	Year	2013	2014	2015	2016	2017	2018	2019	2020 ⁽¹⁾
GDP⁽²⁾		9,592,125	10,361,151	10,950,621	11,996,083	13,328,103	14,290,907	15,012,953	14,972,995
Total Government Expenditure	Recurrent	1,205,180	1,322,898	1,701,658	1,757,782	1,927,693	2,089,713	2,424,582	2,548,359
	Capital	454,303	459,855	588,175	577,036	638,343	612,561	619,069	795,368
	Total	1,659,483	1,782,753	2,289,833	2,334,818	2,566,036	2,702,274	3,043,651	3,343,727
Total Expenditure on Education⁽³⁾	Recurrent	131,748	141,875	189,894	193,727	201,286	216,094	256,769	250,493
		(80,598)	(88,927)	(117,076)	(112,833)	(113,418)	(123,558)	(141,746)	(150,704)
	Capital	18,526	34,774	39,153	40,183	55,221	55,617	48,409	43,967
		(2,013)	(3,324)	(5,518)	(5,235)	(7,322)	(4,435)	(2,728)	(2,402)
	Total	150,274	176,649	229,047	233,910	256,507	271,711	305,178	294,460
		(82,611)	(92,251)	(122,594)	(118,068)	(120,740)	(127,993)	(144,474)	(153,106)
Total Expenditure on Higher Education⁽⁴⁾	Recurrent	22,494	26,826	32,071	35,498	38,729	45,823	59,009	57,960
	Capital	8,969	16,770	18,099	19,833	20,276	25,538	28,281	25,826
	Total	31,463	43,596	50,170	55,331	59,005	71,361	87,290	83,786
Expenditure on University Education⁽⁵⁾	Recurrent	21,655	25,737	30,848	34,196	37,357	44,316	57,231	55,911
	Capital	6,183	11,200	9,735	14,719	14,578	15,201	15,377	12,756
	Total	27,838	36,937	40,583	48,915	51,935	59,517	72,608	68,667

Notes:

- (1) Provisional.
- (2) GDP at Current Market Prices. Data is based on the base year 2010 GDP estimates of the Department of Census and Statistics.
- (3) "Total Expenditure on Education" refers to actual expenditure of Ministry of Education, General Education under Provincial Councils, Ministry of Higher Education and University Education. Figures given within parenthesis indicate expenditure on general education under Provincial Councils.
- (4) "Total Expenditure on Higher Education" refers to actual expenditure of Ministry of Higher Education and University Education.
- (5) "Expenditure on University Education" refers to actual expenditure of University Education under purview of the University Grants Commission which

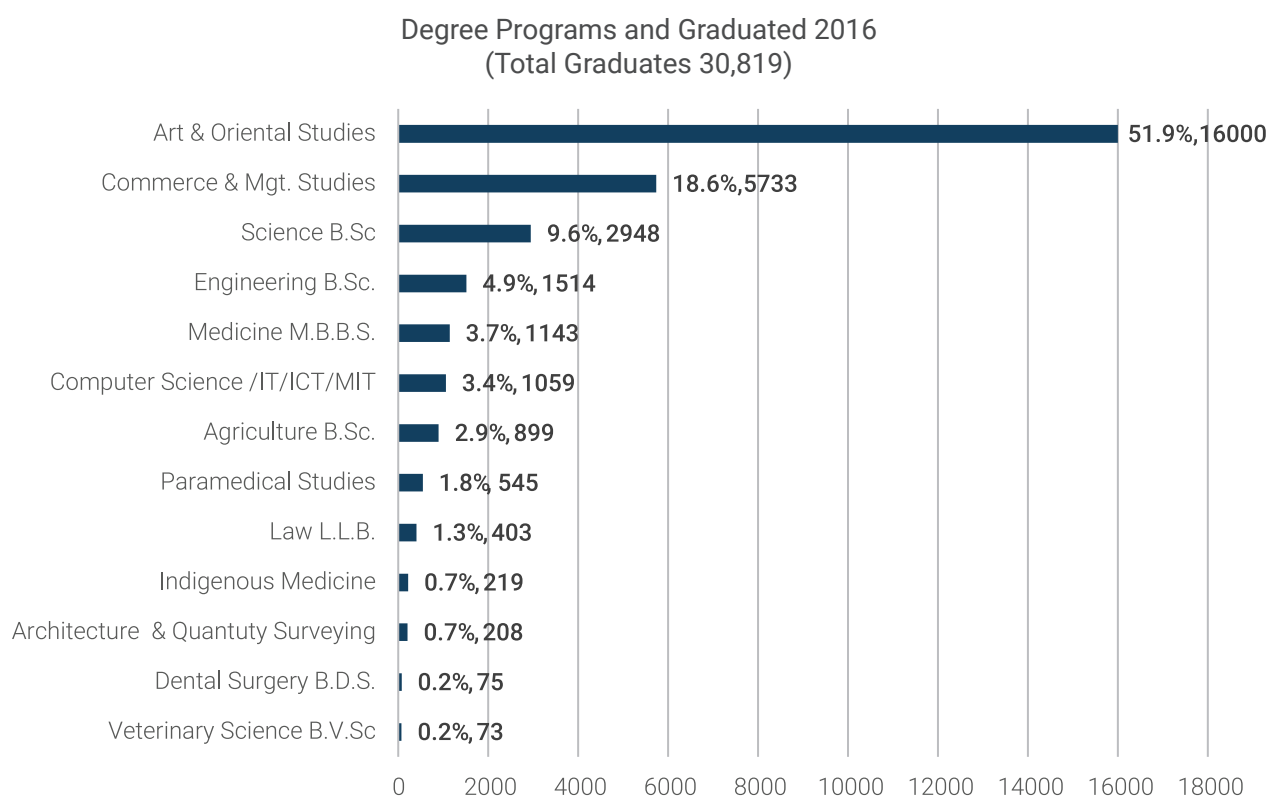
Sources:

- (1) Central Bank of Sri Lanka.
- (2) Ministry of Higher Education.
- (3) Ministry of Education.
- (4) Ministry of Local Government and Provincial Councils.

Figure 4: Higher Education System - Sri Lanka

Universities 33	National 15	Schools 10,254	Government 10,165
	Institutes 18		Private 89
Students 110,287	Universities 84,451	Students 4,197,253	Government 4,061,653
	Institutes 3,290		Private 135,600
	OUSL 22,546		Teachers 254,082
Lecturers 5,440	Universities 4,861	New Admission for Grade 1 343,912	Private 7,490
	Institutes 270		Government 333,074
	OUSL 309		Private 10,838
New Admission for Degree	29,083		

Figure 5: Degree Programs and Graduates 2016



Inequities can arise in multiple ways, and it is possible to observe practices and scenarios that identify the presence of inequities in the education system in Sri Lanka. One may say these are likely to be present in any economy, including the United States. The cause for concern is the extent of inequity and the prevailing directions of inequality, which only appears to enhance the issue.

Table 3: Factors of importance that contribute to inequity / inequalities in the educational service of the country

- **The 1.5% of GDP allocation to education is significantly less than what is required to support developments in the education sector.**
- **Teaching may still be considered as a noble profession, but when considering national status; it is one of the least paid jobs currently. The university structure at present is satisfactory to some extent.**
- **The huge variation in service quality due to poor resource availability – the school system has a significant quality variation both across regions and in local levels.**
- **Early Childhood Education does not exist as a part of the education system and the conditions vary significantly.**
- **TVET system is quite weak and suffers from skill drain, as well as a lack of connectivity to industry in many sectors.**
- **It is not possible to realize education in all areas through the school system. For example, availability in the science stream is significantly limited.**

- **Almost static educational curricula where the change is process driven rather than need and necessity driven.**
- **A significant digital divide exists in the system at public, private education systems and rural, sub-urban and urban levels.**
- **The education system at present does not support the realization of information transfer to knowledge and skills within recipients.**
- **Multiple education systems are currently available: different curricula, different time scales, different criteria, free and at cost etc.**
- **Under the umbrella of free education, the notion of free is perhaps almost notional.**
- **Opportunities for acquiring new knowledge are limited.**
- **Availability of science education is restricted and there are no opportunities for informal education.**
- **Inherent issues across the following sub systems contribute to inequalities in the education service provision: rural / urban, privileged / under privileged, language wise divisions, national / international, religion specific environments, stream-wise divisions, and the tuition eco-system. Understanding these sub-systems is important in driving towards reaching informal systems of education are conspicuously absent.**
- **Sri Lanka is the only country in the region that is lacking a Science Center.**
- **The role of technology in shaping and driving convergence in education is not factored in.**
- **Values and ethics are slipping away from education. The growth in technology demands should be considered.**

All these aspects are dealt with in the following discussion. Perhaps Table 2 provides the basis for action in ensuring a value-based education system in Sri Lanka.

Equality can be achieved through quality investments, both in infrastructure and human capital. The World Inequality Database in Education (WIDE) of UNESCO enables a quick comparison of different countries. WIDE provides country data, which reflects the situation arising out of circumstances such as gender, ethnicity, wealth, and location. These are factors which an individual has little or no control over. However, what is evident is their ability to influence the realization of educational benefits. Specifically, for Sri Lanka, the latest WIDE data available is from 2006, which points to poor data availability or communication. Similarly, this aspect is seen with the Global Innovation Index 2020, where Sri Lanka recently demonstrated a drop of 11 places, and in one specific data set, the number of science and technology graduates passing out of the tertiary education system is indicated as "Not available". Such lapses in data influence decision-making as well as the image of the country. WIDE highlights inequalities in its broadest terms, highlighting the passage of children through the different stages of education. There is no higher-order analysis available from this site. Thus, there is a significant problem in the tertiary education stage. However, whether one can accept the primary and secondary stage performances indicated, which display school entry with a low dropout rate, as satisfactory is a question.

The signature role of education in any society has never been questioned, and this is true for Sri Lanka as well. However, what transpired when studying the characteristics of the current and the emerging Sri Lankan scenario, looking at it from an analytical perspective as opposed to an educationist theoretical lens, is that this understanding is not reflected in practice and decision-making. This policy paper is written in a policy advocacy manner with a techno-economic perspective.

SLNHDR (2018) provides some important analytical views on student populations and their passage through the educational system. It primarily addresses horizontal inequalities of the education system within that particular area of study. The general analysis of student residence times within the schooling system indicates a higher than the average expected, and mean years of schooling. This results in an HDI higher than the global average and even competes with countries with higher levels of human development. These values are input values and they do not consider the quality of the function realized. The quality to some extent cannot be entirely discounted when one observes the acceptance of graduating classes in external environments. The latest available IQ survey across many countries, places Sri Lanka just above Nepal at a lower level in the league, while the countries at the top are all Asian countries (Box 1). Sri Lanka has never participated in a Programme for International Student Assessment (PISA) scheme. IPS (2017) attributes the poor performance in education to high heterogeneity of school-level resources – the size of the school, no. of qualified teachers, teacher absenteeism, and the qualification of school principals, region, or a country.

Box 1: IQ score highlights quality of education system

Wednesday, October 7, 2015 - 19:30S
Siri Hettige Professor of sociology, University of Colombo



Recently published reports on the average IQ test scores for countries across the world show that Sri Lanka's average score is very low in comparison to many other countries in Asia and elsewhere. The highest and the lowest scores reported are 108 (Singapore and Hong Kong) and 59 (Equatorial Guinea) respectively. Sri Lanka stands at 79, closer to the lower end of the spectrum. Among the Asian countries, Sri Lanka is ahead of only Nepal. Some of the Asian countries such as Hong Kong, Singapore, South Korea, and Japan have 108, 108, 106, and 105 respectively, the highest scores in the world. Only a few European countries score 100 or over. They are Switzerland, Austria, Netherlands, Norway, Luxembourg, Italy, and Iceland.

There is general agreement today that average IQ scores of countries are indicative of access to high-quality education rather than the innate intelligence of people. Thus, research evidence shows a very high correlation between the level of educational attainment and scores in intelligence tests. In this regard, scores in maths, science, and language are closely related to scores in IQ tests. So, a lower average IQ score is indicative of the quality of the country's education system, educational inequalities, and access to quality education. A study conducted by the National Education Research and Evaluation Center (NEREC) of the University of Colombo in 2004 on the educational performance of primary school students in the country showed that performance of a large proportion of primary school children in the country in

such areas as maths, science, and language was poor and this no doubt was indicative of the serious deficiencies of the education system of the country. There has been so much criticism of our education system over the last several decades. While one of these has been our almost total preoccupation with memory testing examinations from Grade 5 right up to university level at the expense of providing children and youth with a more skill-oriented, all-round education that emphasized critical thinking, problem-solving skills, and life skills, logical reasoning, etc., the other has been on the growing educational inequalities within the country, leading to an unnecessary concentration of a large proportion of children in a few privileged schools, both public and private and deprivation of many who attend poorer rural and urban schools.

Underprivileged schools

As is well known, the vast majority of secondary schools do not have facilities to teach subjects in the science stream at GCE A/L. Moreover, many underprivileged schools do not have competent maths and science teachers. What should also be noted is that the quality of teachers has declined over time, forcing most parents to take children around to give them private tuition to make up for the deficit of school instruction. Today most children spend many hours travelling back and forth from schools rather than concentrate on reading and other education or real-life related activities. In spite of the presence of serious issues within the country's education system, successive governments and national educational institutions have shown little or no interest in responding to these in a rational and systematic manner. Meanwhile, we talk about the need to allocate more money for education, as if this is the most important problem in education, whereas the biggest challenge seems to be to liberate education from persisting political control. As is well known, every newly appointed minister begins to pretend that he or she knows everything and educationists, if at all have to play second fiddle to him or her. This is a recipe for disaster because all those who know something about education take a back seat and enjoy life, without making an effort to point out that most education ministers, perhaps with the exception of the first Education Minister, Dr. C. W. W. Kannangara, did not know much about the complexities of education.

Source: <http://www.dailynews.lk/2015/10/07/features/iq-score-highlights-quality-education-system>

If education is skewed to rote learning and an examination mindset, these attributes take a direct hit, and the result is poor human capital – the most applicable term in this century.

Nutrition and education too are intrinsically connected. Our culture dictates the idea that a hungry stomach is not conducive to learning or taking on any philosophical thought. However, this situation is prevalent and is the reality in schools across regions. The reduction in access to nutritious foods will have further impacts on health. For example, the number of children unable to consume iron-rich foods could increase, with potential impacts on their cognitive development. Stunting and wasting levels among children are also likely to rise (prior to the crisis, Sri Lanka had the 9th highest wasting rates in the world). This UNICEF reporting on Sri Lanka makes for a distressing read and it is quite clear that this should not be the case. Nutritional security of the country needs closer scrutiny and planning. The education process is continually affected due to nutrition-related issues, and these impacts are the result of irresponsible decision-making. Intervention demands much more than a free glass of milk!

From an economic perspective, the required nature of education in the technical domain is quite weak, indicating a higher attention requirement from the top. Those with a non-technical (particularly non-STEM skill set) constitute the bulk of students. As a result, there is a gross mismatch with the job market and the unemployed and underemployed are in turn feeding into another socioeconomic crisis. This vicious cycle needs to be arrested. It is important to consider the results from an Australian analysis, which indicates that if 1% of the student population switches to STEM subjects, the Australian economy stands to benefit by \$50 billion. This is an interesting analysis and the lesson offered should be taken up in Sri Lanka considering the fact there is a significant income migration to Australia for educational services (one country among many), which later transfers to brain drain as well. The Australian economy is gaining without any investment, and this is certainly true of economies which are built on the migrant factor (e.g. USA). Head of WIPO GII program, during his first visit to Sri Lanka, asked why Sri Lanka expends so much time and energy promoting studying abroad. It was quite a revealing question and when one sees thriving businesses with this business plan in operation, Romer economics cannot deliver for Sri Lanka.

When disaggregating data and findings across the Sri Lankan landscape, glaring inequalities come to light. With significant educational inequalities present, there is no way of realizing equality and growth in outcomes. The results clearly demand effective investments embracing more openness to partnerships and technology.

The Sri Lankan education is not just one system - there are multiple sub-systems operating within it. Broadly, it has a public side and a private side. It also observes national curricula as well as external curricula systems in operation. As a country focused on growth and the achievement of growth with the right mix of human capital, these mixed approaches are worthy of analysis.

When having multiple mechanisms with different endpoints, it is questionable whether such goals are realistic.

The basic physical infrastructure is a variable too. Provision of basic Water, Sanitation and Hygiene (WASH) infrastructure is an issue in certain schools, and there are also plenty of situations where access and transport to schools are a hardship that has to be endured every day. Certain sectoral deficiencies are also quite visible, such as in the plantation sector. It is worth investigating why these deficiencies are present two decades into the 21st century when there have been many infrastructure-related projects in the past. A technological approach in resolving this issue requires contemplating whether the entire public education system be considered in one Enterprise Resource Planning platform (ERP). Examining the current questionnaire-based database approach indicates the need for radical change to the basics of management.

Another significant difference to be highlighted is the disparity in qualifying when following these two different streams. An article (Box 2) emphasizes this and at present, the difference is worsening. When a group of students get a 2–3-year advantage, the system is no longer equitable. An extract of an advertisement published in a local paper (Table 3) demonstrates the issue raised above. The process offered is appealing and can push parents to prefer it, although the net results are unclear.

Do you want to be a globally employable graduate at the age of 20?
(Making an employable university graduate at the age of 20?) - this is the institutional promise to the aspirant. The process is explained as follows:

Table 4: Making a globally employable graduate at age of 20

Age 16	Finish O/L examination
Age 17	Finish university foundation in one year
Age 18	Finish 1st year of university degree (diploma level) at the age of 18
Age 19	Complete 2nd year of the university degree at the age of 19
Age 20	Complete the final year of XXX (an overseas university) degree at the age of 20
Age 20	Opportunity to start postgraduate studies

This is to be compared with the reality within the public secondary and tertiary education system. The earliest a student can graduate is at the age of 23. Starting postgraduate studies within the same year is impossible. The public system entertains many gaps, whereas the other pathway smoothly follows one stage of education to the other. The idea should be not to curtail these systems but learn from and address deficiencies ensuring that the public system becomes competitive.

Box 2: OH MY EDUCATION! I AM TWO YEARS BEHIND!!

Thursday, 6 September 2018 00:05

The print-richness of classrooms in some countries is not seen in our classrooms

This column gave rise from many communications and observations after a discussion with my Head of Department at University of Moratuwa. Not having direct evidence, myself, I was quite intrigued by what I heard and there was the need for some quiet fact checking. I found the situation really disturbing. My initial take home point was that two children from a lower grade deciding or pushed on two different pathways can find themselves in very different positions with time. Someone who opts to follow an external curriculum and in perhaps in the English medium too can find him or herself in the second year of a university degree program while the friend from the same class staying on course with the national education system will be just sitting down for Advanced Level examinations! We are seeing an almost two years of difference and what one can do with a head start of two years in this day and age with globalization, technology and in a fast-paced world is surely clear to anyone. I again found myself observing the scenario of a bright kid who has been shown a different pathway by her father opting to follow a professional management course after Ordinary Level examinations and then completing course with flying colours and today occupying a senior position in the private sector having to handle responses again from her former classmates who are just coming out of the final examination from the public university system seeking placement opportunities. It was interesting to hear that she will grill them for the couple of placement opportunities available. The senior management of many a private organization, however, may not be quite sympathetic to the public sector university graduate who may have the label of 'not employable' too due to multitude of reasons some reasonable and some quite unreasonable! As time moves on with the numbers that the system produces, there may not be any compelling reason even to consider the output as they will have a wider choice available to them. The State then may have the uncomfortable situation of addressing this growing unemployment issue among graduates.

A system of education which opens up minds

What I feel is that there should be all the opportunity for oneself to do and learn as one wishes. It is really important that all learn because they love to rather than they have to. The importance of learning should be positioned within any child's mindset at an early stage but that should happen in a creative manner. That is also a product of the environment. In that context having the opportunity to follow what anyone like is a real capability of the system. I see the flexibility and the opportunity when Steve Jobs wanders into a calligraphy class and then changes the world, Watson seeking courses on crystallography and cracking the DNA code, forever changing the world. Behind these episodes lies a system of education which opens up minds. Today we hear Finland surpassing United States in the process of education. However just by rushing into Finland one may not exactly would be able to emulate the Finns. One is quite sure that when you land in Helsinki and walk about you will not be seeing walls plastered with Einstein's and Socrates' offering classes from ages one to any level. Sri Lanka must have the only capital in the world that you see this spectacle of education service offerings. We are truly in a class of our own. An exception may be in neighborhoods in Australia where we have migrated in droves and the process of education in home style is quite ably emulated. Yet you will not find big colourful posters on bus stands and on lamp posts but may be a small, laminated notice on corner shops and notice boards. Some due diligence to local culture still had to be adhered to.

Public education system should be jewel in the crown

We just cannot have the public education system as it reaches the university level falling way behind the multiple alternative systems that exist in quite big numbers outside. A public education system should almost be the jewel in the crown of your society as it sets the stage for your own society's future. Today we have a significantly leaking public education system. One may say that around 350,000 enter to the school system at Grade 1. As they progress over 13 long years the number entering the university system is about 29,000 per year. Now this 29,000 enters to about 15 universities across the country. We see private university service providers who are capable of providing 21,000 entries in one single location. We know that setting up of educational institutes makes such a sound business case in Sri Lanka. This basically exploits the fact that for any parent their children's education is a top priority. Even when speak of free education the IPS State of the Economy report for 2017 indicates that over 45% of a SL household's education budget is spent on private education. It is not uncommon to find families who make serious sacrifices on behalf of their children's education. Only hospitals may have a better ROI but definitely the required capital for an international school is much less. Consider the leakages of our system as it moves from Grade 1 to university graduation. The leakages are significant. However, we do have the reality of even the final output taking to wings. It is quite important that the State has now taken the decision to support student's mandatory passage to advanced level from ordinary level. We live in an era where a child gets the experience of tuition almost from the first day of school. It appears that parents are so keen to see that they repeat whatever the subject that the child learns at school by placing the child in another class. The well-to-do may opt for individual attention. University graduates elsewhere may get social experience by working in McDonalds or Burger King but in Sri Lanka home-tutoring visits provides the opportunity space. To witness the power of tuition is to observe the traffic and crowds when these supporting classes end. Public schools in Grade 13 may not see any students coming in for classes. As per the teachers the classrooms at this level are almost empty. However, close-by buildings which offer the surest way to get an 'A' are full of students who are so busy practicing what is defined as rote learning. The creative spirit of our future is withering away in our town and village centres within buildings in environments, which are not at all conducive to learning while we speak of becoming a knowledge economy.

Immediate need for change; the future is at stake

These children usually are experts with their mobile phones. You do not take notes. Today you snap them and WhatsApp to your friend who is busy with other things – not in school, not in the tuition class either and most certainly not in the library! Having dug into social research I now believe in some immediate need for change. The future is at stake. We just cannot push the students to learn and benefit from the public system. Literally from Grade 1 some positive changes need to happen. I enter classrooms and my mind sees the classes I have seen in other countries. The richness of a classroom is not to be seen in our classes. Educationists identify this as print-rich rooms and certainly that feeling is absent. For a child at an early stage for development this is perhaps very important. Most certainly there is a need for the change of atmosphere in a school in both software and hardware. How can one have a learning process, which is not dictated by the final examination, the spectre of limited opportunities at public universities, and finding alternate opportunities which mean having money? Such stresses will not do anyone any good. Parents may have a huge sigh of relief when they find that their child has managed to secure a place in the public university system, yet they cannot be happy to find that their son or daughter will be comparatively quite old when they come out of the university. It is not only parents that should be worried the decision makers and planners too. If you have your human resource spending two more years because of inefficiencies, you really must be sensitive to the enormous opportunities lost as a result. It is definitely possible to eliminate this time difference that is taking place between the private and the public systems. Removal of this is an imperative. The public educational system just cannot afford to have this embedded deficiency and playing second fiddle to another.

No interest in sharpening the blade

Nelson Mandela stated, “Education is the most powerful weapon which you can use to change the world.” Over a long period of time, we have been dealing with quite a blunt weapon and with no interest in sharpening the blade. My short conversation seriously implanted in my mind the need to address these serious deficiencies – we have not much of love for learning, so much interest in money yet no sign of entrepreneurship, multiple systems with different speeds with the national system being the slowest, we can learn Korean with speed but not English even if we study it for many, many years, etc. Sri Lanka is in serious need of competent human capital, but we see mass migration and mass employment as three-wheeler drivers and graduate assistants. I see the need for change... do you?

Source: <http://www.ft.lk/columns/Oh-my-education-I-am-two-years-behind/4-662297>

In Sri Lanka, both free health and free education have definite cost elements to the receiver, which implies that the concept of “free” is not fully realized at present! Closely following the education system is the tuition system, which is perhaps unique in Sri Lanka and seen overseas in places where pockets of Sri Lankans live. Families have a significant cost burden in managing tuition. Even in the public school system, there is a distinction between the “popular” schools and the remainder – another fallacy that is crippling the real purpose of education. With 11,000 public schools, the number of popular schools is 36. There are 376 national schools. This number is relevant to the Grade 5 scholarship examination and has resulted in another sub-culture of classes and education starting from Grade 3 itself. The race is on in every parent’s mind with the aim of getting placement to these popular schools, particularly if a Grade 1 admission opportunity was not available. Getting placement to Grade 1 is another issue in itself. The race results in another program, which does not contribute to real education and has even been identified as robbing the youth of quality time. The parental obsession with school admission could be counterproductive and goes beyond the education sector. Gunasekera (2016) forcefully and lucidly argues for many changes that are needed in the schooling system of Sri Lanka. Our education system at present is a clear example of the fact that what is right is not popular and what is popular is not right!

Available data indicates that in 2016, Sri Lankan households in the poorest decile spent Rs 92 per month on education, while the richest spent Rs 7,741 (8300% more). Of this expenditure, the poor spent 48% on private tuition while the rich spent 26% on the same. This prevailing inequality is quite clear and reinforces the fact that the concept of free education is not exactly present.

Technology can be a strong enabler and equalizer. Education determines an individual’s final earning capacity, and any disparity reflects differences in the education received. It is vital that parents understand the value of education. However, the system should also have a clearer idea of what is of value when implementing proposals.

Sri Lanka had not shown an improvement in the Gini coefficient since independence. The disparity between the rich and the poor has kept growing and this is of significant concern. This fact is also an indictment of policies and management in place thus far. This reality reflects existing educational disparities directly. How can one address a single segment of policies when the broader set of policies has failed to address this fact of growing disparity with the overall topic missing from the national agenda?

A particular segment of the population that has faced significant barriers in education are the differently abled. This is another gap that could be tackled well with technology. PIM (2016) indicates that in four areas tested for ‘identification of Special Educational Needs (SEN) in primary schools in Sri Lanka, namely, ‘awareness of teachers and management’, ‘attitude of teachers and management’, ‘steps taken in schools for SEN identification’, and ‘attitude of parents towards SEN’, were at a very low level. SLNHDR 2018 concludes that parental education and income are key drivers of educational outcomes. Some positive developments have been the lower gender gaps in expected years of schooling and parental education becoming less important in educational outcomes of children. Research has also indicated that there is a prevailing tendency to invest more in the education of girl children.

Free education up to the university level is an important feature of the education system in Sri Lanka. In recent times the issue has been limitations in entry to the system. Although many qualify to enter public universities, only a small percentage find their way in. As such, there is always popular pressure to increase admission numbers. Increases in numbers are also commonly seen, although the increases are never supported through an infusion of resources. Currently, there is a proposal to admit 10,000 more students to public universities in 2021. This is an increase of 30%. There is an additional plan to increase entry to state technical colleges. The planned increase is from 100,000 to 200,000. Furthermore, there is a proposal to create a system of city universities catering to every district. There is also a proposal to set up a university township for universities in other countries to set up franchise operations enabling foreign students to come to Sri Lanka. A myriad of new options is afoot.

An additional investment currently in planning is the provision of SMART TV sets to national and provincial schools. Under this program, 7000 TV sets are planned for distribution with an investment of Rs 495 million (the ratio in service is 1 TV set for 100 students). There are at present quite a number of TV channels airing educational programs. A separate state ministry has also been established for Education reforms, open universities, and distance learning promotion. Further, underdevelopment is a digital resource collection saved on DVDs and expected to be shared via pen drives. A streaming hub is to come into operation soon which could be a significant support mechanism to so many underprivileged. It must be indicated that Sri Lanka has invested in establishing a cloud service (Akash), but that is not factoring into these plans at this stage.

The University of Colombo (UoC) School of Computing had been running a project through Swedish funding to create a National E-learning center. This is expected to provide support to develop a national e-learning movement in Sri Lanka. The center has supported development programs in external universities as well (i.e. Bhutan). The University of Kelaniya too has an e-learning resource center. Another facility at UoC is the National Education Research and Evaluation Center. The role of these centers in the overall education system itself at present is not quite evident.

Higher education systems need some radical overhauling, as is shown by the Central Bank (CB) in their annual report of 2019. The gross tertiary enrolment rate in Sri Lanka, which is 19.6%, is lagging even behind an average lower middle-income country. A comparable upper-middle-income country would be averaging 53%, and Sri Lanka's numbers call for strong intervention. CB highlights STEM field enrolment in universities, which is 14.8%, as an even poorer figure. Poor STEM enrolment at tertiary levels reflects poor performance in science and maths at the upper secondary level.

SDG 4 and Education's role in Sustainable Development

The United Nation's 17 SDG goals with the overall aim of "Leave No One Behind" have as its 4th Goal, Quality Education. The UN has defined 10 targets and 11 indicators for SDG 4. Targets specify the goals and indicators represent the metrics by which the world aims to track specific achievements. The summary at present as measured at the global level indicates a sad picture. Although it's the final decade to realize the SDG goals, the prognosis is bleak. Due to COVID-19 in 2020, the UN admits to having pushed back perhaps almost all the gains realized in education till that time.

COVID-19 while directing school closure also demanded remote learning as the way forward. The UN is indicating that 500 million students do not have access to remote learning. The evidence to date also demonstrates that while access may be present, quality is far from satisfactory.

Figure 6: SDG 4 and COVID-19 implications



The country evaluations on SDG 4 as per the UN SDG tracker present a situation of no data across all targets (www.sdg-tracker.org). The Sustainable Development Report (2020) however indicates the national contribution to SDG 4 to be on track. It is one of three positive assessments for Sri Lanka. In the overall evaluation, SDG 4 appears to be the best performing action among all. The table displays the SDG 4 target assessments presented for Sri Lanka.

Table 5: SDG 4 – Quality Education (SDG Dashboard 2020)

Net primary enrolment rate (%)	99.1 (2018)
Lower secondary completion rate (%)	96.4 (2017)
Literacy rate (% of the population aged 15-26)	98.8 (2018) - indicates trends not being available for this target

The targets and their areas indicate that performance is not measured in some of the challenging areas of the country's education system – the tertiary and vocational sectors. The systems of free education and mandatory schooling over a long time have resulted in these parameters becoming quite positive. SDG 4 indicators and targets are not sufficient for the country in facing up to the emerging future. It is important to benchmark the best or upper percentile nations in driving decision-making. The current value may be comforting but serves no purpose.

STEM Education for Economic Growth

With Industry 4.0, Education 4.0 STEM education is quite important. Teachers need to have STEM elements within them too, which commands learning by those who teach. STEM is a universal requirement in these changing times. It is important to understand the potential for economic development. This is highlighted as in Sri Lanka; this awareness is currently missing – particularly in the main discourse. However, with the efforts of many across the local education system, a report was presented to Parliament on 03rd January 2020. However, this did not garner sufficient attention. This effort was based on and was facilitated by the Cabinet paper for STEM Education requirement that had been presented by the Ministry of Science Technology and Research in August 2017. The Ministry of Education started formulating the policies from May 2018 onwards, and the Sectoral Oversight Committee on Education and Human Resource Development finalized the Policy Statement and STEM 2030 Vision to the Parliament. Immediately afterwards another Presidential Committee looked at educational reforms. The current reform document covers the entirety of the system and if executed well, would certainly bear fruit. The present PTF report addresses the entire education system and identifies many structural reforms needed. It pays attention to STEM and pushes for STEAM but does not address the issue in depth. If the PTF recommendations also take up the STEM reforms and consider both together the output could be extremely positive.

The initial argument was the potential ways in which STEM contributes to an economy, which are well accepted and to be pursued with vigour.

- **STEM Education prepares students to meet the challenges and opportunities of the economy in the 21st century and beyond.**
- **STEM education enhances the impact and overall effectiveness of the education system.**
- **A STEM-educated workforce adds value, efficiency, productivity, and innovation to the economy.**
- **STEM education addresses socio-cultural aspects of both the individual and society, and helps to develop a responsible citizen.**

Having recognized the importance of promoting STEM education, several countries have adopted a system to improve industrial growth, thereby providing breakthroughs and creating jobs. Countries like Australia and Canada have opened up their countries with limited work visas to attract talent. Box 3 articulates the need for STEAMing STEM! The poor STEM scenario is easily understood when considering the leaking pipeline. Consider and compare the Malaysian human resource development plan that is being executed, which strongly understands STEM requirements and identifies methods of redefining education to employment aspects.

Box 3: STEAMing STEM – Moving from horoscopes to telescopes!

Thursday, 20 September 2018 00:00

21st century skills from STEM education

Walking into an inventors' exhibition should give one an experience similar to an immersion into the future. The world change with inventions and inventors lead the change. The creativity displayed is an indicator of the creativity of the society from within which they emerge as lives of Da Vinci, Edison and Jobs would exemplify. However, when one witness an invention of a clock to display the 'Rahu' time, the feeling one gets is that we are still stuck in astrology over astronomy or horoscopes over telescopes. The observation in a recent event in Colombo reminds me of a similar comment by a visiting scientist during Arthur C. Clarke's time on the same. It was also interesting to see so many paper articles on this invention displayed by the inventor indicating the attention and the publicity that this particular invention has received. Finding time in the middle of the day and on every day too (idea of Rahu time!) that one should not work in whatever the manner is not a sign of a society that seeks progress. The creativity of the young minds needs to have the ability to channel their energies into productive endeavors. In Myanmar it appears that one has suddenly ordered all the cars to be driven on the right side because of a statement by an astrologer. However, the driver's seating arrangement has not changed, thus plunging the country into one of the worst nations for road accidents. All because someone indicated that it is bad to do what one is doing and rulers obliged. Late Abdul Kalam appealed to our students while he was in Sri Lanka to not seek synthetic happiness. Allowing the alignments of planetary bodies – real and imaginary – to determine what we do or not and when is indeed allowing serious cognitive decline! That this is 21st century is hard to fathom when one listen and observes many an action from some parts of the world including ours! If science education is made more prevalent, the universal situation can change. Much of the unscientific and baseless discussions that rage over many a topic can be averted if citizens are more grounded on exact science. Science is evolving too with time but it is the method – the scientific method that is important to have a solid understanding of. Well there is still a group of people who believe that the world is flat, etc. in USA. Not much of an issue as they are a fringe group and no major influence on US policies come from them. Probably the believers in a flat earth play a more entertaining role in today's society. They however are not immune to use mobile phones and the rest of modern-day paraphernalia and forget the principle of geostationary satellites and the consequent of earthly shape in bringing such services

Sciences and Arts

Now this plea is not to emphasize Sciences only but to bring in Arts to all as well. This introduction will enhance on critical thinking. The logical left-brain activities will be nurtured with more artistic and creative right brain activities. The challenge would be to have an effective fusion when no one loses through generalization. Science Education, Sustainability and National Development are important aspects both from a global context and of course local! This of equal importance to us Sri Lankans as well, especially as a developing nation. Closer scrutiny reveals that a serious change in mindset is required in driving these important elements in a national context. Our ratio of science to arts and commerce stands at 30:70. It has been indicated that 60% of the global job market in the future to be filled by STEM educated personnel, the grave situation facing the products from the current system is obvious. We need to flip this ratio on its head basically – we need 60:40 as a goal. Value systems and ethical

norms are quite important – two important areas any education system should support and build on. The significant erosion in this area due to the tuition culture is a serious situation which many of us have turned a blind eye. While the basics are getting affected it is a real challenge to take into consideration the additional elements that needs to be catered to as necessary when integrating sustainability concepts. As time is of the essence one will have to work on quite creatively at this juncture. Quality of education is a core attribute of a society and we stand to go up or down with it! When Civics departed from our curricula it appears that Civility also disappeared. Something educational reforms should bring into at entry level perhaps. It is important that the basics are dealt with first. Imparting the basics should not be in any way compromised. We need to introduce all fundamental sciences and open up the educational pathways for different carrier options. Separating biology and math streams would prevent organizations learning from organisms – so important in bringing in sustainable development or in introducing circular economics. We have pursued with this division far too long and it is time to drop this and develop. We cannot have arts going separate ways to science as well from an early division.

Emphasis on STEM education

There is a need to emphasize on STEM education in Sri Lanka. We do have a deficiency in science education. Of all the schools, which number around 10,194, we only find science at advanced level only in about 1,000 schools (experimental learning so vital in science is lacking even in these schools.) I know my passage through a leading school in Colombo went through minus laboratory studies, which I compensated by having a small lab at home! That is not possible for everyone. I did it because of the great influence of the Science teacher I had in Grade 6! This is an important point to understand – the school system is as strong as its teachers. Teacher has a unique responsibility and the status of this profession really needs an upgrade. We may not understand the vital contribution of the primary teacher and the rest of the teachers to follow as a child advance. If one thinks that a university teacher can mould any input to a productive output one is sadly mistaken. Today we observe the issue every day. Infusion of STEM with Arts STEAMing STEM refers to the well-accepted trend in ensuring quite a broader education and refers to the infusion of STEM with Arts. STEAM is an educational approach to learning that uses science, technology, mathematics and engineering with arts included.

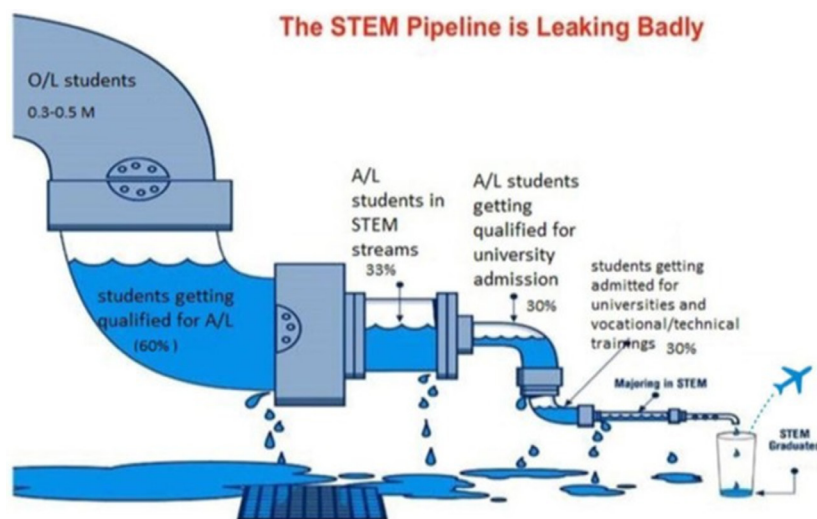
The hope is to enrich students learning experience by strengthening the three attributes of inquiry, dialogue and critical thinking. STEAM considers integrating STEM subject areas to various other relevant educational disciplines. With STEAMing STEM a broader community with STEM awareness is the likely output. Society would be so much better and they will see stars as stars and not as entities that yields influence over them. STEAMing STEM is akin to blending both science and arts education. In Russia to study Medicine the two compulsory subjects are Mathematics and Russian Language. That should be a message to some of our diehards! When you appreciate both science and arts the products can be exciting.

The spray-on-clothing is a great example of two different professions coming together due to the fact of each other appreciating what other one has to offer. The designer teamed up with an engineer to come up with a global first, which incidentally became one of the top ten nanotechnology products in 2005. For such stories to emerge from within us, we must have a strong STEM education and then place in Arts and Humanities too within. The broader initial and secondary education is a key to success subsequently. Today our practice of staying and

operating in silos indicates that we just have no idea whatsoever about another. We may sing in a Paduru party but I am doubtful whether that is the ability we are seeking with STEAM (especially when the singing is supported by alcohol). Not having had a STEAM learning I am unable to express critically but today feel the importance strongly. We have lots of arts education but only a sprinkling of science education. We do not carry out experiments. We memories how experiments are to be carried out. Then when faced with a practical situation we destroy equipment and efficiencies are not to be boasted about. No creative designing enters much of our activities due to lack of understanding of creative subjects. So much is at stake due to the prevailing ignorance. Horoscope reigns supreme. It is a rare child who sought a telescope. That ilk has to grow for them as well as for us.

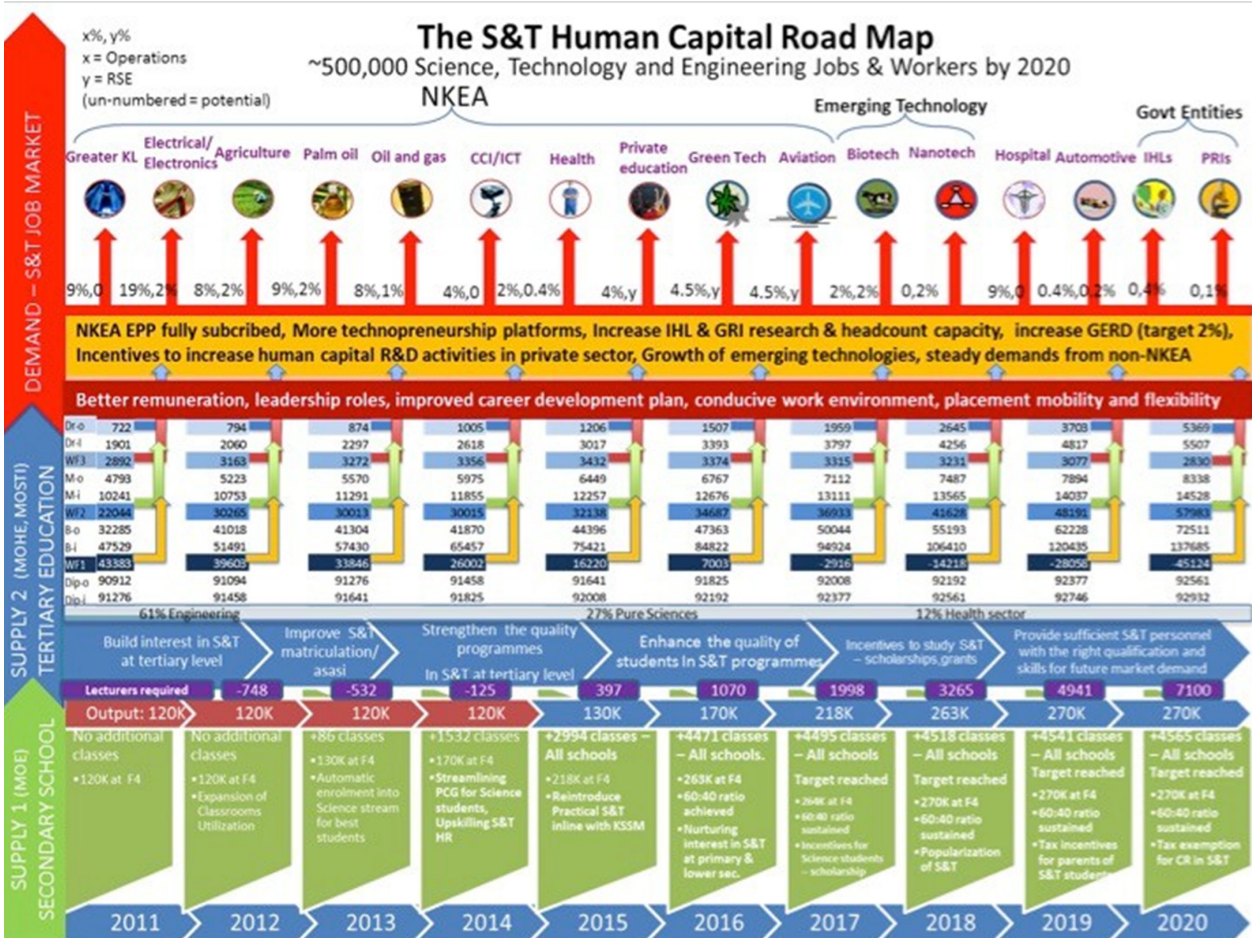
Source: <http://www.ft.lk/columns/STEAMing-STEM-Moving-from-horoscopes-to-telescopes/4-663133>

Figure 7: Sri Lankan STEM pipeline



The Sri Lankan STEM pipeline is leaking badly, and even at the end there is drainage due to brain drain. Interestingly, brain drain statistics are not available for analysis. Only skill migration to countries such as the middle east is measured. As per UNESCO data, there are about 15,000 students from Sri Lanka who are engaged in overseas educational institutes. These numbers too are latent figures to add to brain drain.

Figure 7: Malaysian S&T Human Capital Roadmap (Hamdan, 2012)



The Malaysia S&T Human Capital Road Map is an interesting planning exercise that demonstrates the details by which the planning and decision making is occurring. Malaysian planning is an example to be emulated, as it well understands the importance of education to employment. ICT workforce is perhaps the only category in Sri Lanka that receives some detailed analysis driven by the ICTA (ICTA, 2019). In this sector, a bachelor's degree has become the standard entry qualification. Sri Lanka has a definite demand-supply imbalance in this sector and a major lack of numbers in the ICT manufacturing segment. The ICT sector is aligned more with the service subsector of the global ICT market than the manufacturing sub-sector. ICT companies in Sri Lanka create job opportunities mainly for workers with skills demanded by ICT service industries. This is another deficiency that needs addressing considering the emerging world of work.

The Sri Lankan economy shows the dominance of the service sector in contributing to the GDP. Both industry and agriculture are relatively weak sectors. An immediate result of this situation is the inability to absorb human capital developed through education. This is especially true with the tertiary education system. The lack of sophistication in the industry is a problem for the TVET sector too. There is no pressure from these two systems on the education system. The service economy's susceptibility was shown through the COVID-19 pandemic. Having lost many individuals due to brain drain, it is now almost an expectation that graduates will go abroad. There is also a lack of interest in many industry sectors to employ graduates, preferring personnel who may do as they are told. This delinking between the education system and the industry has to be addressed. With no new inflow of blood there is no

breathing of life to decaying industrial infrastructure. Except for a few sectors, this is the visible picture, and the situation further propagates inequities.

The STEM recommendations are placed as an appendix (Appendix B) to indicate the suggested developments across all years. There was a radical revision of the advanced level system to bring changes, to ensure that the current issues are addressed. Recommendations included the addition of an entrepreneurial study stream to the A/L Syllabus, in addition to the existing commerce stream. Sri Lanka is currently constrained by the extremely poor percentage of entrepreneurs, which also demands attention at an educational system level.

Technology and EduTech: A driver in Divergence and Convergence

“The future will be about pairing the artificial intelligence of computers with the cognitive, social and emotional capabilities of humans, so that we educate first”

OECD

“Pointing a cell phone at a printed QR code opens up a universe of interactive content”

UNDP

Technology has the innate ability to confer divergence. It is due to technology that we have the divided nations of today – some which are termed as industrialized and produce and export manufactured high technology goods. For many countries, the reality is still a dependence on primary commodities. Sri Lanka too is a clear example of a country where technology has created great divergence. Pockets of technology adaptation creating social growth can be seen in Sri Lanka, similar to many other developing countries. If you consider mobile phones as a basic technology, access in Sri Lanka is excellent – the number of active SIMS outnumber the population. However, advanced technologies such as the internet and broadband adaptation are limited, indicating the convergence in basics but the divergence is with the more advanced facilities. This divergence should not be allowed to grow but must be addressed.

Technology is demonstrating great convergence capability too. The mobile phone is an excellent demonstration of technological convergence. Students of today essentially have access to a computer through their smartphones. The challenge is making use of these capabilities to push the education agenda. With convergence, there are significant costs and operational benefits to be had through scaling used. M-learning platforms are EduTech opportunities that can be leveraged through mobiles. The tablet too has been a device that has transformed user experience. Today mobiles that perform a double function as a tab and smartphone are coming entering the market. The limits to technology are not an issue; the question is how technological growth can be aligned with education.

An example of a disruptive EduTech was when MIT opened its courses to the world (MIT Open courseware). Since then, Massive Online Open Courses) (MOOCs) have been a disruptive innovation in education. MOOCs with their online delivery of courses accessed via the web and open to anyone means an opportunity for almost unlimited enrolment. Different business models too have evolved (freemium business model). The opportunity to learn is available to anyone from anywhere provided that there is existing ICT infrastructure. Today multiple MOOC platforms exist. This is a huge opportunity for everyone anywhere that is still very much unexploited in Sri Lanka. Thailand interestingly has developed a national program to develop a MOOC platform.

Such a development can benefit many due to the availability of education in one’s mother tongue. The slowly developing language translation capabilities could one day disrupt this situation, removing yet another barrier through technology.

Imagination is a key element in the development of novel methods and processes by service providers. Kahn Academy with the catchphrase of learn almost anything for free is an example of innovation and imagination. Salman Kahn identified an educational need of one of his relatives and solved the issue by combining available technologies, and the rest is history. Mindspark used in India has shown significant development potential in its engagement of students in Maths and Hindi subject areas. In partnership, the Government of India has provided a learning platform named Dikshie. India, with its significant young population, has understood the importance of technology in strengthening education to address poverty.

Artificial Intelligence continues to disrupt the way the world is moving forward. Even amidst COVID-19, 2020 was an excellent year for AI. An AI-based company in Canada even unraveled the Wuhan disease emergence. 2020 has become a year where AI enters a new era. One cited example, which has a significant impact on education, is the GPT-3 algorithm. This algorithm can write almost flawless songs (as perceived by some analysts), technical manuals, and even short stories in the literary style of your choice. The capability of course lies with those who have significant computing power. At present, newspapers do have contributions from machine intelligence. When a technology appears, it is usually evaluated or examined in multiple ways to make use of it in every arena, and EduTech too would quickly enter these platforms.

Technology also enhances other aspects of education, in addition to delivery. For example, collaborative projects are made easier and problem-based learning could be facilitated. There is an understanding when videos are used in the learning process, it ensures that assimilation is better. The impact of a micro-learning environment (DCPE.me) that was set up to support chemical engineering teaching at UoM, and the benefits of how that can be coupled with the online program is a prime example in Sri Lanka. Technology enables immediate feedback to a learner, which is better than delayed feedback. In terms of response measurement, better analytics could be integrated to technologies, which would reveal significant insights to the learner. In newly available proctoring technologies these features are accessible. However, one important aspect to navigate is privacy, especially when using the camera.

COVID-19 and Education

“The Coronavirus created a digital learning gap between students who can afford several on-line tuition classes from the best lecturers and those who cannot afford nor have access to on-line learning”

Dr Sakunthala Yatigammana Ekanayake
Faculty of Education, UoP

“Only 30 pc of the student population have access, or can afford online learning”

Udara Dikkumbura, ICT branch director

91% of children globally were affected by COVID-19, while 100% of children in Sri Lanka have been impacted albeit at different levels. The long curfew period and resultant disconnect are likely to have impacts on children. Online education came on stream quite quickly and tuition also transitioned online. However, it needs to be indicated that Virtual Learning Environments (VLEs) have been present and well known prior to COVID-19 hitting us. It is the widespread enforced adoption of VLE's that COVID-19 dictated.

However, realizing that the services are a function of socio-economic standing and considering the differences that exist, the services would have served only a portion of the community. In shut down conditions, additional impacts on children are possible, and the impacts could vary based on gender too. COVID-19 indeed was a phenomenon that brought in so many unknowns into the daily equation. Yet COVID-19 also provided a pivot to change our paradigms.

An ADB review indicates that Sri Lanka has made a remarkable transition to online tertiary education after closing its higher education institutions in response to the coronavirus disease (COVID-19) pandemic. According to the universities surveyed by the study, nearly 90% of student respondents (there is a question mark on this number due to all students who answered were those who had access) have been able to access online education. This rate, as the study reveals, is comparable to developed countries like Japan. The University Grants Commission (UGC) made this transition possible by engaging LEARN and working with internet providers in the country. The free service access provided played a key supporting role in realizing this transformation. However, in the long run, the ADB review indicates the need for facilities such as laptops etc. to be provided to students. In the case of households with multiple students, the challenge is quite clear, as parents had not been ready for the provision of multiple computers and connections at short notice. Since COVID-19 the market is witnessing an array of data services (i.e. Zoom cards). However, these costs are making a serious dent in family budgets.

Local media, however, have highlighted the difficulties faced by communities in different areas. The costs of online access are a major challenge. These are problems currently awaiting solutions. When considering the availability of data resources to benefit from online learning, it is evident that many gaps exist. The cost and expenditure of connectivity is significant for many a household. It has been indicated by the UGC that 70% of university students come from households below the national poverty line.

Some positive developments seen alongside the pandemic is the e-thaksalawa gaining ascendancy and acceptance. e-Thaksalawa is the virtual learning platform that supports Grade 1-13 curriculum and is the main distance education support mechanism introduced by the Ministry of Education. ICTA has supported data-free connectivity through the telecommunication regulatory mechanism. Similarly, Telecommunications Regulatory Commission (TRC) supported the UGC to provide data-free connectivity on the ZOOM platform that enabled universities to support their students.

That the higher education environment would no longer be the same as before COVID-19 is seen by the UGC circular requesting 25% of all curricula to be carried out in a distance mode. It has just come to light that ITC has placed Sri Lanka in the top 20 nations in the world for the least expensive data services.

Figure 9: SL Media on Accessing Lessons and Cost During COVID-19

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Monthly cost for online lessons

Grade 5-9	O/L	A/L
Per month School online sessions for internet around Rs. 2,000	Mobile phone purchase (one time) Rs. 15,000-25,000	Mobile phone purchase (one time) Rs. 15,000-25,000 or laptop easy payment Rs. 6,000-10,000 per month
Tuition online fees Rs. 500-2,000	Monthly internet Rs. 2,000	Monthly internet Rs. 2,000
Group classes Rs. 3,200-4,000	Tuition online fees Rs. 4,000	Tuition online fees for three subjects Rs. 6,000- 9,000
Individual classes Rs. 3,200-4,000	Group classes Rs. 8,000	Group classes Rs. 6,000- 9,000
	Individual classes Rs. 8,000	Individual classes Rs. 12,000+

Pathways for EduTech in Sri Lanka in creating access

The traditional classroom has inherent limitations. Incrementally working from one classroom to another with investments in the concepts of the past is not going to improve the situation. It is quite clear that the whole process of education needs revamping to meet future challenges. At present, it is not fit for purpose and any more delays are only going to aggravate the situation.

Investments are key. Developing an appropriate teacher community is important. In the Edutech integrated system, many teachers may have to switch to content delivery than stand as teachers. Online teaching education enables – provided infrastructure availability – reaching any part of any country. Students stand to receive instructions from the best lecturers from anywhere in the world.

Actively taking measures is necessary. The actions necessary are in both mindset and infrastructure. Through creating access, many opportunities and pathways could be identified in realizing success. Technology is making boundaries and distance irrelevant. The future demands skills to manage emerging technologies as well. The flipped classroom concept today is a result of fresh thinking. Allowing collaboration, group work in the classroom, encouraging problem-based learning etc, are considered the way forward.

These approaches can change the differences that exist today. Incremental improvements planned across schools are not sufficient to have an impact. Teachers should also understand their changing roles. The author once was aghast to listen to a teacher in the western province who got up and stated quite forcefully that we do not need these technologies and we are doing quite well with what we have and there was no push back on that comment from the rest of the teachers present as well. The incident demonstrates the challenge that one has in trying to address the needs of the present with what is more appropriate for the future. Identifying and fighting for rights of the position, especially in a job function as a teacher is not quite acceptable. The mindset is molded from the past. This calls for a frank dialogue with all stakeholders in the education system to reach consensus and move ahead.

Education is a human activity. Technology alone is not sufficient and when applied without planning and imagination, results could be negative. Using technology inappropriately can undermine learning, especially in terms of other skills that one expects from the process of education. Hence a simple goal of adding technology, i.e. introducing a smart board and the provision of internet, should not be the way forward. Planning and promotions based on such approaches are quite evident across the landscape and this approach should be checked and remedied.

EduTech is here to stay. Significant developments and technology continue to be introduced, for which COVID-19 has been a catalyst. The E- learning-based education model has become the default mode. The vaccine is now unlikely to reset the advances made. In this era of extreme events precipitated largely due to climate change, the need for emergency learning plans for education is a necessity. This is particularly important given that Sri Lanka has been ranked high in the list of countries most susceptible to climate risks. Resilient service infrastructure should be a goal. For technology fulfillment, connectivity and bandwidth are essential. Another factor to be considered is the ability to ensure emergency power. With the resources provided, anxiety and stressful scenarios can be avoided. These steps would ensure resilience and sustainability in education. All developed plans should be properly disseminated to the community. Holding scholarship examination, O/L, and A/L had given some exposure to stress test the system and there should be many lessons available. EduTech offers seamless transfer between different learning plans and two of its most desirable functionalities are simplicity and integration of capabilities.

Sri Lanka should encourage people to enter the Education Industry. The reference here is not to the tuition industry, which is of course something that one should not have, at least at the dominant scale present today. There should be developments in the Sri Lanka Edutech sector. Currently, there are several EduTech service providers, and the list is growing. However, closer examination reveals that they are servicing mostly the private education system and even overseas demands. The public education system appears to seek outside service providers with no interest shown to anyone within. This is supported by the usual project-based developments that take place and it is easy to see the expertise bundled alongside the grant or loan, leaving little or no choice to the receiver. The lack of public-private engagement in education service provision should be examined and corrected.

Table 6: EduTech service providers in Sri Lanka

Yara Pvt Ltd	Talkative Parents platform
Third Space (Orion City)	Maths tutoring platform for UK
Next Generation Education	Genius Education System
Codegen (Pvt) Ltd	Cloud University
DP Education	Streaming external options locally

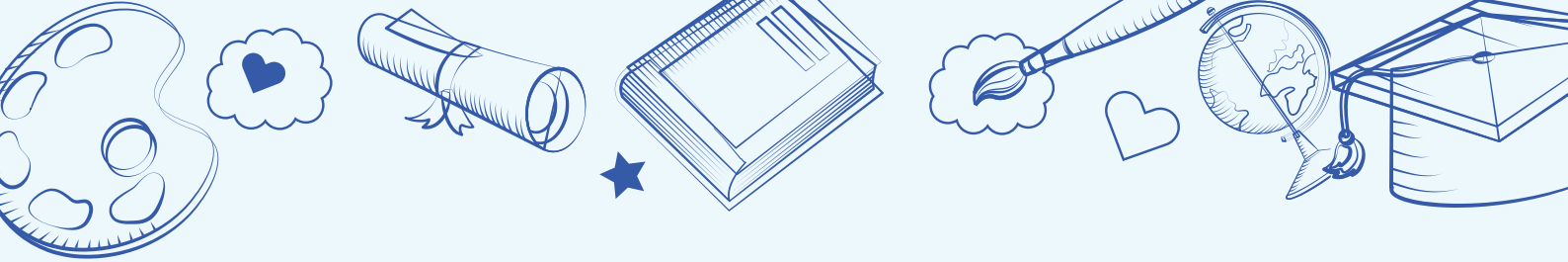
Partnering for progress is important. One can identify that the tuition system has made and is making significant progress in technology assimilation. The system transitioned to online mode with investments and skillfully managed the situation. The issue is that technology assimilation alone is not sufficient to enable the development of the future-ready workforce that the country needs.

Sedera (2016) poses a question – one among many - which is highly relevant to consider: How can we prepare the teacher not to teach but to facilitate learning and promote learners to want what they learn and help those who need to be helped? How can we create a deepening of knowledge? We are living in an era where knowledge is doubling every 72 days (applicable to 2020). It is indicated that it only takes 2-3 years to double all human knowledge. This situation is a serious challenge to educators. Teachers come from a different era, and students who come from the present must be prepared for the future. They themselves are expected to be creative and add to this knowledge economy. Technology has to be the primary tool in navigating this issue. It is known now that countries have changed and modified their approaches, and Finland is an excellent example of this. Subjects are gone and topics are in, and examinations too are on the way out. These are perhaps paradigm shifts. When most of our activities are carried out with politics in mind at all levels, how do we bring about these vital changes? Teachers have to develop result-oriented mindsets. At times, instead of complaining about resources, it is necessary to align what you have to do in the direction of what is most effective. An example comes from the state of Haryana in India and a young educationist's bold venture. WhatsApp is EduTech in that example. Seema Bansal has forged a path to public education reform for 15,000 schools in Haryana, India, by setting an ambitious goal (by 2020, 80 percent of children should have grade-level knowledge). This is an action with the imaginative use of resources. Bansal and her team are using creative, straightforward techniques such as communicating with teachers using SMS group chats, and her presentation indicates that success is being realized. It is instructive the activities developed and disseminated by Saeed (2020) which are directly applicable to teaching ICT – enabling learning key computing concepts using everyday household objects. These go to demonstrate the possibilities one has if the right attitudes are present.

How can one integrate these available options into the existing curricula and methods? Collections of open educational resources are being developed and are available. How can they be considered as part of the institutional learning curriculum? How can technology help in having resources in the mother tongue, which is quite important, especially at the primary level?

Reaching out to every Sri Lankan in education appears to be imperative. Education as an important core element in growth has to come to the centre stage again. There is no denying the spectacular nature of technological developments that are taking place.

Finally, it must be stressed that a system of morals and ethics should be taught to children from the beginning. This is becoming quite important with the diffusion and development of technologies. Emerging life sciences and biotechnologies are offering an array of challenges. How can one participate in a discussion over stem cell research perhaps is one potential challenge? Today civics too is not a subject. It is evident that the societal ill-discipline is what has placed us into a spiraling Covid-19 sink and high death rates in road accidents. The place of Sri Lanka in the global corruption perceptions index speaks volumes over the societal decline. A case for 'value education as emphasized by Sederage (2019) is an idea to be implemented.



CONCLUSIONS

In the Vistas of Prosperity and Splendor, the current state policy, the need for reforms on education is quite clear – The policy goal statement of “An Informed Citizen: A Society Endowed with Knowledge” makes it quite clear. The PTF (2020) had identified structural reforms necessary and indicate broadly the changes required. PTF report is the outcome of the pledge - “Comprehensive reforms will be undertaken to establish a quality education system to which all children would have a right to access from pre-school to the tertiary level education under a single curriculum in accordance with international standards. This will enable young children to develop their inherent talents and skills and also to select the education stream that would provide them with a pathway to the employment market”. The analysis suggests additional steps necessary in the area of STEM teaching and learning.

This draft policy advocacy paper is based on research and policy analysis done by the UNDP, IPS, plus the STEM for Sri Lanka activities, utilizing the 36 years of university learning environment experience of the author, and other state and non-state agencies and individuals in Sri Lanka. The current engagement with the national industry policy has opened our minds over industry 4.0 and education 4.0. The more you see the more you understand - our own situation in a different but even more challenging light! The paper is intended to stimulate further policy discussion.

There is no question that the Sri Lankan education system needs significant upgrading. The system does not serve each and every Sri Lankan well. It is not positioned to meet the requirements of the emerging new economic future. Pockets of excellence are present as well as excellent students. What is visible is that none of these twin attributes are helping the economy. The harnessing of these strengths for national benefit appears to be seriously lacking.

On the specific issue of digital technologies in education addressing equity and inequalities, there is an urgent need to understand and implement resource allocations.

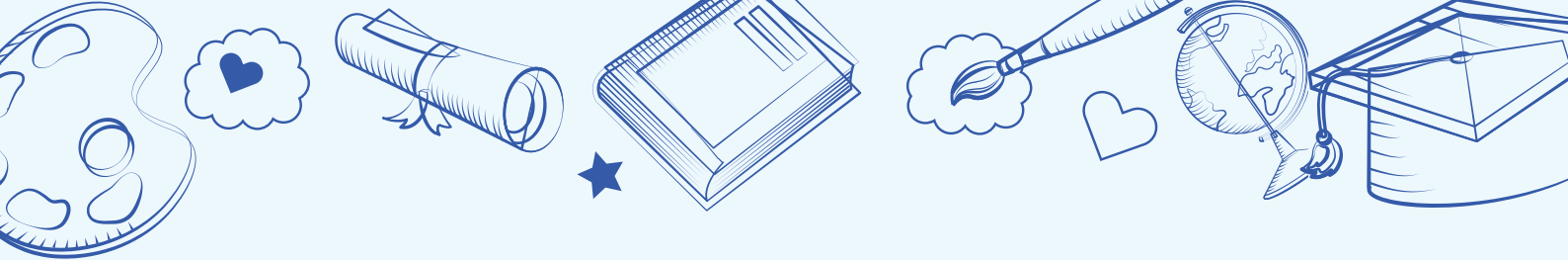
There are multiple divergences that exist – rural with urban, public with private. Even in a single location divergence could be identified.

Individually owning a digital device is an aspiration that gets fulfilled even resorting to debt. Moving ahead, the utilization is poor and what is required to reap benefits may still be out of reach. Both connectivity and device availability are issues that are quite capable of driving discord and should be understood. It is recommended that these differences are addressed as quickly as possible. The plan to fiberise all schools across the island is a welcome initiative. The brick-and-mortar model of education could be supplemented with the click and mortar model. Ensuring this change would be an investment for a bright future.

The current education system is one with significant inertia and there is the need to remove such barriers. The adoption of technologies could be quite disruptive yet essential. Digital technologies are not only to support learning.

The very structure of education system management should be changed with the adoption of technologies. Some reasons for divergences are due to the absence of technologies. Enhancement of service quality through digital technologies could solve a number of issues such as time disparities in public and private pathways, saving years and adding to productive life etc. These investments should not be delayed at any cost.





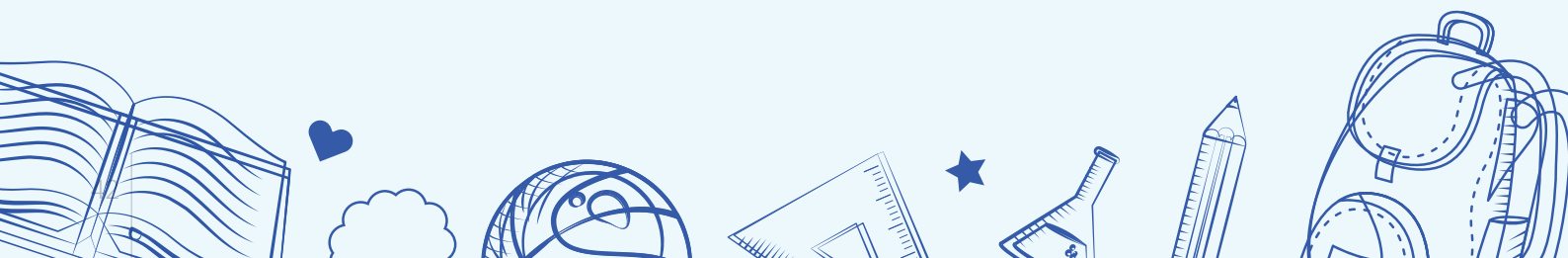
COVID-19 directly enabled the process of experiencing the impacts on the education system and the technological interventions resorted to in order to manage the situation. The evidence of alternate systems of education becoming much more tech-savvy to deliver the same was observed. In a way, COVID-19 provided an opportunity to carry out a social experiment to a scale that was quite unimaginable. Significant experimental findings are available for supporting decision-making for future courses of action.

This is a draft working document that needs to be further developed and refined based on constructive comments and suggestions from experts and institutional practitioners who are conversant with the subjects discussed here.

There is a need to identify the desired system of education, including the eco-system relevant to that model. The build-up from where we are today to the ideal system requires investment, commitment, and sacrifice. Education is a system with a long lag time and hence requires closer scrutiny to understand and gauge performance. That is not at all difficult with today's technologies, and adoption with transparency is key. It must be reiterated that education is a human system, technology alone is not the key. Technology is the key enabler in delivering the ability to bridge effectiveness with speed.

A defined roadmap for implementation is important and steps taken should be taken with a result-oriented mindset. There should not be politics, or any such ideologies mixed with this implementation but a sincere understanding that education matters and Sri Lanka is at a crossroads. No more deterioration should be acceptable as with the consequences will affect the future of a country. Financing does play a part as investments are necessary for redress. There has to be an understanding that investments in education are not short-term driven. Again, teaching is a noble profession and Sri Lanka has one of the lowest remuneration rates for this profession. The administrative mindset views the 'teaching' or the more transformative 'facilitator in learning' just based on a set of qualifications and fails to understand the importance of that exact activity. We are observing the dividends of such thinking today. At a broader level, there is a need to commit a more impactful share of GDP to education. The intent should be made clear. There again could not be made such statements such as the income of the state in GDP is so much and such allocations are thereby impossible which translates to lack of will. It is instructive India at an early stage supported 6% of GDP to education at an early stage. Similarly, the GDP commitment to R&D. India in many ways has seen the rewards. If Sri Lanka takes some brave decisions, it would be much easier for this country to realize the rewards. The understanding awaits.

A leadership that would envision the requirement and build the necessary ecosystem is imperative. In the government policy document of Vistas of Prosperity and Splendour, there is an emphasis on human capital development – educational determinations are spelt out well – Healthy citizen, happy citizen, informed citizen, and productive citizen. Giving leadership to that realization awaits.



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APPENDIX A

SDG 4 – QUALITY EDUCATION

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

TARGETS AND INDICATORS

- 4.1. By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes**
- 4.1.1 Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex
- 4.2. By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education**
- 4.2.1 Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex
- 4.2.2 Participation rate in organized learning (one year before the official primary entry age), by sex
- 4.3. By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university**
- 4.3.1 Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex
- 4.4. By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship**
- 4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill
- 4.5. By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations**
- 4.5.1 Parity indices (female/male, rural/urban, bottom/top wealth quintile 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
- 4.6. By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy**
- 4.6.1 Percentage of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex

4.7. By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development

4.7.1 Extent to which (i) global citizenship education and (ii) education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in: (a) national education policies, (b) curricula, (c) teacher education and (d) student assessment

4.a. Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all

4.a.1 Proportion of schools with access to: (a) electricity; (b) the Internet for pedagogical purposes; (c) computers for pedagogical purposes; (d) adapted infrastructure and materials for students with disabilities; (e) basic drinking water; (f) single-sex basic sanitation facilities; and (g) basic hand washing facilities (as per the WASH indicator definitions)

4.b. By 2020, substantially expand globally the number of scholarships available to developing countries, in particular least developed countries, small island developing States and African countries, for enrolment in higher education, including vocational training and information and communications technology, technical, engineering and scientific programmes, in developed countries and other developing countries

4.b.1 Volume of official development assistance flows for scholarships by sector and type of study

4.c. By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least developed countries and small island developing States

4.c.1 Proportion of teachers in: (a) pre-primary; (b) primary; (c) lower secondary; and (d) upper secondary education who have received at least the minimum organized teacher training (e.g. pedagogical training) pre- service or in-service required for teaching at the relevant level in a given country

APPENDIX B

Recommended Strategies and Activities to Introduce STEM General Strategies:

Strategy	Activities
1. Restructure/develop curriculum for each stage focusing on implementing STEM	<ul style="list-style-type: none"> a. Appoint a curriculum development committee for each stage b. Conduct a need analysis while considering the existing curriculum c. Develop a new STEM related curriculum for each stage
2. Establish a mechanism to monitor the implementation of STEM related curriculum	<ul style="list-style-type: none"> a. Link monitoring mechanism with existing school quality assurance process
3. Providing opportunities to explore various career path based on skills/ multiple intelligence	<ul style="list-style-type: none"> a. Conduct exhibition annually on various careers and take students to these exhibitions. b. Conduct sessions where professionals/entrepreneurs explain the challenges, opportunities, skills etc to join the profession
4. Create more opportunities for career paths	<ul style="list-style-type: none"> a. Conduct awareness programmes on available career paths in foreign countries for professionals and emerging careers in various sectors, particularly shortage in global context (for example, shortage of data scientists in USA, information, security professionals in India.
5. Introduce an accreditation system for schools (Physical resources, using a national exam etc.)	<ul style="list-style-type: none"> a. Conduct a national examination to benchmark students/schools in the national context b. Conduct an international examination such as PISA in Sri Lanka to benchmark students in the international context
6. Continuous teacher professional development	<ul style="list-style-type: none"> a. Organise and conduct STEM related continuous professional development (CPD) programmes regularly b. Establish zonal level help desks/centres for teachers with trained facilitators to solve problems teachers encounter in STEM related teaching and learning.
7. Create web-based examination system	
8. Provide an extra budget allocation for schools to implement STEM education	
9. Enhance students' interest towards STEM education	<ul style="list-style-type: none"> a. Introduce co-curricular activities while integrating STEM

Recommended Specific Strategies and Activities to Introduce STEM at Primary level:

	Strategy	Activities
Transitional Strategies	1. Re-structuring the primary stage of education (key stages)	a. Introduce two key stages as key stage 1 (Grade 1 & 2) and key stage 2 (Grade 3, 4 & 5).
	2. Designing a multidisciplinary integrated primary curriculum according to spiral curriculum approach	<p>a. Conduct a study to identify appropriate themes for key stage 1 (Ex: air, water, machines, our food, our family)</p> <p>b. Conduct a study to identify STEM practices / processes /skills/ attitudes suitable for each key stage considering intellectual, physical social and emotional development of a child.</p> <p>c. Introduce STEM activities within the identified themes in developing the above-mentioned practices/processes/skills/ attitudes.</p> <p>d. Include first language, second language, Mathematics, religion as four separate subjects in the key stage 2 of the primary stage.</p> <p>e. Integrate several other subjects' geography, agriculture, Civics ...) in the teaching learning process of STEM component</p>
	3. Changing the policy of recruiting teachers for primary stage	<p>a. Recruit professionally qualified science graduates to teach STEM in the primary stage.</p> <p>b. Provide opportunities for science graduates / B. Ed. in science education graduates/ Diploma holders passed out from NCoE (science courses) to obtain a professional training in STEM education.</p>
	5. Introduce an accreditation system for schools (Physical resources, using a national exam etc.)	<p>a. Conduct a national examination to benchmark students/schools in the national context</p> <p>b. Conduct an international examination such as PISA in Sri Lanka to benchmark students in the international context</p>
	6. Continuous teacher professional development	<p>a. Organise and conduct STEM related continuous professional development (CPD) programmes regularly</p> <p>b. Establish zonal level help desks/centres for teachers with trained facilitators to solve problems teachers encounter in STEM related teaching and learning.</p>

Continuous Strategies	1. Strengthening teacher capacity building	<ul style="list-style-type: none"> a. Design well planned, organized professional training programmes by the Faculties or Departments of Education in universities /NIE/ in collaboration with Ministry of Education b. Establish well qualified, experienced pool of resource persons to facilitate teachers to solve issues regarding implementation of STEM
	2. Maintain quality of the implementation of STEM curriculum	<ul style="list-style-type: none"> a. Conduct a research on the efficacy of the STEM curriculum and its implementation.
	3. Developing and providing STEM- based teaching learning materials	<ul style="list-style-type: none"> a. Prepare a detailed guide book for teachers for conducting STEM activities. b. Design activity books for each grade related to the STEM activities and practices expected in each key stage. c. Prepare teaching materials for teachers and learning materials for students to engage in STEM activities d. Prepare a list of materials and equipment needed to each activity, each grade and finally to the all-STEM activities (STEM package) in the primary stage. e. Provide each primary school with a “STEM package and STEM activity room.

Recommended Strategies and Activities to Introduce STEM at Junior Secondary Level Specific strategies:

	Strategy	Activities
Transitional Strategies	1. Use multidisciplinary, multifaceted, integrated approach in designing the curriculum	<ol style="list-style-type: none"> a. Need analysis to identify the requirements in subject contents in grade-wise b. Gap analysis of competencies to identify gaps between primary to Junior secondary and Junior secondary to senior secondary c. Conduct a study on what are the contents have to add and what are the contents have to remove in the existing syllabus d. Conduct comparative studies to identify international STEM education arena e. Match the syllabus/activities with local and international requirements/ needs/ socio-economic environments f. Mapping the contents of syllabi grade-wise and subject-wise for multi- disciplinary integration g. Prepare the multidisciplinary integrated subject profiles for STEM h. Develop learning books on how to use real world problems for innovative learning process as self-guides
	2. Establish STEM Education centres (1 centre per 10 schools)	<ol style="list-style-type: none"> a. Upgrade the Field study centres as STEM education centres (as the available field centres will not be sufficient to have 1 STEM centre for 10 schools, it is recommended to construct new STEM centres) and facilitate the following: <ul style="list-style-type: none"> • Organize visits to nearby places to apply knowledge to analyse indigenous knowledge local workshops/social interactions with industries to further develop attitudes and skills through the formation of STEM societies • Facilitate new invention and innovations • Organize local competitions to popularize researches, projects, industrial constructions, Robotics, IT and electronics. • Facilitate international competitions which are related to STEM area • Develop programmes for sharing regional experiences and skills. Ex: carpenter's experiences, Meson's experiences, indigenous doctors' experiences

	3. Develop capacities of Teachers for STEM teaching	<ul style="list-style-type: none"> a. Conduct teachers' training need analysis for STEM teaching b. Conduct teacher training programs (in- service and pre-service) (Postgraduate and certificate level) on implementation of STEM. c. Upgrade the subject content (considering the integration of STEM) of in- service and pre-service teacher professional development programmes (postgraduate diploma in Education, MEd in Education) d. Create template education centres that contain smart classrooms, novel educational facilities, etc. e. Prepare a web- based Learning management system (LMS) to guide teachers f. Conduct trainings for enhancing the competencies of teachers to use Inquiry / problem /research/ projects/ discovery-based teaching learning process g. Provide more opportunities to self-learning with the help of e-learning materials h. Develop guide books for problem-based teaching
	4. Reduce national exam pressure	<ul style="list-style-type: none"> a. Introduce carrying marks system b. Practical exam at levels where there is no competition c. Revisit the existing evaluation system to find shortcomings. d. Develop a question bank using LMS e. Introduce online repeat O/L examination within two months after releasing results
Continuous	1. Enhancing students' interest towards STEM	<ul style="list-style-type: none"> a. Conduct awareness sessions at zonal level/school level among students to popularize the national level science museum, NURD, Atomic energy board, Syntec, etc. b. Provide more opportunities for students to engage, develop learning activities related to STEM, which can be carried out with the collaboration of National science centres (Museum, NERD, Atomic energy board, Syntec, etc.) c. Facilitate to form STEM activist volunteer task force from professionals/university students to support STEM education in schools. d. Facilitate translating or publishing relevant books/e-learning materials; increase the accessibility to these books

2. Guide to career path based on skills/ multiple intelligence	<ul style="list-style-type: none">a. Conduct a national level skills auditb. Conduct awareness program for existing career pathsc. Introduce a national level skill test (on-line) to guide career path at the end of grade 8d. Introduce module-based approach from grade 9, 10 (core subjects' modules and career path-based modules/ A/L targeted)
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Strategies that MUST be implemented for successful mainstreaming of STEM education at 11+:

Strategies	Activities
<p>Basic education should be 12+ so that examination is aimed at testing knowledge but does not serve as a hurdle for students progress through the school</p>	<ol style="list-style-type: none"> 1. Already being implemented (13+) 12+ to be included and a planned approach to be presented 2. Process road map for a K-16 education process
<p>Grade five scholarship should be replaced with an alternative system to meet the objectives of the scholarship examination i.e. Providing assistance (financial and access to an appropriate learning environment) for underprivileged capable students</p>	<ol style="list-style-type: none"> 1. Prepare a proposal with a set of possible alternatives that will allow complete abolition of year 5 scholarship examination without compromising its main objectives
<p>Tuition based education system should be changed into more school centric education since tuition-based education does not provide an opportunity for experiential learning</p>	<ol style="list-style-type: none"> 1. Changing the teaching approach in schools where an emphasis will be given for more experiential learning to make tuition-based education ineffective 2. Changing the exam-oriented assessment system so that the demand for the tuition-based system goes down
<p>Recruitment and retention of students and teachers into STEM education</p>	<ol style="list-style-type: none"> 1. Provide special training for teachers engaged in STEM and STEAM education 2. Introduce STEM/ STEAM licensing scheme for teachers that can inform the annual increment scheme 3. Revise salary scales appropriately, incentives, performance-based increments 4. Increase of activities based on student-society-industry nexus 5. Create opportunities for part time work, scholarship schemes, career guidance etc., for students 6. Industrial and research internships with a stipend
<p>Linking up tertiary system of education – all universities, vocational universities, and institutes with a clear process for entry post A/L</p>	<ol style="list-style-type: none"> 1. Addressing defragments system currently in place and streamlining institutions

Specific STEM strategies:

Strategies	Activities
Broad basing the A/L syllabus to make available STEM education to all	<ol style="list-style-type: none"> 1. Road map to achieve A/L with combined science-commerce-arts-technology 2. Replacing the A/L with a modular system comprising of six subjects (each subject to be presented as a set of module and modules shall be broadly categorized into breadth and depth modules) with an emphasis on emerging technologies 3. The student will have the liberty to select depth modules based on their career aspirations 4. Develop a system of entrance for III level education under the proposed modular delivery system
Integrate ICT through experiential learning into the modular system i.e. coding, virtual learning etc.,	<ol style="list-style-type: none"> 1. Address through the design of modules 2. Akasa – development and use for delivery
Integrate communication through experiential learning into the modular system	<ol style="list-style-type: none"> 1. Address through the design of modules 2. Akasa – development and use for delivery
Experiential Learning Strategy to promote multidisciplinary integrated learning	<ol style="list-style-type: none"> 1. Providing 30% of the marks for a given subject grade on a continuous assessment mode based on practicals and assignments comprising of multidisciplinary teams when possible (extend the school time by 2 hours to facilitate this process only for A/L students) 2. Promote Co-education environments 3. Promote authentic immersive learning environments 4. Project based learning 5. Industrial and research internships
60:40 strategy for STEM student population at the A/Ls	<ol style="list-style-type: none"> 1. Road map to transform current 30:70 study population into a 60:40 (STEM: Non-STEM) mixture 2. An in-depth sociological analysis of issues and perceptions 3. An in-depth data analysis
Identification of teaching skill gaps needed for mainstreaming STEM education	<ol style="list-style-type: none"> 1. A rapid gap analysis to be conducted 2. Teacher Skill matrix
Identification of learning skill gaps needed for mainstreaming STEM education	<ol style="list-style-type: none"> 1. A rapid gap analysis to be conducted 2. Learner Skill matrix

General Attributes	STEM specific attributes:
Effective Communication skills	Interactive problem-solving ability
Problem Solving skills	Design thinking
Logical Reasoning	Model building (math and prototype)
Ability to connect	Scientific Methodology
Knowledge and Skills	Experimental and research methods
	Cause and Effect analysis

APPENDIX C

PTF (2020) RECOMMENDATIONS ACROSS ALL SECTORS

1. Evaluate and restructure the current administrative structure

- a. Formulate a new overarching Ministry of Education and Human Resource Development, with integrated responsibilities of Early Childhood & General Education, Vocational & Technical Education, Higher Education and Education Reforms. The Ministry should function under a cabinet minister and three state/deputy Ministers may be appointed to oversee each sector respectively.
- b. Develop a National Policy for Education, and review and amend existing legislation to facilitate the implementation of key recommendations made by the PTF, including, but not limited to, the University Act and the existing Education Ordinance.
- c. Establish an independent Authority/Task Force to oversee reforms until necessary amendments are made to existing legislation. The National Institute of Education will fall under the purview of this authority and will focus on teacher training and the quality assurance of learning content and classrooms.
- d. In order to ensure integration between the national and provincial levels, the Provincial Secretary of Education should be assigned broad functions related to overall provincial initiatives, while Provincial Directors of Education are assigned the implementation and monitoring of national education policies at the district, divisional and school levels.

2. Facilitate an integrated value chain

- a. An integrated LMS system across all sectors of education, and supported by trusted external parties, such as the Lankan Education and Research Network (LEARN). It should contain the following elements, among others:
 - Grade and syllabus specific guidelines and learning content
 - An engagement platform allowing virtual classes to be conducted
 - A portal for student assessments, grading and provision of feedback
 - A link to a digitised version of the 'Skills passport' (elaborated on in a later section)
 - An e-Library facility and repository of digital content
 - A provision to audit digital courses and earn certificates (possibly for a payment) without being enrolled at a university
 - Data security and privacy

- b. Study, revise and establish multiple progression pathways with cross-linkages across key education sectors.
- c. Ensure linkages between educational content at all levels and employment market demands, by updating all curricula in line with global best practices and industry skills requirements that are conducive towards the creation of a 21st century workforce.
- d. Ensure that students receive mandatory career guidance at key stages in their schooling career. Guidance counsellors must be trained to identify students' skills and interests and equipped to guide students and parents/guardians to potential study and career pathways accordingly.
- e. Introduce a comprehensive system for monitoring and collaborating with private and international schools.

2. Revise curricula and learning methodologies

- a. Establish an independent institution for curriculum development and assessment, as a subsidiary apex body under the National Education Commission, tasked with updating all curricula as per global best practices and industry requirements.
- b. Facilitate 'blended learning' techniques, such that students are exposed to both traditional and digital learning avenues, while allowing the incorporation of a range of teaching methods and student engagement within the classroom.
- c. Introduce blended learning concepts, such as 'flipped classrooms', whereby students are introduced to content at home, perhaps digitally, and then practice working through it at school, encouraging independent study and student-led research.
- d. Ensure that STEAM education is incorporated into all classrooms as an overarching principle. Elements of these subject streams should be incorporated into core subject areas.

3. Comprehensive and standardized teacher development

- a. Streamline learning pathways to gain accreditation as a teacher, such that the equivalent of a Bachelor's in Education is required to teach.
- b. 'Teacher Service' established as a core government service, to give it its due recognition.
- c. Develop guidelines for the training and qualification of pre-school teachers in line with NEC and NIE requirements, focusing on provision for the protection and well-being of children, development of personal and social skills, as well as ensuring inclusivity for children with special needs.
- d. Teachers to compulsorily receive training on the following aspects:
 - Digital tools and digitalising content on the integrated LMS.
 - Alternative teaching methodologies to accommodate varied learning styles and abilities, to ensure an inclusive education – for instance, ensuring that students with learning disabilities are identified and catered towards.
 - The provision of psychosocial support to students.

4. Re-deploy investments and educational resources

- a. Evaluate past and current budget allocations and redirect funding based and evaluated returns on investment in education and on need.
- b. Limit reliance on donor funding, with a renewed focus on receiving loans that have an inbuilt layer of accountability, as opposed to outright grants.
- c. Conduct a digital needs assessment, including, but not limited to, a survey of the availability of equipment, connectivity within school premises, connectivity within the education zone, and connectivity among students and teachers.
- d. Procurement and distribution of required devices and ensuring access to Internet connections for all educators and students, including a loan facility for students.




- e. Introduce a textbook management system, in aid of reducing printing and environmental costs.
- 5. Ensure consistent quality assurance and control**
 - a. Evaluate and revise current measures of success within the education system, including, but not limited, to evaluations of teachers, principals and the regular review of learning content.
 - b. Based on these measures of success, design an integrated quality assurance system that cuts across all sectors of education, and establish KPIs that also take into account the uptake of soft skills and the practical applicability of knowledge and skills learnt.
 - c. Establish a common dashboard for monitoring success across a range of KPIs. d. Place less weightage on final, summative examinations and ensure increased emphasis on formative, potentially project-based assignments that evaluate critical thinking, analytical skills and other competencies throughout the year.
- 6. Inculcating value systems within education systems**
 - a. Introduce mindfulness education across all schools and learning institutions in aid of encouraging students to be self-aware, focused and empathetic. Globally, we see an increased emphasis on consciousness based approaches to education that draw on practices such as yoga and meditation. Mindfulness practices are often introduced to students at the preschool level and continue to be built into classroom practices thereafter.
 - b. Eliminate any and all forms of harassment and violence within the education system:
 - Strictly implement the Prevention of Ragging Act
 - Introduce compulsory student mentorship programmes and programmes to redress ragging and harassment victims
 - Empower law enforcement authorities to handle cases of ragging and violence
 - c. Ensure all educational institutions have access to trained counsellors/therapists, to ensure mental well-being and student welfare.

PTF [2020] also has sector specific recommendations which are not reproduced here.



United Nations Development Programme

202-204 Bauddhaloka Mawatha,
Colombo 07, Sri Lanka

 socialmedia.lk@undp.org  +94 11 2580 691  www.undp.org/srilanka