MINISTRY OF EDUCATION, HERITAGE & ARTS : FIJI

UNESCO INGSA International Workshop:

"Dialogue on Science and Science **Policy for the SDGs in the Pacific SIDS"**

Presentation

BY

Dr. Mahendra Reddy,

Minister for Education, Heritage and Arts,

Republic of Fiji

INTRODUCTION:
Importance of Science Education

- The growth, development and prosperity of countries depend to a large extent on our ability to understand how and why things work like they do.
- Knowledge of science which will help us to explain the mechanics and reasons behind the daily functioning of complex systems, which range from the human body to sophisticated modern methods of transport as well as climatic conditions.
- Our ability to inculcate this knowledge amongst our children and students will determine our ability to deal with this and other problems in future.
- Science also helps to provide tactile or visible proof of many facts we read about in books or see on the television; this helps to increase understanding and helps children and teenagers to retain that information.
- Without science, we will not be able to develop curious minds as well as develop the ability of our children to think critically.

INTRODUCTION:
Importance of Science Education (Cont...)

- The world now focused upon exploring and initiating developments and progress based on Science development.
- The focus has never been greater than in this century where giant strides has already been achieved world-wide in terms of new discoveries and experiments.
- With Science and technology, innovation has seen the epitome of human invention.
- A lot of human contemporary issues or ever threatening complications from the past are now eliminated thorough Science and Technological innovation.
- Serious threats to humans in the form of land, air, space, food, water and luxury are all now removed with new developments.
- => mandatory that Pacific Island States need to invest, not just invest, but input strategically and relentlessly into developing quality Science and Technology development in the region.
- =>Regional collaboration/sharing of ideas of the highest order is needed at the highest levels to attain on par developments with other global nations.

Declining interest and performance in Science and Technology

(i) Education in Science and Technology in Fiji

- Mathematics and Science are key learning areas (KLA) in the national school curriculum from ECE, Primary to Secondary education.
- Numeracy and Mathematics (ECE, Years 1-13); Elementary Science (Primary Years 3-6); Basic Science (Primary Years 7-10); Biology, Chemistry and Physics (Secondary Years 11-13).
- Technology and Employment Skills Training (TEST) is also offered in the national school curriculum for Secondary education.
- Enterprise Education (Primary Years 3-8); Home Economics, Computer Science, Basic Technology, Agriculture Science (Secondary Years 9-10); Home Economics, Computer Science, Applied Technology, Agriculture Science, Technical Drawing, Introduction to Technology (Secondary Years 11-13).
- Technical education is also provided by the 13 Government Technical College Campuses.
- Tertiary education in specialized areas of science, technology and engineering are offered by various tertiary providers in the country.

Declining interest and performance in Science and Technology (Cont...)

(ii) The number of students taking science and technology subjects in our schools at Year 12 and Year 13 level has declined over the past two years.

Table 1 : 2015 - 2017 student data for Year 12 Science and Technology subjects in secondary schools

Subject	Yr 12-2015	2016			2016			2017		
		Yr 11	Total Students in Year 11	% of Students	Yr 12	Total Students in Year 12	% of Students	Yr 12	Total Students in Year 12	% of Students
Agricultural Science	2660	3240	13503	24.0	3119	13171	23.7	2356	13525	17.4
Applied Technology	1526	2035	13503	15.1	1682	13171	12.8	1218	13525	9.0
Biology	4172	4154	13503	30.8	4516	13171	34.3	3327	13525	24.6
Chemistry	4447	3936	13503	29.1	4510	13171	34.2	3047	13525	22.5
Computer Studies	3174	3735	13503	27.7	3609	13171	27.4	2733	13525	20.2
Home Economics	1369	1446	13503	10.7	1370	13171	10.4	1532	13525	11.3
Office Technology	308	724	13503	5.4	465	13171	3.5	553	13525	4.1
Physics	3108	3067	13503	22.7	3147	13171	23.9	2131	13525	15.8
Technical Drawing	2546	3021	13503	22.4	2686	13171	20.4	1835	13525	13.6

Declining Interest and Performance in Science and Technology (Cont...)

- **Table 2 : 2015 - 2017 student data for Year 13 Science and Technology subjects in secondary schools**

Subject	Year 13 - 2015	Yr 13- 2016	Total Students in Year 13- 2016	% of Students	Yr 13- 2017	Total Students in Year 13- 2017	% of Students
Agricultural Science	1406	1366	7432	18.4	1395	8598	16.2
Biology	2736	2573	7432	34.6	2228	8598	25.9
Chemistry	2936	2763	7432	37.2	2234	8598	26.0
Computer Studies	1782	2146	7432	28.9	2015	8598	23.4
Introduction to Technology	1307	1475	7432	19.8	1203	8598	14.0
Physics	2051	2068	7432	27.8	1269	8598	14.8
Home Economics	773	795	7432	10.7	689	8598	8.0
Office Technology	136	267	7432	3.6	295	8598	3.4

Declining Interest and Performance in Science and Technology (Cont...)

- There is a declining student interest in Science subjects at Year 13 level, especially, in Biology and Chemistry.
- Students lack the motivation to venture into Science and Technology education for a number of reasons.
- This may include: their pre-conceived ideas that Science and Technology subjects are difficult, there are lack of career opportunities in Science and Technology field in Fiji and the region, Parents pressurizing their children to adapt to career choices that are more readily available and less complicated.

Declining Interest and Performance in Science and Technology (Cont...)

- In Fiji, Science subjects have also been characterized with low pass rates over the years This has led to less number of students progressing from Year 12 to Year 13 for sciences. Thus, the equation for low numbers of Science students in tertiary education is well explainable.

Table 3: Student Performance in Science Subjects in Year 12

FY12CE		BIOLOGY	CHEMISTRY	PHYSICS
2016	% >=50	62%	53%	40%
2015	% >=50	56%	35%	64%
2016	Average	55	51	44
2015	Average	53	41	58

Table 4: Student Performance in Science Subjects in Year 13

FY13CE		BIOLOGY	CHEMISTRY	PHYSICS
2016	% >=50	43%	49%	45%
2015	% >=50	40%	34%	57%
2016	Average	48	51	47
2015	Average	46	44	54

Effects of the lack of Science and Technology development

1. Inability to deal with contemporary problems

- While other global nations are tackling national issues and constraints through development of Science and Technology, Pacific Island States are laging behind on many fronts.
- Inventions all over the world in areas of health, food production, safety, business, production and productivity and human welfare has made tremendous strides, while many Pacific Island nations still struggle with issues.
- Lack of policy making due to less scientific research in policy making and lack of availability and access to research data
- Poor protocols for scientific advice during emergencies.
- Lack of Scientific and technological expertise for Environmental Impact Assessment, environmental monitoring and rehabilitation.
- Lack of Scientific and technological capacity to deal with environmental disasters, droughts, infrastructure development and maintenance.
- Lack of Science and technological capacities for disaster preparedness, post disaster risk and needs assessment, etc.

Effects of the lack of Science and Technology development (Cont...)

2. Inability to maintain problem levels in different facets of the economy

- The growth and progress of the nation is measured in terms of the economic superiority and expansion.
- The absence of Science and Technology is the thorn in the economic expansion plans of any nation and our region is not exceptional.

3. Major rise in natural problems such as pest and disease outbreaks, declining production and yield levels;

- With climate change, global warming and sea level rise at our doorsteps and threatening to vastly change the routine of life in the Pacific, the rise to other varied difficulties is evident.
- Our agricultural reliance is under threat from salt-water intrusion and devastation caused by resilient pests and diseases. As Pacific Islanders, we are proud of our agricultural heritage and animal husbandry, but all this is set to change and even become eliminated if solutions are not worked out now.
- Therefore, our lack of Science and Technology development poses a major hurdle in saving production and having sustained yields in the future.

Effects of the lack of Science and Technology development (Cont...)

4. Loss of livestock and breeds and genetic gene pool

- The 21st century world has made strides in animal cloning, making specialist breeding and overcoming issues related to live stocks. One can just imagine what will happen to all our livestock if a really serious disease breaks out. While we may not be able to protect the livestock, the problem may be far greater than it is at its origination.
- Our inability to tackle the disease will lead to its resilience and thus, its spread to other things including humans, and then it becomes a crisis.

5. Loss of bio diversity

- Climate change is slowly but surely changing our landscapes. The nature we are so proud of and the rich bio-diversity which defines our beauty to the rest of the world is at stake.
- The mangrove swamps, coastal coconut palms and beaches are slowly being starved of the rich nutrients for growth and are becoming inundated with salt water.
- This would lead to very weak nation states and economies.

The question is how are we going to protect all these?

Strategies

(i) What are the STI policy priorities in Fiji?

- Increasing student interest in Science and the number of students taking up Science subjects in schools;
- Increasing and meeting the demand in the number of teacher graduates in Sciences, especially in Mathematics and Physics;
- Providing specialist teachers for Science in Primary Schools;
- In-service training for Science teachers and scholarships for advanced studies;
- Up-to-date science laboratories for science teaching and learning in Primary and Secondary schools;
- Improved quality of science, technology, engineering and mathematics education (STEM) at all levels;
- Remunerating and retaining educators, researchers and scholars in science and technology;
- Promoting educational technologies such as digital literacy, e-learning and distance learning;
- Increasing the quality of physical infrastructure for driving scientific and technological developments;

Strategies (Cont…)

- Obtaining internationally accredited standards for education and research for science and technology;
- Transition to green economies and sustainable societies – training and awareness ;
- Agriculture & Food security – awareness and training;
- Enabling capacities in biodiversity and conservation, natural resource management, sustainable agricultural practices, climate change mitigation and adaptation, developing climate resilience, disaster risk reduction and management;
- Research and development in renewable energy technologies;
- Ensure STI action plans are aligned to the Sustainable Development Goals and cross-cutting SDGs are integrated across the relevant government ministries.

Strategies (Cont…)

(ii) Research and Development in Science and Technology

- Various government research centers focus on science and technological developments, such as agriculture.
- Universities also have a strong research emphasis through establishment of research units and postgraduate studies.
- Apart from PNG, Fiji is the main contributor to science publications from the Pacific Island states between 2005 and 2014, (UNESCO Science Report, Second revised edition 2016). For example, in 2014, Fiji had 106 publications, mainly concerning life sciences and geosciences.
- Fiji has very high rate of foreign collaboration, with 82.8% share of science papers produced with foreign co-authors in the 2008–2014 period (UNESCO Science Report, Second revised edition 2016).

Strategies (Cont...)

(iii) Government promoted STIs in Fiji

- Committing significant budgets to Education, Health and Medical Services, Infrastructure, Agriculture and Environment;
- Supporting state-of-the art ICT facilities, such as, low cost and high-speed internet;
- Using Research and Development activities to enhance agricultural production;
- Assisting the micro, small and medium-sized enterprises with incentives;

<u>Example of a Government Priority for Science and Technology:</u>

- Training opportunities provided by the Fiji government for Science and Technology Priority Areas:

  - 630 National Toppers Scheme (NTS) – Scholarships 2017

  - Priority areas: Infrastructure, Tourism, Mining and Milling, Medicine and Health, Agriculture, Fisheries and Forestry, Technology, Environment/Marine Science, Social Sciences, Education, Land and Town Planning, Commerce.

Strategies (Cont...)

(iv) Female Scientists are given more opportunities, however, there is more work to be done at the education level whereby more girls are encouraged to take Physics and other science subjects so that they can become scientists and engineers.

- Currently, there is an increase in female science teachers and doctors so we are doing fine but more emphasis is needed on other technology and engineering related fields.

(v) Ministry of Education's major Science Interest Project launch

- Recently, we have analyzed the figures in the number of students interested in Science subjects and have already started to pipeline strategies in the mainstream education arena to improve student interests.
- We have started off with competition compromising of varied activities in Science for all Year 9 students in the nation to take part in. We are coming up with great prizes to attain maximum participation. This is another way we are going to react greater interest in Science subjects amongst students.

Strategies (Cont...)

(vi) Positive data

- It is obvious that STI policies espoused by Governments in the Asia-Pacific region differ greatly in their respective forms and functions.
- One data-driven method to capturing the Asia- Pacific region's diversity with regard to STI development is to categorize countries into four quartiles according to their score in the latest Global Innovation Index of the World Intellectual Property Organization (2015).
- Fiji has scored on the first quartile, which represents catch-up economies, in comparison to the second quartile, which represents post-catch-up economies, the third quartile represents emerging economies and the fourth quartile represents the knowledge-driven economies, where the terminology for STI development status reflects the World Economic Forum terminology on competitiveness (World Economic Forum, The Global Competitiveness Report 2013-2014: Full Data Edition (Geneva, 2013).

Strategies (Cont...)

- As per the UNESCO Science Report (Second revised edition, 2016), growth in high tech good have significantly dropped for Fiji over the years.

	High-tech exports (US$ millions)		Change (US$ millions)	Change (%)
	2008	2013		
Australia	4 340.3	5 193.2	852.9	19.7
Cambodia	3.8	76.5	72.7	1 913.6
Fiji	5.0	2.7	-2.3	-45.7
Indonesia	5 851.7	6 390.3	538.6	9.2
Malaysia	43 156.7	63 778.6	20 622.0	47.8
New Zealand	624.3	759.2	134.9	21.6
Philippines	26 910.2	19 711.4	-7 198.8	-26.8
Samoa	0.3	0.2	-0.1	-40.6
Singapore	123 070.8	140 790.8	17 719.9	14.4
Thailand	33 257.9	37 286.4	4 028.5	12.1
Viet Nam	2 960.6	32 489.1	29 528.5	997.4
Total	240 181.9	306 482.5	66 300.7	27.6

Source: United Nations' Comtrade database

Concluding Remarks

- Science and Technology development across the region is tasked with attaining a greater level of commitment from all Government authorities and regional leaders.
- It is a compulsory ladder for development in this modern era. Countries which chose to neglect this notion are down-sliding in more complicated scenarios and constraints which hinder success and prosperity at all levels.
- Science and Technology has announced itself all over the world as the answer to many of the worlds most aggravated and devastating issues. We need to take the queue from worldwide examples and learn from it.
- The coordination via this collaboration is one such step in the right direction. Together we all can make the difference in our region.
- Our nations have the human expertise and resilience to become the topmost scientific nations in the world.
- We just need to tap into these areas and nurture it to become empowered and grow.