

# **Science & Technology Education Policy for 21st Century India: Lessons from History**

# Formal Education in India

“From ancient Bharat to modern India, higher education has always occupied a place of prominence in Indian history. In ancient times, Nalanda, Taxila and Vikramsila universities were renowned seats of higher learning, attracting students not only from all over the country but from neighboring countries like China, Burma (now Myanmar), Korea, Ceylon (now Sri Lanka), Tibet and Nepal”.

***From UGC website***

...and then the British came...

Thomas Macaulay's *Minute on Indian Education*, delivered in 1835. It reads,

- “ It is impossible for us, with our limited means, to attempt to educate the body of the people. We must at present do our best to form a class who may be interpreters between us and the millions whom we govern; a class of persons, Indian in blood and colour, but English in taste, in opinions, in morals, and in intellect. To that class we may leave it to refine the vernacular dialects of the country, to enrich those dialects with terms of science borrowed from the Western nomenclature, and to render them by degrees fit vehicles for conveying knowledge to the great mass of the population.

# Modern Education: the 1<sup>st</sup> wave

## 1. 1800-1900: British initiative:

*To involve native Indians in Administration*

“ ...each city to consist of two principal departments, a College for the Higher Branches of Literature, Philosophy and Science, and a High School for the Cultivation of English Literature and of the vernacular languages of India and the elementary departments of Philosophy and Science”.

# Modern Education: the 1<sup>st</sup> wave

**1817:** Hindoo College, Kolkata, which later became Presidency College, Kolkata in 1855

**1841:** The Preparatory School, which later became Presidency College, Madras in 1855.

**1857:** University of Kolkata, Bombay and Madras

**1887:** University of Allahabad

# History is full of unanticipated twists to any policy decisions

- At the time of taking a policy decision: one would be comparing one hypothetical scenario in the future to another hypothetical scenario
- Cause could be: bad implementation or influence of changing times

# **Modern Education: the 2<sup>nd</sup> wave**

## **Raise of Indian Nationalism**

**1876:** The Indian Association for the Cultivation of Science, Kolkata

**1905 (1936):** Indian Agricultural Research Institute (Pusa Institute)

**1909:** Indian Institute of Science (IISc)

**1916:** Banaras Hindu University (BHU)

**...1920s beginning of separation of  
research and education**



**...and then we became Independent (from British rule)**

*“It is science alone that can solve the problems of hunger and poverty, of insanitation and illiteracy, of superstition and deadening of custom and tradition, of vast resources running to waste, or a rich country inhabited by starving poor... Who indeed could afford to ignore science today? At every turn we have to seek its aid... The future belongs to science and those who make friends with science.”*  
**Jawaharlal Nehru** (Independent India 's first prime minister)

# Modern Education: the 3<sup>rd</sup> wave

IITs (Kharagpur in 1950, Mumbai in 1958, Chennai, Delhi and Kanpur in 1959)

New Universities

Central Universities (JNU in 1970, HCU in 1974),

Expansion of CSIR, ICAR and ICMR

DAE (1954)

DRDO (1958)

ISRO (1963)

DST (1971)

DBT (1986)

Did Independent India forget  
importance of primary education?

An error of judgment in the policy?

# **Dichotomy of colleges and Universities**

**...1970s complete separation of  
research and education**

# **...nevertheless in post-independent India**

IISc, IARI and IITs have played very important roles in India's modern economy.

**IARI:** Self-sufficiency in food

**IISc** led science and technology by helping to create new Govt organizations such as DAE, ISRO, DST, DBT etc and industries such as BEL, etc.

**IITs:** Strength behind the new economy. Symbolic of India's confidence in modern science and technology.

# **1991-2004: Turn around**

Investment in Education, Science and technology made since Independent, resulted a whole new generation of confident Indians, who led economic revolution started in 1991.

Considering the fact that literacy rate was 12% in 1947, India has come a long way just in two generations.

# Building the nation: still an unfinished job

**Literacy** is still only 67% (as on 2007)

## **Poverty:**

According to the World Bank, 42% of India falls below the international poverty line of \$1.25 a day (PPP, in nominal terms Rs. 21.6 a day in urban areas and Rs 14.3 in rural areas) in 2005. It was 90% in 1980.

According the Planning Commission of India 27.5% of the population was living below the poverty line in 2004–2005, down from 51.3% in 1977–1978, and 36% in 1993-1994.

According to Oxford Poverty and Human Development Initiative (using a Multi-dimensional Poverty Index) there were 421 million poor living under the MPI in 8 north India states of Bihar, Chattisgarh, Jharkand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal. This number is higher than the 410 million poor living in the 26 poorest African nations.

However, for sustainable and equitable development and to provide clean water, clean energy, nutritious food and healthy life to 100s of millions of people we need to **move from service economy to knowledge economy**



# Modern Education: the 4<sup>th</sup> wave

- More IITs and Expansion of existing IITs
- More Central Universities
- IISERs, NISER
- IIST, NIPERs
- Stem Cell institutes
- Translational research institutes
- UNESCO Centre for Biotechnology Education
- Expansion of IISc, TIFR,
- *Large number of high-quality Private Universities*

# Modern Education: the 4<sup>th</sup> wave

- Increased funding for research
- Flexible funding; establishment of **THE SCIENCE AND ENGINEERING RESEARCH BOARD**
- Synchrotron – leasing of an entire beam
- Funds for public-private partnership
- Govt. funded small innovation centres
- Emphasis on interdisciplinarity

**We still lack, a critical mass of  
academic excellence.**

**Excellence can not be achieved  
with one or two bright stars in few  
selected institutions. It needs large  
number of researchers of very high  
quality spread across the country  
and motivating their colleagues and  
students.**




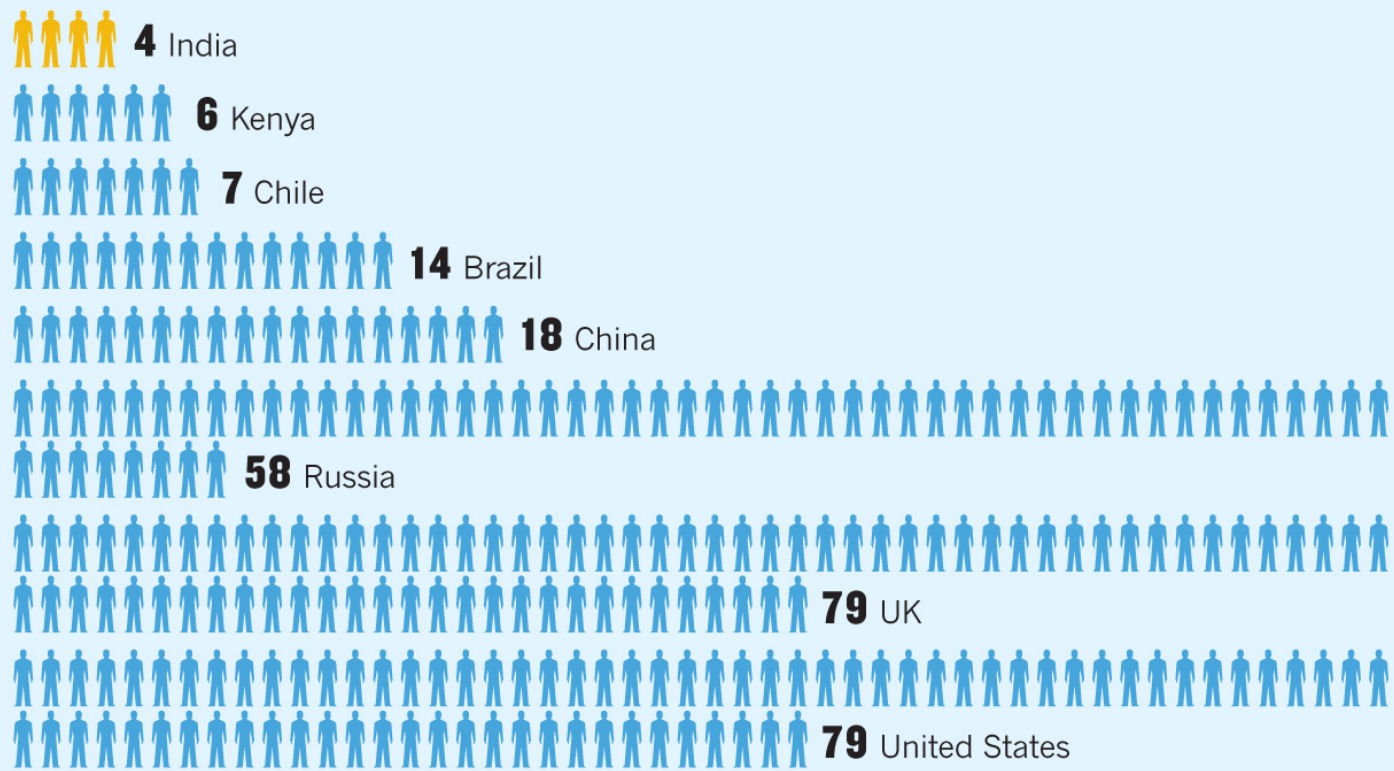
**Everest is a peak in the Himalayan range**



# Workforce

With only 200,000 full-time researchers (14% of them female) in a population of nearly 1.3 billion, India ranks below Chile, Kenya, and many other countries in terms of the density of its scientific workforce.

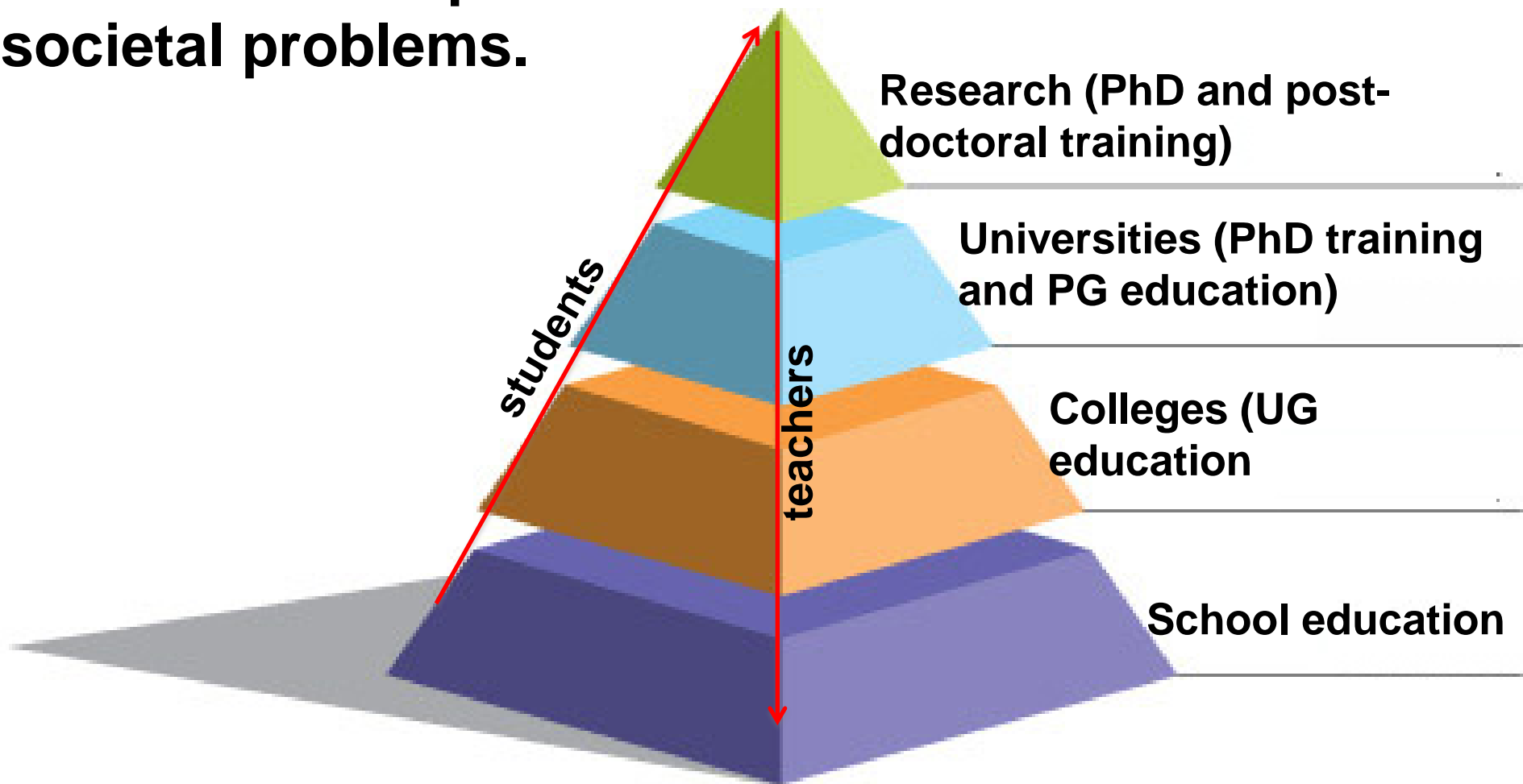
 One researcher per 10,000 labour force



**In this context, there is an urgent need to**

- 1. develop inquiry-based and research based under-graduate and graduate science education programs.**
- 2. provide serious attention to pedagogy**
- 3. *train next generation of teachers.***

We should work for a **seamlessly-integrated** **non-hierarchical** structure of research institutes, Universities, Colleges and Schools feeding on to increase the number and quality of S&T personnel, who will also provide science-based solutions to societal problems.



**Policy to regain quality of education of 1950s, but at a scale of 2020s...a mission impossible?**

**To ensure that quality is maintained, while we expand higher education sector, we need to develop innovative pedagogical methods**