Nurturing and Sustaining Excellence in Engineering Education

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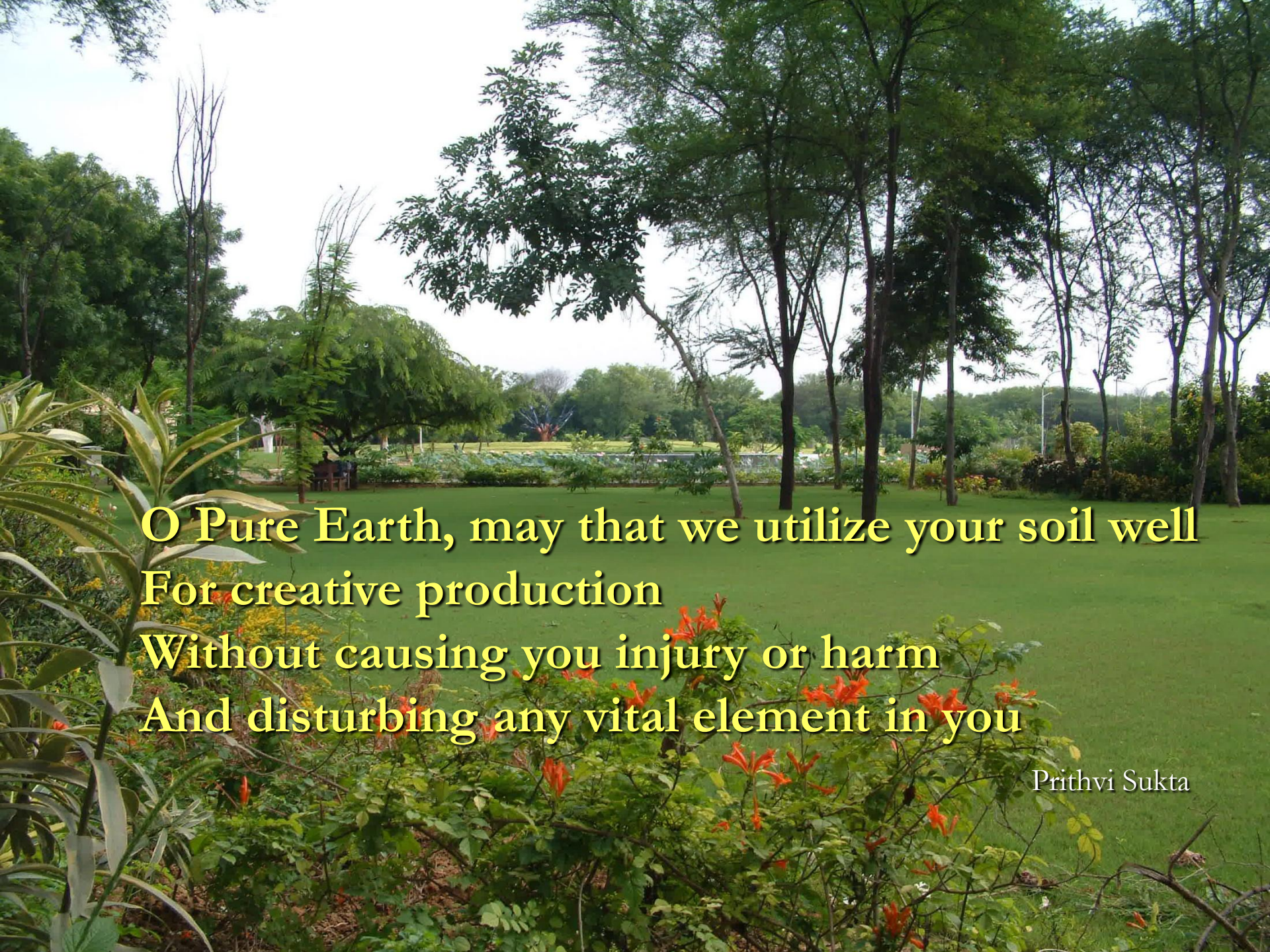

O Pure Earth, may that we utilize your soil well
For creative production
Without causing you injury or harm
And disturbing any vital element in you
Prithvi Sukta

Excellence in Engineering Education

How To:

- Define excellence
- Measure excellence
- Recognize excellence
- Assess potential for excellence
- Assure excellence

Too often we fail to recognize and pay tribute to the creative spirit. It is that spirit that creates Jobs.

Alfred Sloan

Clear Strategy and Goals for excellence.

Centre of Excellence -Goals

Set Measurable goals consistent with university vision.

Nalanda – Global University

2nd-12th Century AD

Nalanda – ***Giver of Knowledge, Centre of Excellence***

- World's most ancient university, largest residential, international centre of learning
- 14 hectares (1,40,000 sq m, 35 acres)
- **2,000 Faculty**, 10,000 Students (1:5)
- Rigorous Admission Test; Merit-based admission; Rigour & Discipline

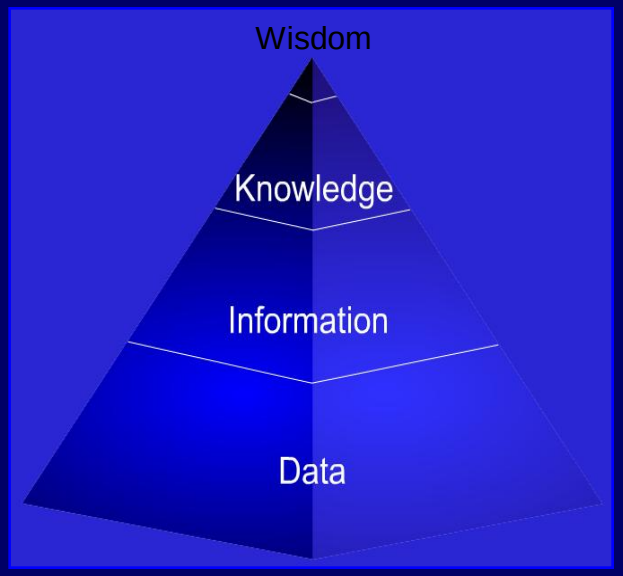
2nd-12th Century AD

Nalanda – ***Giver of Knowledge, Centre of Excellence***

- Science, Literature, Logic, Fine Arts, Medicine, Yoga, Philosophy, Theology, Grammar, Astronomy, Mathematics
- Emphasis on **knowledge** and **practice** through Learning (Free Discussions, Debates) in classes
- Library in a 9 storied building

What A vision in 2nd Century AD! Can we do better?

Engineering Education



The Student we educate today will be a

Lateral Thinker, Innovator,

Change Agent, Wealth Generator, and

Leader of the Future,

for the well being of our citizens, through

creation & transfer of knowledge.

A Polymath

Equip & nurture to face challenges of 21st century.

Crucial Requirements

Motivated Students

Quality Faculty

Enlightened Management

Excellent Facilities & Infrastructure

Systems & Processes

e-Campus

Faculty is the most important resource

Paradigm Shift in Education

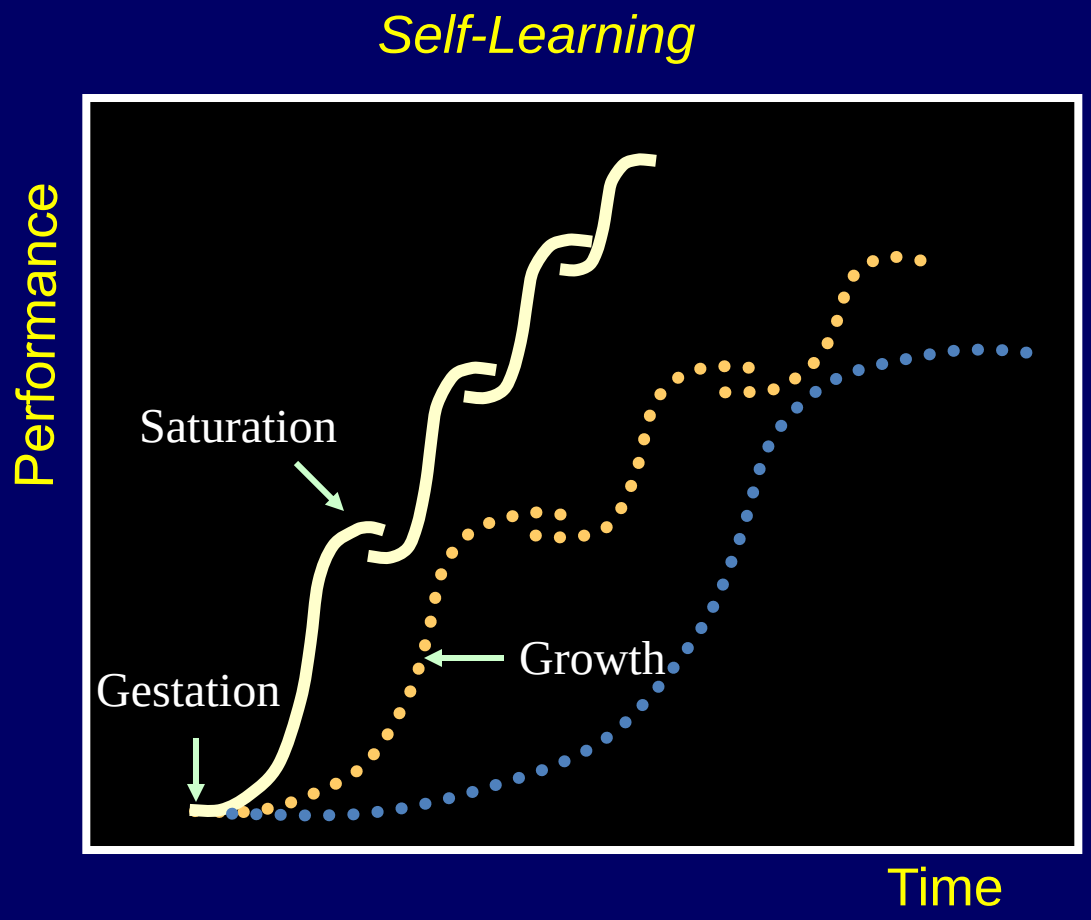
From	*To*
Teacher-Centric	Student-Centric Active Learning
Job-centred	Knowledge-centred
Individual Labs	Integrated Labs
Machine Shop	Fabrication Technology Lab
Sage on Stage	Guide on Side
Individuals	Teams
Fixed Classroom environment	Flexible Learning Environment
Training	Internships

Input ⇨ Academia + Industry + Professional Bodies ⇨ *Output*

⇒ *Generalist–Specialist* (*Scientist–Engineer–Technologist-Manager*)

⇒ *Better Conditioned Product - Innovator.*

The ‘S’ Curve



- Short Learning Stage
- Rapid growth Stage
- Quick Transition to next S-Curve before decline

⇨ Life-long learning

Continuous Self-Renewal.

Paradigm Shift

Be the change you want to see in the world.

Mahatma Gandhi

Transformation in thinking needed.

Pursuit of Excellence

Faculty

- Teaching
- Research
- Extension
- Service

- PhD
- High teaching and research potential
- Competitive remuneration
- Attractive incentives
  - Consultation
  - Continuing Education
  - Summer assignments
  - Liberal sabbatical norms
- Initial 2-yr research support
- Research collaborations
- Transparent, Performance-based recruitment, retention, advancement policies
- Quality living & support system
- Opportunities for spouse

Tenure-track appointments

Centre for Academic excellence & leadership; age of faculty

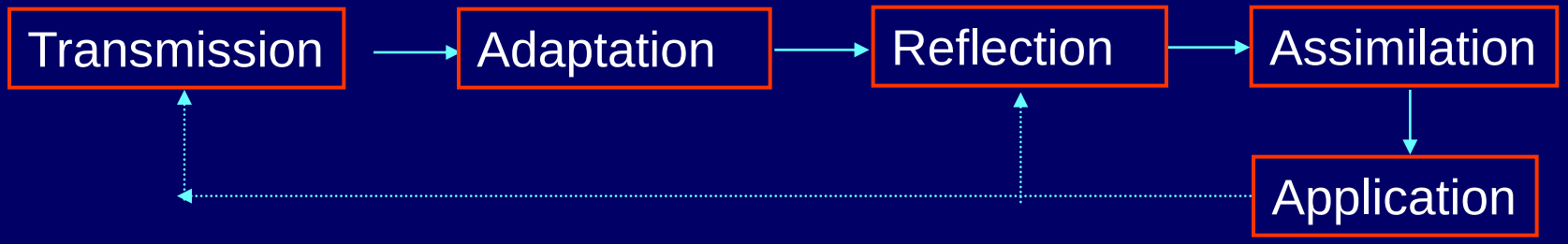
Is external motivation necessary?

Pursuit of Excellence

Faculty

- *Teaching*
- Research
- Extension
- Service

- Transmission model
  - ⇒ Reflective model
- Mentoring
- Teacher centric education
  - ⇒ Student-centric active learning
- Feedback – students, peers, …….
- Innovation
- Effective use of technology



OpenCourseWare; On Line Courses

Recognize and reward teaching

Strive for Excellence in everything we do.

Quality in Higher Education

It is the supreme art of a teacher
to awaken joy in
creative expression and knowledge

Albert Einstein

Tasmai Gurave Namah – Do we deserve?

Pursuit of Excellence

Faculty

- Teaching
- *Research*
- Extension
- Service

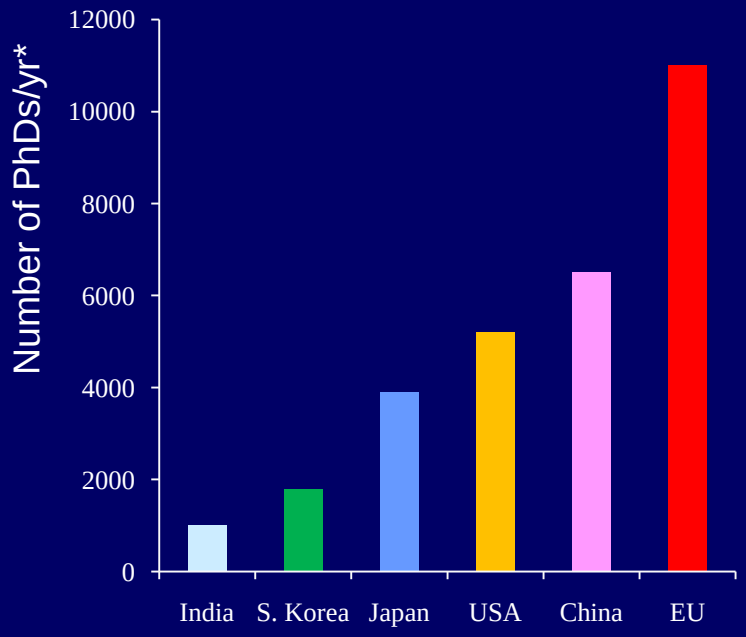
- Quality *vs* Quantity
  - Publications in reputed, reviewed, recognized journals
  - Presentations in reputed national & international conferences
- Recognition from peers
- National & International awards, memberships
- Research grants from funding agencies & corporations
- Innovation
- Patents
- *Societal contributions*
- Spin-offs

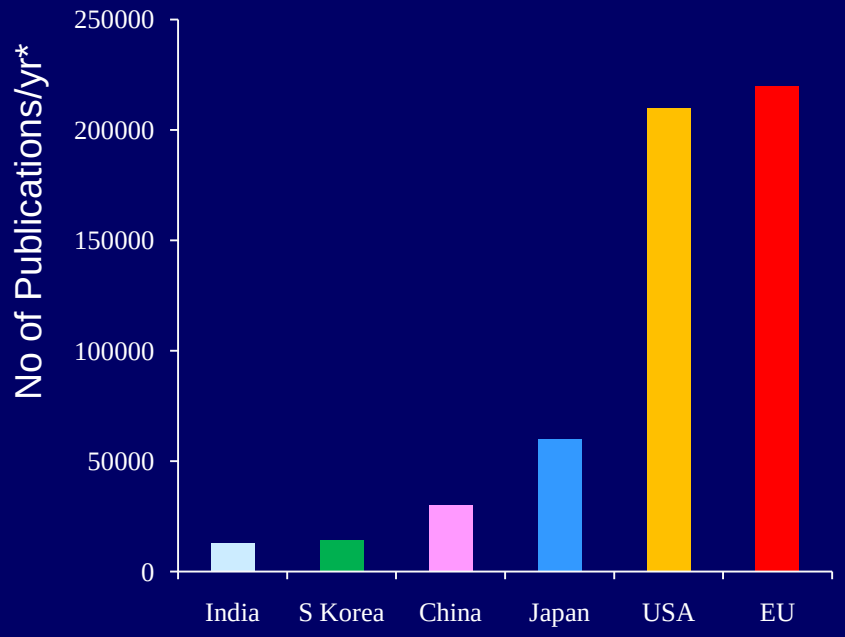
Research & Innovation Ecosystem by Kudchadker et al, PANIIT

Centre for Innovation Management

Ideas to Innovation.

India: PhDs & Publications in Engineering





*2003 figures

Research-led Teaching Institution.

Main Features of Academic Programs

Thesis, Projects
Seminars, Workshops
Internships (Rural, Industry, Research)

HASS

Communication
Team work
Life-long Learning
Ethical values

Management

Engineering Core Courses

Technical Electives

Eng. Sci. Electives

Open Electives

Flexible Learning Path

Credit System

'Tinkering' Lab

Fabrication Tech Lab

Integrated, 'Open-ended' Science, Engineering Labs

Design projects

Hands-on Experience

Sciences, Design & Innovation, Economics, Logic, Engineering Sciences & Fundamentals, Humanities, Arts, & Social Sciences, Ecology

Holistic education and learning for Knowledge Society.

Academic Program – Student Focus

Courses Offered, Sequencing, & Linkages, etc.

Designed, Implemented - Meet Students' Requirements

- Educational, Professional, & Personality Development
- Active Learning
- *Short retention time*
- Catering to Individual Differences in

  Student Learning Rates & Styles
- Proper Assessments
- Complete Transparency in Evaluations, Grading, & Grades

Student-centric active learning.

Academic Programs – Theory + Practice

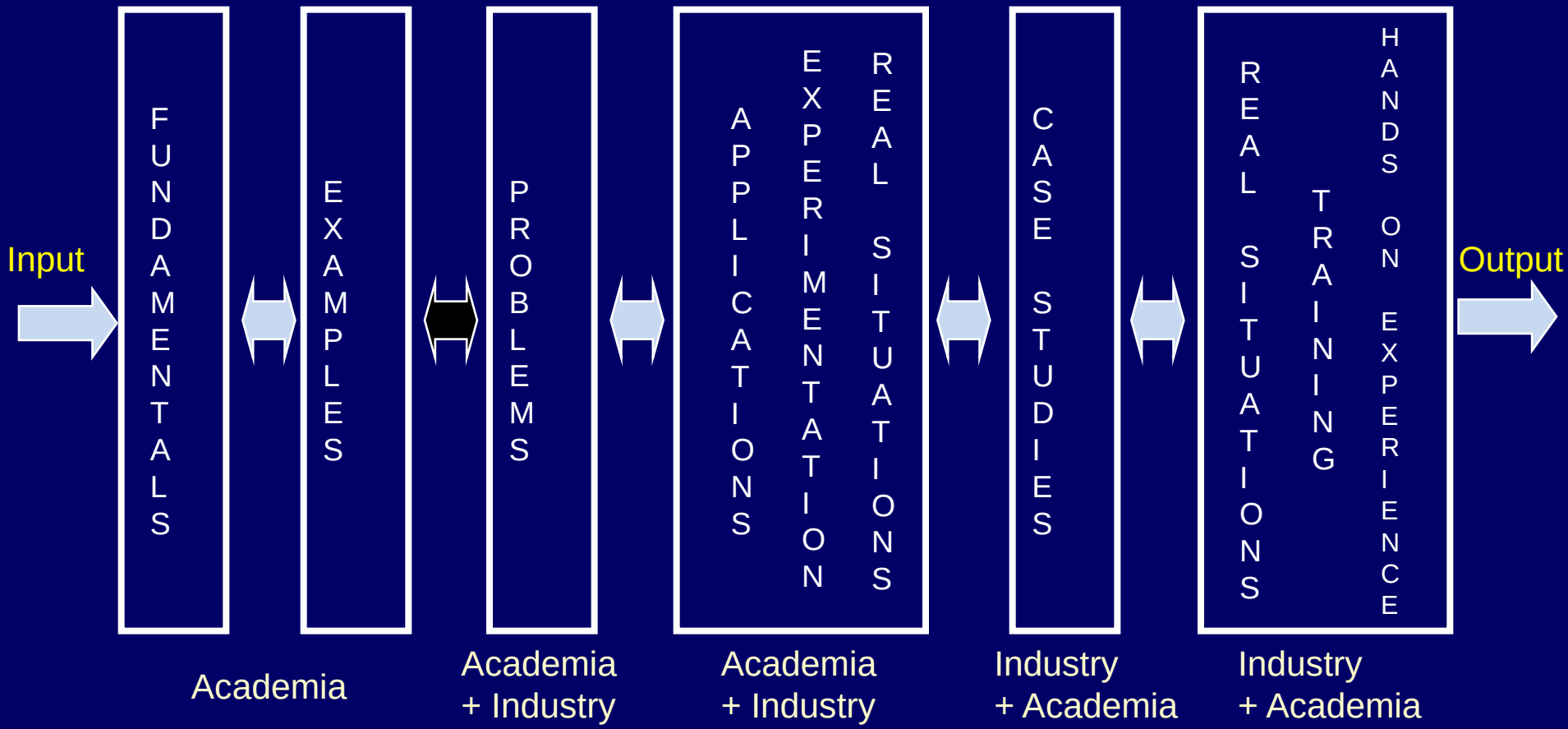
Medical Education Model

- *Industry as "Live" Workshop*
- *Bring Industry to Classrooms (video)*
- *Team-Teaching courses & Guidance*

	Internships
Summer I	Rural
Summer II	Rural/ Industry
Summer III	Rural/ Industry/ Research
Summer IV	Industry/ Research/ Project

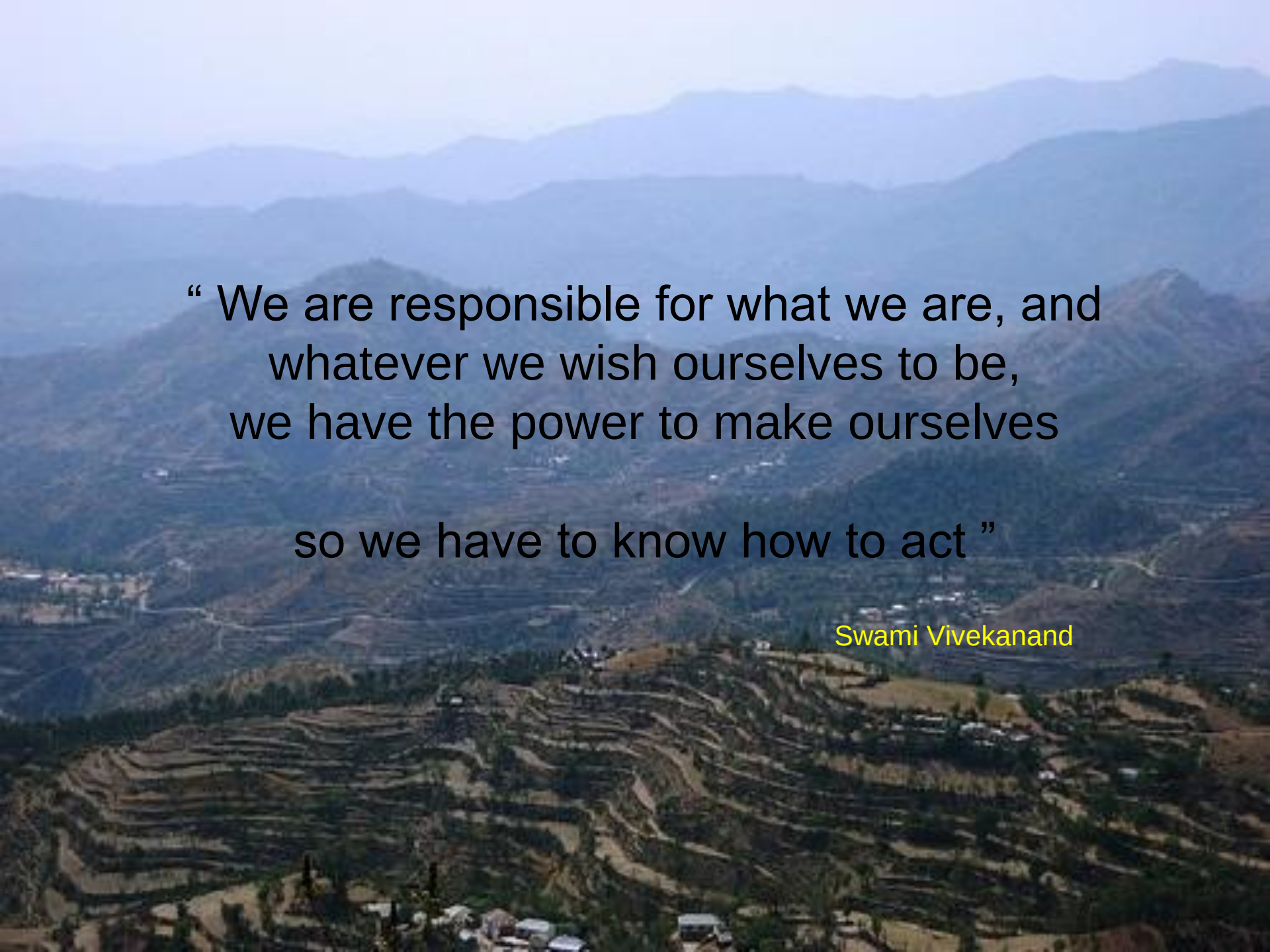
Problem solving and hands-on experience.

Academic Programs – Theory + Practice



⇒ *Fundamentals are* GLOBAL

⇒ *Applications are* LOCAL


“ We are responsible for what we are, and
whatever we wish ourselves to be,
we have the power to make ourselves
so we have to know how to act ”
Swami Vivekanand