Industry – Academia Interactions for Glasses
National Perspective
(Research & Innovation for Serving the Social Needs)

Prof. Devendra Kumar
Professor of Glass Technology
Department of Ceramic Engineering
I.I.T.(B.H.U.), Varanasi.

Experience in Research, Innovation, Education - with Social Needs

- **Research and Innovation**
  - ✓ **Ceramic, Glass-Ceramic and Composite Material for-**
    - ❖Electronic, Electrical, Mechanical, Thermo-mechanical and Bio-medical Applications.
  - ✓ **Collaboration with more than twenty researchers from academia, research and Industrial organizations across 5-6 disciplines**.
  - ✓ **Approx. 200 research publications.**
- **Education** – Teaching and Curriculum development.
- **Social Needs**
  - ✓ **Surveyed large, medium, small and micro ceramic glass industries for their techno-economic needs.**
    - ❖Tata Steel, OCL, Birla Carbon, Asahi Glass, Gujrat Gurdian
    - ❖**Glass and Ceramic clusters at-**
      - Khurja, Chunar, Ajamgharh, & Firojabad
    - ❖Published popular articles on bases on above studies.

Varanasi Traditional Pottery


सेरामिक अभियान्त्रिकी विभाग
DEPARTMENT OF CERAMIC ENGINEERING
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Azamgharh Black Pottery





















Firojabad Glass Cluster





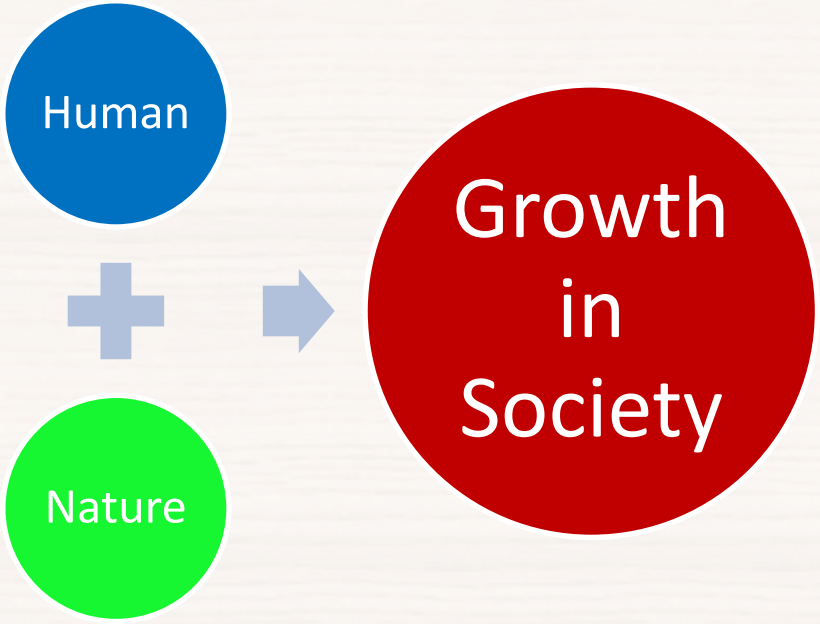




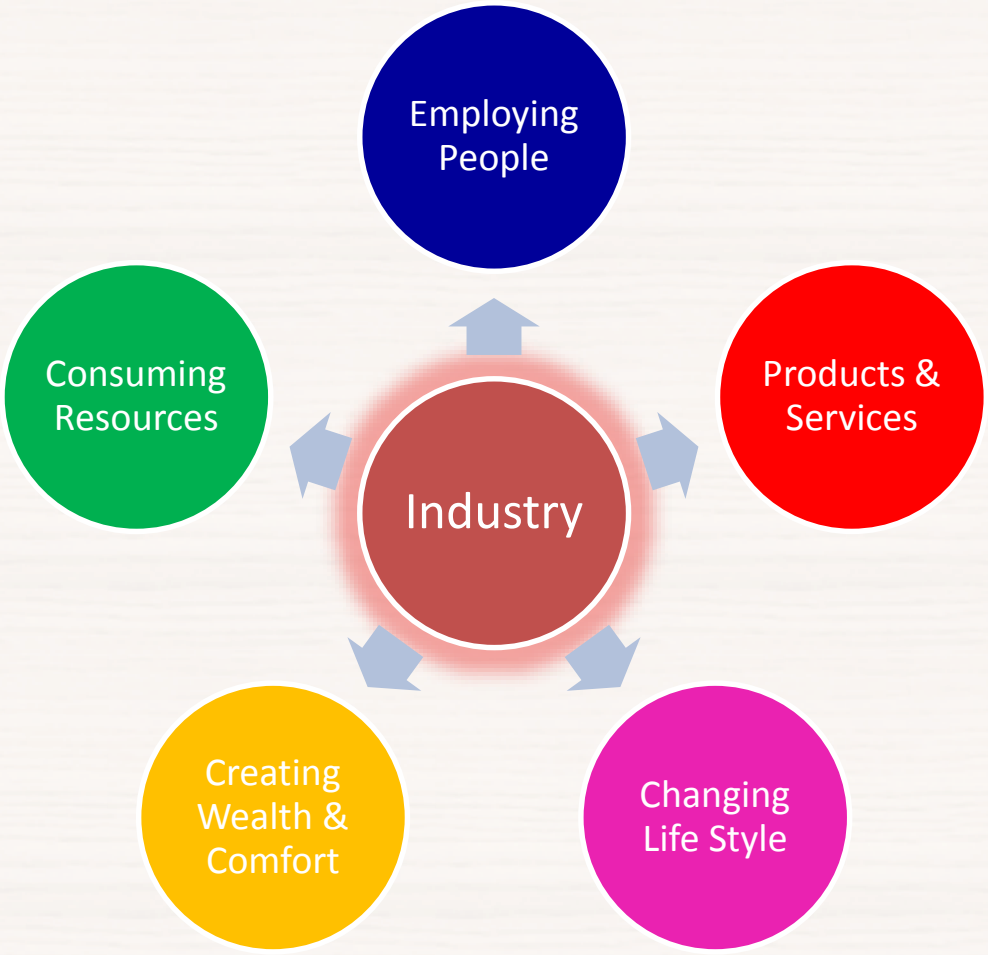
Industry – Academia Interactions
Why and How?
A fundamental point of View

Human → Society → Nature

- Human want happiness and Comfort
- Society needs harmony and Mutual Respect
- Nature demands Sustainability



Industrial Role on Culture and Nature



Challenge of Industrial World

- Global Competition
- Profitable Business
- Design and Development of New Products and Processes
- Optimization and Control of Existing Processes
- Sustainable Growth
- Compliance of Institutional Regulations

Answer to these Challenges are in the:

- **Advancement of Technologies and Processes through Research and Innovation**

Challenge of Technology World

- Technologies are supported by inventions.
- Technological Solutions with futuristic approach come with research and innovation
- Fundamental concepts and phenomenon are some time used in non contextual environments.
  - To innovate for
    - New Design
    - New products and/or applications.
      - Which are tested in public.
      - Only fittest survives.

It requires working in trans-disciplinary areas in multi dimensional environment.

Industry – Academia Interactions

Why?

- **Industries are**:
  - Engaged in manufacturing products through processes, which are
    - feasible and tested over time.
  - Using real life Technologies and Practices.
- **Academia is**:
  - Centres of learning, research and innovation.
  - Generating Knowledge in Futuristic Dimensions.

For Growth and Sustainable Development there is

- **Strong need for close Industry-Academia collaboration**.

Industry – Academia Interactions

Why is being not possible?

- Objectives, Environment and Work Culture of both Institutions are entirely different.
- Knowledge in Academia normally does not have a price; it is an open source.
- Knowledge in industry is used by paying price and its use generate money.
  - **Knowledge is Intellectual Property.**

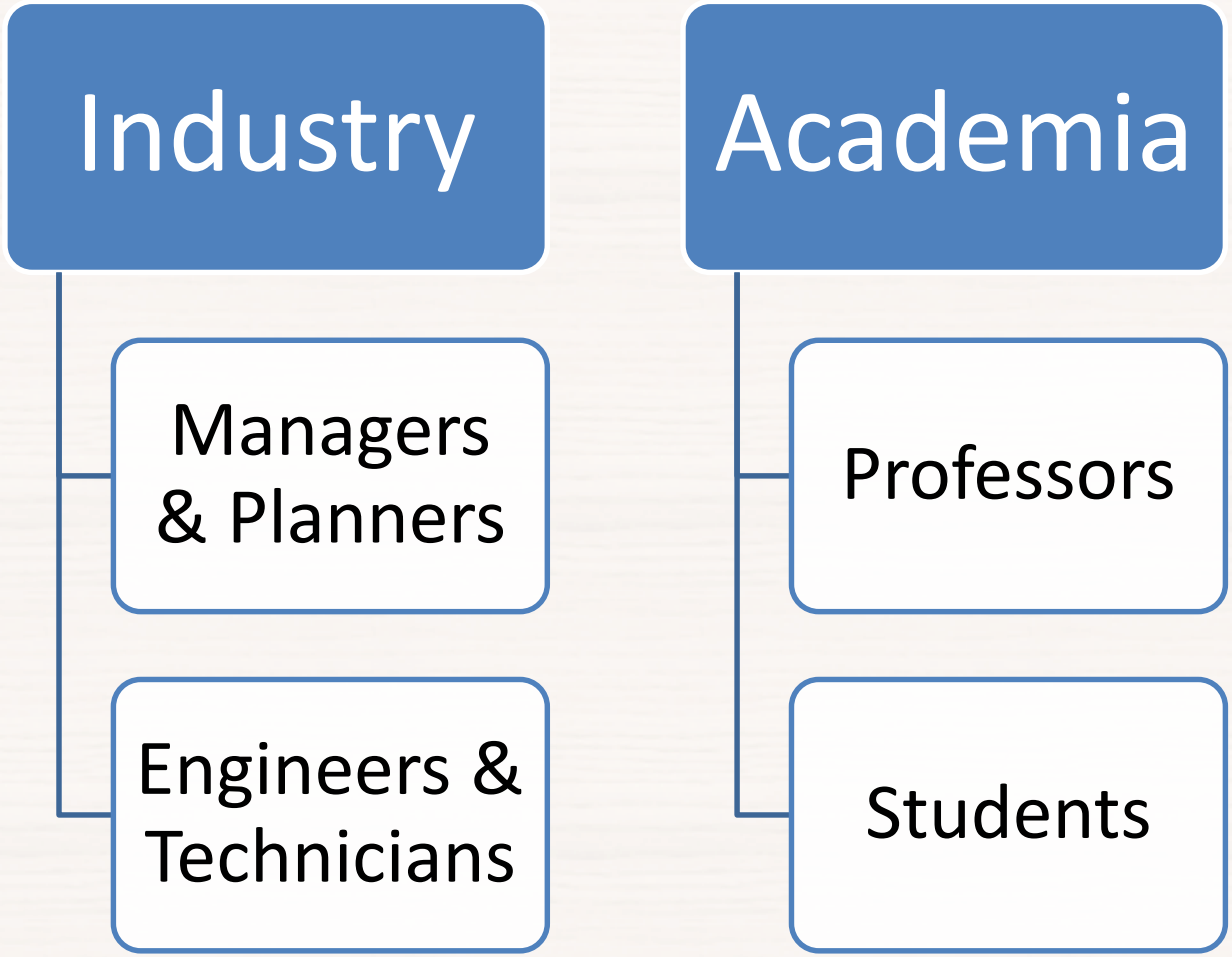
Naturally Industry and Academia blame each other for non-fruitful results for any collaboration leading to Mistrust.

Industry – Academia Interactions

What is the solution?

- Understanding and respecting each others environment, objectives and work culture.
- Adopting holistic approach towards the sustainable development of each other.
- Identifying common areas of interest not only for present requirements but also for unseen future.
- Finding methods of balancing Meta-matter (Knowledge) with real matter (money)

Understanding
People their Aims and Work Culture



Objectives of the Graduates

- Professionals, Academicians and Scientists are Graduates of Institutions of Higher Learning such as IITs.
- Most of the Graduates choose to work in Industries.
  - A fraction of them would like to go for higher studies in engineering and technology or management.
- Depending on the opportunity and potential Graduates may or may not choose to work in area or branch of Engineering in which they are graduating.

The objective of Graduating Engineers is to have such potential knowledge, skills and personality so they can face the challenge of professional word and earn a handsome amount.

Understanding
Work Culture

Academia

- Focus is on learning with a broad base.
- Laboratory and project component have smaller weightage.
- Professor's goal is to finish the course and student's goal is to pass examination and get a Degree.
- Usually they do not bind themselves with time.

Industry

- Focus is on efficient delivery of assigned work with existing knowledge.
- Skills in performance is required.
- Investment and profitability is of prime importance

Holistic Approach
Towards Sustainable Development

- **Understanding Sustainable Development.**
  - Ecology and Environment
  - Security, safety, Health, Education and Training
- **Identification of Common Programmes**
  - Advancement of technology
  - Energy efficiency
  - Conservation of resources
    - Money, Material and Manpower

Holistic Approach
Cooperative Effort

- Among Industries themselves
- Among Academia themselves
- Among both Industries and Academia
  - Sharing non-proprietary information regarding
    - Technology requirements, Good Practices, Trouble shooting etc.
  - Conferences, seminars and workshop
  - Exchange Programmes and extended education.
  - Cooperative research
  - Establishment of centres with common goals

Holistic Approach

Cooperative Research and Innovation

- Dissecting the Scientific and Technological problems into smaller units by Industrial Organizations and creating a database (Open Source) for the same.
- Students and Professors be encouraged to take up these problems. They will also create a database (Open Source) of solutions of Industrial Problems.
- Industries and Academia can utilize this knowledge database (Open Source) for their benefit.
- Meta-matter (Knowledge) of Academia is to be balanced with real matter (Money) of Industry.

Understanding
Meta-Matter (Knowledge) and Real Matter (Money)

- **Meta-Matter (Knowledge)**
  - **Knowledge within minds of individuals which trans-dance by direct communication and living together can be considered as Meta-Matter. It is personalised.**
- **Real Matter (Money)**
  - **All objects including documented knowledge may be valued in form of money. These can be termed as assets or property.**

Recent
Curriculum Changes at
Indian Institute of Technology (BHU)
Varanasi

Integrating
Design and Innovation with Education

Integrate Design and Innovation with Education inculcating three qualities in students:

- ✓Analytical ability

  (ability to analyse given situations),

- ✓Building ability

  (ability to design with creativity), and

- ✓Caring and character

  (sensitivity to others and courage to act on one's beliefs)

Project based learning in Practice-Theory-Practice Environment

- **Project based learning is being integrated with course work to reinforcing each other.**
  - **Project provides experience**
  - **Course work provides knowledge**

- **To find ways to select projects which have:**
  - **Good research or innovation value, and**
  - **Which relate to societal, industrial or pedagogical need.**

- **To connect with resource persons**
  - **Who have rich experience of working on societal or industrial problems and**
  - **Who can help in selection and execution of real life projects related to engineering.**

Weaving Research & Innovation

1. **Layered Learning**

   Practice-Theory-Practice

   ✓ Leads to deeper learning

2. **Working with Projects**

   ✓ Enhances Creativity

3. **Channelizing Creativity** using Streams

   ✓ Can contribute to Society (while being student)

Working with Projects

- **During First two semesters** the students are **enabled** with the tools or equipments of **projects** and **focus is on Practical Subjects.**
- **Students get hands on experience working with** exploratory projects at an early stage; in 3rd semester for **Exciting Imagination and Enhancing Creativity**
- Students are facilitated to work with their seniors – **peer learning**.
- **Research and Innovation project** starts at early stage; **say in 5th Semester** and continues for a longer duration.

✓ BUILDS TEAM SPIRIT AND CHARACTER.

Flexibility in the Curriculum:

- Different students might learn and do projects in different areas.
- The students can **study courses** of their curriculum at **an early stage** depending on her/his **project needs.**
- There will be **flexibility in the curriculum** serving the needs of students of **different streams.**

Industrial Tour, Training and Project

- Industrial exposure is very important for learning process in engineering education.
- For some disciplines it is an important component of curriculum, while for others it may not be so important.

Reward of Study through path of Stream

B. Tech./B. Pharm. (Honors)

Students will be allowed to register or choose a stream of the Department/ School

- **They will carry out research or innovation project** over 5th to 8th semesters.
- They would also **register for the stream courses** along with the project, starting with the 5th semester.
- This would make it possible for them to carry out **serious research or a innovation project.**

✓ Those who register for such a stream, would get a special degree, B. Tech. / B. Pharm. (Honors).

Introduction of Flexibility in Duration of Programmes

Course-Semester-Programme

- **Course** is a unit of academic programme.
- **A set of compulsory and elective courses constitute a programme.**
- Course is unique in terms of its **specific subject** referred by its **Title and Content**. .
- The educational programme is divided into semesters.

Earning of Credits and Graduation

- Course, Semester and Programme are quantified in terms of **credits.**
- The **Credits are supposed to be earned by the students** by perusing/studying different courses in a semester and **obtaining a Pass Grade.**
- Thus student **accumulates the credits** and he/she is supposed to **qualify for the award of a degree** in a programme, whenever:--

  His/her **accumulated credits crosses the minimum credit requirement for respective Programme**.

Flexible Residence Requirements

The minimum residence duration and maximum limit of residence for various undergraduate programmes are as under:

Programme	Minimum Duration (Semesters)	Maximum Limit of Residence (Semesters)
B.Tech./B.Pharm.	Seven (07)	Twelve (12)
B. Tech.- M. Tech./ B. Pharm.-M. Pharm. (Dual degree)	Nine (9)	Fifteen (15)
M. Tech. (Integrated):	Nine (9)	Fifteen (15)

Permission to Proceed to other Institutions

- In order to help a student to broaden his/her horizon and gain course/work experience, he/she may be permitted to proceed to other institutions in India or abroad as a non-degree student..
- Students studied/worked at other institutions in India or abroad as a non-degree student may apply for waiver of equivalent credits.

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Anticipation from Industry

- Understand the objective, work culture of Academia and try to get the work done in that framework.
- Exchange of personals between Industry and Academia.
  - Having non-discloser agreement;
    - Offer have provisions of mid-term and preplacement offers for students while they are continuing their studies.
    - Offer visiting positions to Professors, who can work for some duration in Industry. (may range from few weeks to few months).
  - Provide study leaves for part time and fulltime education to their employees.

Anticipation from Industry

Investment in

- **Creation of infrastructure for research which may be jointly owned by Industry and Academia**
- **Scholarships to Professors and Students**

Thanks for Attention
and
Useful Suggestion