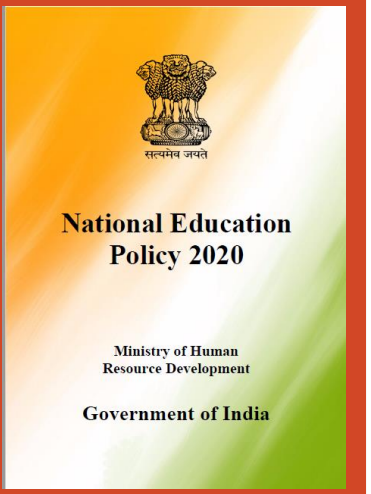
National Education Policy Implementation

in Higher Education - Karnataka State



Discussions on Curriculum Aspects

Gopalkrishna Joshi

Executive Director

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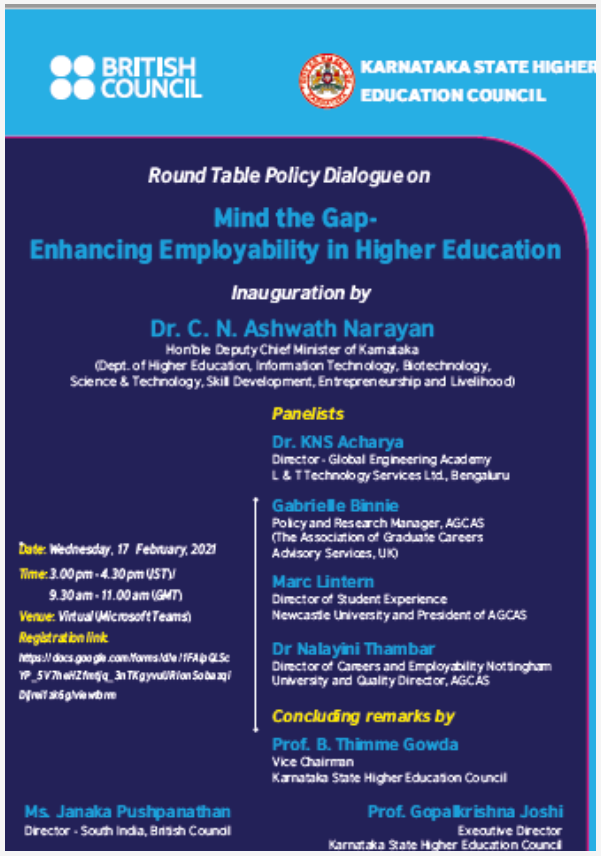
NEP Implementation : Preparations at HEd Dept and KSHEC

- **Task force on NEP Implementation under the Chairmanship of Sri.S.V.Ranganath Chief Secretary (Retd), GoK**
  - **“Sub-Committee on Academic Reforms” - Prof.Thimme Gowda**
  - **“Sub-Committee on Regulations” - Prof.Yashavant Dongre**
- **Cabinet approval for NEP Task Force Committee**
- **“Karnataka State Higher Education Institutions Bill” - Dr.Vasudev Aatre Committee**
- **GO on Implementation of NEP**
- **Faculty wise curriculum structure committees formed – Model curriculum**
- **Subject committees for curriculum content formed – Model curriculum for all programs**
- **Union HRD Minister Inaugurating the implementation of NEP on August 23**
- **NEP Awareness Programs**
  - **VCs of all Universities**
  - **Deans, Professors and Boards of studies**
  - **Open sessions with faculty members**
  - **Managements, Principals and faculty members at university levels**
  - **Students**
- **NEP HelpLine**

NEP Implementation : Preparations at HEd Dept and KSHEC

Collaborations and exposure to global best practices

KSHEC- British Council “Round Table Policy Dialogue Series”



“Design of multi-disciplinary programs in tune with NEP propositions.”

Date: Friday, 16 July 2021

1. Prof.Prashant Jha, King's College London
2. Sarah Graham, Newcastle University
3. Prof.Bhanu Murthy, BASE, Bengaluru

“Internationalization and its benefits to Karnataka HEIs”

Forthcoming Dialogue on “Building research and Innovation culture in Karnataka HEIs”

NEP Implementation : Preparations at HEd Dept and KSHEC

Collaborations and exposure to global best practices

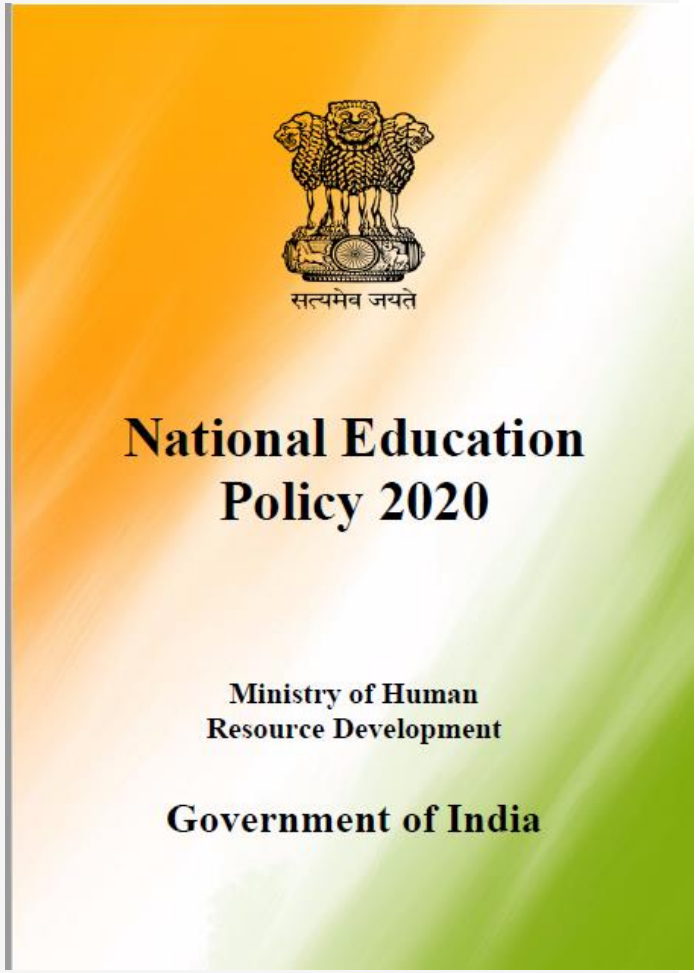
KSHEC-Pennsylvania State Hub for Higher Education (PASHE)

1. Harrisburg University
2. Shippensburg University
3. Elizabeth Town College
4. Theil College
5. Athens University, Alabama

NEP2020 – A few major curricular recommendations

Curriculum - UG

- Graduate Attributes and Program Outcomes
- Multiple entry and multiple exit
- Employability skills in undergraduate education
- Critical thinking and Problem Solving
- Multi-disciplinary and Interdisciplinary learning
- Student centred teaching learning practices
- Focus on formative assessment

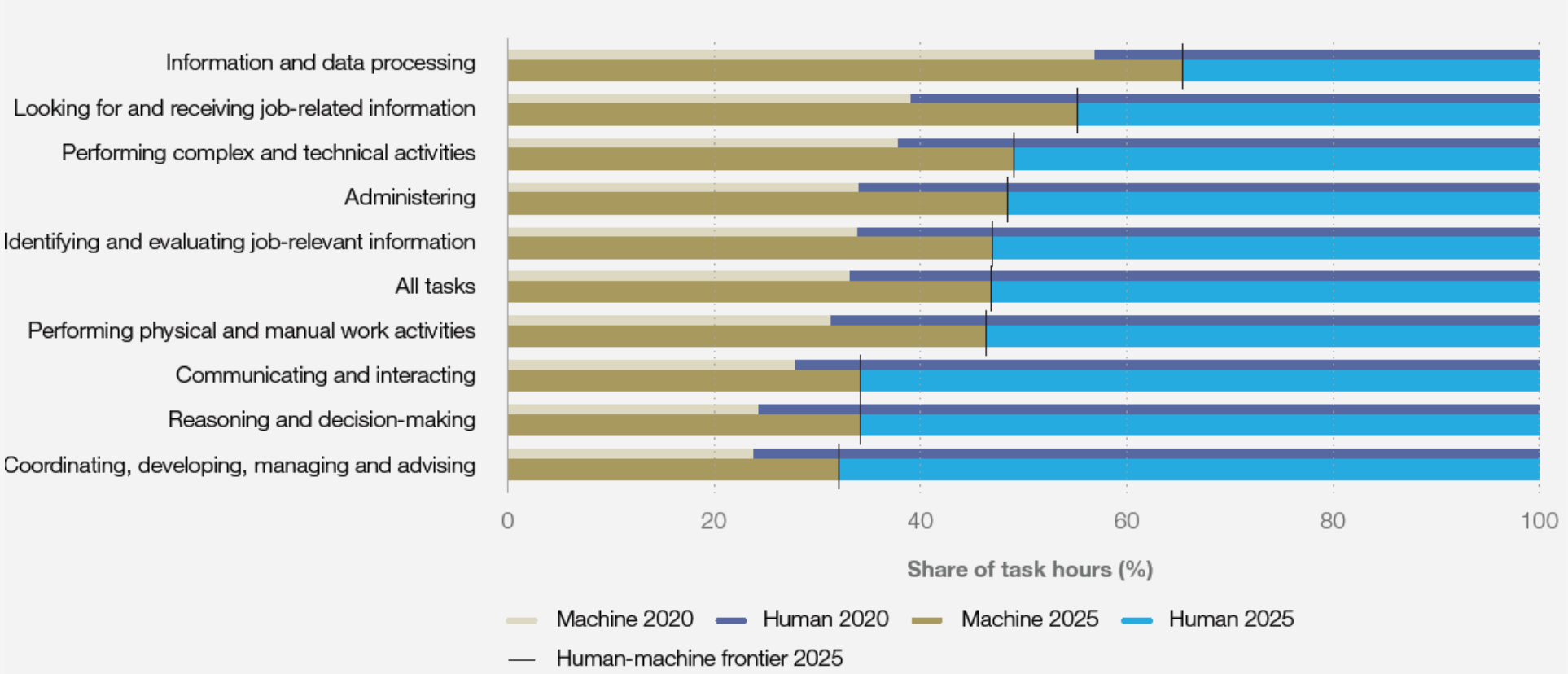


NEP Implementation : UG Curriculum

Graduate Attributes or Program Outcomes	• **List the skills and competencies leading to employability of graduates of your faculty** • **Focus on problem solving, critical thinking, teamwork and collaboration**
Multiple entry and multiple exit	• **List the competencies at various levels of exits on the continuum**
Focus on skills	• **Not just psychomotor skills, in higher education focus shall be on cognitive skills – critical thinking, problem solving** • **Employability focus** • **Alignment with standards – National Skills Qualification Framework**

Future of Jobs Report 2020 by World Economic Forum

Share of tasks performed by humans vs machines, 2020 and 2025 (expected), by share of companies surveyed



Future of Jobs Report 2020 by World Economic Forum

Top 20 job roles in increasing and decreasing demand across industries

↗ Increasing demand	
1	Data Analysts and Scientists
2	AI and Machine Learning Specialists
3	Big Data Specialists
4	Digital Marketing and Strategy Specialists
5	Process Automation Specialists
6	Business Development Professionals
7	Digital Transformation Specialists
8	Information Security Analysts
9	Software and Applications Developers
10	Internet of Things Specialists
11	Project Managers
12	Business Services and Administration Managers
13	Database and Network Professionals
14	Robotics Engineers
15	Strategic Advisors
16	Management and Organization Analysts
17	FinTech Engineers
18	Mechanics and Machinery Repairers
19	Organizational Development Specialists
20	Risk Management Specialists

↘ Decreasing demand	
1	Data Entry Clerks
2	Administrative and Executive Secretaries
3	Accounting, Bookkeeping and Payroll Clerks
4	Accountants and Auditors
5	Assembly and Factory Workers
6	Business Services and Administration Managers
7	Client Information and Customer Service Workers
8	General and Operations Managers
9	Mechanics and Machinery Repairers
10	Material-Recording and Stock-Keeping Clerks
11	Financial Analysts
12	Postal Service Clerks
13	Sales Rep., Wholesale and Manuf., Tech. and Sci.Products
14	Relationship Managers
15	Bank Tellers and Related Clerks
16	Door-To-Door Sales, News and Street Vendors
17	Electronics and Telecoms Installers and Repairers
18	Human Resources Specialists
19	Training and Development Specialists
20	Construction Laborers

Top 15 skills for 2025

1	Analytical thinking and innovation
2	Active learning and learning strategies
3	Complex problem-solving
4	Critical thinking and analysis
5	Creativity, originality and initiative
6	Leadership and social influence
7	Technology use, monitoring and control
8	Technology design and programming
9	Resilience, stress tolerance and flexibility
10	Reasoning, problem-solving and ideation
11	Emotional intelligence
12	Troubleshooting and user experience
13	Service orientation
14	Systems analysis and evaluation
15	Persuasion and negotiation

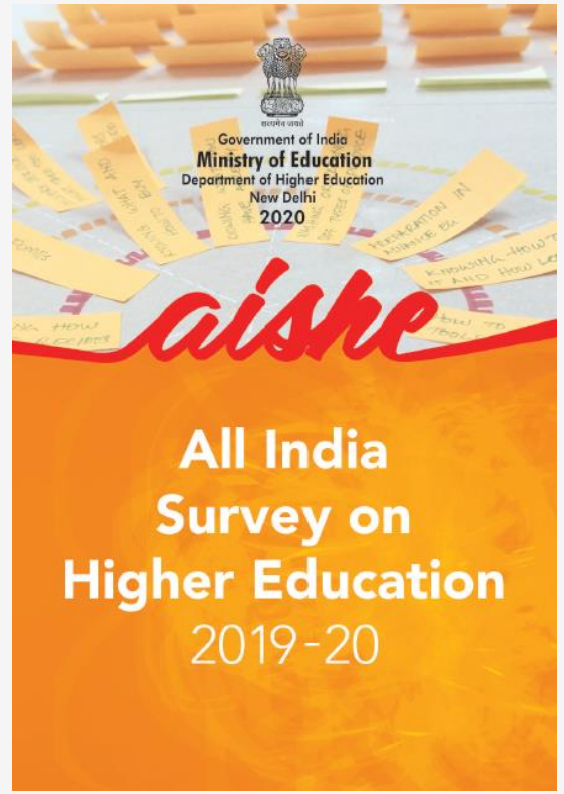
AISHE 2019-2020

Total enrolment in higher education has been estimated to be 38.5 million with 19.6 million boys and 18.9 million female.

Gross Enrolment Ratio (GER) in Higher education in India is 27.1

Maximum numbers of Students are enrolled in B.A. programme followed by B.Sc. and B.Com. programmes. 10 Programmes out of approximately 196 covers 79% of the total students enrolled in higher education.

At Undergraduate level the highest number 32.7% of students are enrolled in Arts/Humanities/Social Sciences courses followed by Science 16%, Commerce 14.9% and Engineering and Technology 12.6%.



India Skills Report 2021

A majority of the employable resources are qualified in their domain of education.

However, the evolving economy needs a skilled talent pool with hands-on experience in various emerging technologies. The inclusion of technology assets across industries has created a high demand for professionals with a knack for learning new skills and industry specific certifications.

Cloud computing, data science and natural language processing are in high demand, owing to large skill gaps in these areas. To fill the skill gap in the IT sector requires practical exposure to the latest technologies that gained popularity in the last 5 years.

In the coming years, industries and the governments should focus on making the existing talent pool more employable and aligned to the evolving industry demands.

India Skills Report 2021

Which sectors have hired the most?

Skills and National Standards - NSQF

- National Skills Qualification Framework (NSQF) was notified by Government of India on December 27,2013.

- NSQF is a nationally integrated education and competency based skill framework that will provide for multiple pathways, horizontal as well as vertical both within vocational education, general education and technical education thus linking one level of learning to another higher level.

- NSQF organizes qualifications according to a series of knowledge, skills and aptitude. These levels are defined in terms of learning outcomes which the learner must possess regardless of whether they are acquired through formal or informal learning.

- This will enable a person to acquire desired competency levels, transit to the job market, and at an opportune time, return for acquiring additional skills to further upgrade his competencies.

Skills and National Standards - NSQF

The key elements of the NSQF provide:

a. National principles for recognizing skill proficiency and competencies at different levels leading to international equivalency
b. Multiple entry and exit between vocational education, general education and technical education and job markets
c. Progression pathways defined within skill qualification framework
d. Opportunities to promote lifelong learning and skill development
e. Partnership with industry and employers
f. A transparent, creditable and accountable mechanism for skill development across various sectors
g. Increased potential for recognition of prior learning

Program Outcomes – An Example of BSc(Physics)

PROGRAM OUTCOMES: ***After the successful completion of the PROGRAM, the student will be able to:***

1. **Discipline Knowledge:** Acquire the knowledge of basics of science and research, and apply the understanding of fundamentals of specialized discipline in solving complex scientific problems.
2. **Conduct investigations:** Conduct investigations of issues using research methods and research-based discipline knowledge including design of experiments, data collection, interpretation and analysis to arrive at valid conclusions.
3. **Problem analysis:** Identify, formulate and analyze complex scientific problems using first principles of respective discipline.
4. **Design and Development of solutions:** Design solutions for complex scientific problems and execute them by considering the environmental, societal and public safety aspects appropriately.
5. **Modern tool usage:** Identify, select and use a modern scientific, engineering and IT tool or technique for modeling, prediction, data analysis and solving problems in the areas of their discipline.

Program Outcomes – An Example of BSc(Physics)

6.Environment and Society: Evaluate the impact of scientific solutions on society and environment and design sustainable solutions.
7. Ethics: Demonstrate professional ethics, responsibilities and norms in respective profession.
8. Individual and teamwork: Work effectively as an individual as a team member and as a leader in a multidisciplinary team.
9. Communication: Communicate effectively with the stakeholders with emphasis on communicating with scientific community, comprehend scientific reports, write research papers and projects proposals and reports, deliver effective presentations, and give and receive clear instructions.
10. Project Management and Finance: Apply the knowledge of scientific and technological principles to one's own work to manage projects in multidisciplinary settings.
11. Lifelong Learning: Identify knowledge gaps and engage in lifelong learning in the context of changing trends in respective discipline.

Multiple Entry and Multiple Exit

Exit after one year – Certificate

Jobs after exit	Technical Skills	Professional Skills
1.Lab Technicians 2.Data Entry Operators 3.Mechanical Repair and Maintenance 4.Electrical Repair and Maintenance 5.Electronics Repair and Maintenance 6.Agriculture Equip Maintenance	1.ICT 2.Computer Programming 3.Equations and Graphs 4.Chemical Handling 5.Materials Testing 6.Electrical Maintenance 7.Basic- Data Mgmt. 8.Electronic Maintenance 9.Agriculture Equip Maintenance	1.Kannada LSRW skills Science Communication 2.English LSRW skills Science Communication 3.Personality Development & Etiquettes 4.Team Work and Confidence Building 5.Awareness of Constitution of India and Environmental Science

Multiple Entry and Multiple Exit

Exit after two years – Diploma

Jobs after exit	Technical Skills	Professional Skills
1.Instructors **2.Supervisors** 3.Lab Technicians 4.Data Entry Operators 5. Agriculture Equip Maintenance 6.Mechanical Repair and Maintenance 7.Electrical Repair and Maintenance 8.Electronics Repair and Maintenance	1.ICT 2.Computer Programming 3.Equations and Graphs 4.Chemical Handling 5.Materials testing 6.Electrical Maintenance 7.Basic- Data Mgmt. 8.Electronic Maintenance 9.Agriculture Equip Maintenance 10.Laboratory practices and safety 11.Graphing Software 12.History of Science	1.Kannada LSRW skills Science Communication 2.English LSRW skills Science Communication 3.Personality Development & Etiquettes 4.Team Work and Confidence Building 5.Awareness of Constitution of India and Environmental Science

Multiple Entry and Multiple Exit

Exit after three years – Degree

Jobs after exit	Technical Skills	Soft Skills
1.**Wildlife and Nature Photographer** 2..Entrepreneur 3.**Administration (Govt &Pvt jobs) via Competitive Exams** 4.Science Communicators 5.**NGO and Environmental Activists** 6. 7.Lab Technicians 8.Data Entry Operators 9.Mechanical Repair and Maintenance 10.Electrical Repair and Maintenance 11.Electronics Repair and Maintenance 12.Agriculture Equip Maintenance	1.History of Science 2.Scientific Philosophy 3.**Entrepreneurship and Business** 4.Sports Science 5.Science of Music 6.**Nature & Wild Life Photography** 7.ICT 8.Computer Programming 9.Equations and Graphs 10.Chemical Handling 11.Materials testing 12.Electrical Maintenance 13.Basic- Data Mgmt. 14.Electronic Maintenance 15.Agriculture Equip Maintenance 16.Laboratory practices and safety 17.Graphing Software	1.General Knowledge 2.**Mental Ability and Maths** 3.**Scientific Communication** **a.Seminars and Conference Presentations** **b.Reporting minor Research Projects** 4.Science Communication in Kannada 5.Science Communication in English 6.Personality Development & Etiquettes 7.Team Work and Confidence Building

Multiple Entry and Multiple Exit

Exit after four years – Honors Degree

Jobs after exit	Technical Skills	Soft Skills
1.**Scientist/Researcher** 2. Agriculture Equip Maintenance 3.Entrepreneur 4.Competitive Exams 5.Lab Technicians 6.Data Entry Operators 7.Mechanical Repair and Maintenance 8.Electrical Repair and Maintenance 9.Electronics Repair and Maintenance	1.**History of Science** 2.**Scientific Philosophy** 3.**Entrepreneurship and Business** 4.ICT 5.Computer Programming 6.Equations and Graphs 7.Chemical Handling 8.Materials testing 9.Laboratory practices and safety 10.Graphing Software	**Soft Skills & Languages:** 1.Kannada Science Communication 2.English Science Communication 3.Personality Development & Etiquettes 4.Team Work and Confidence Building 5.**Scientific Communication** **a.Seminars and Conference Presentations** **b.Reporting minor Research Projects** **6.Entrepreneurship and Business Etiquettes**

Program Outcomes – B.Sc. (Hons.) (Economics)

- **PROGRAM OUTCOMES: After the successful completion of the PROGRAM, the student will be able to:**
- **Discipline knowledge: Ability to apply knowledge of mathematics, science, and statistics fundamentals to solve complex problems in economics.**
- **Problem Analysis: Ability to analyse economics problems, interpret data and arrive at meaningful conclusions involving mathematical inferences.**
- **Design and Development of Solutions: Ability to design an engineering system, component, or process to meet desired needs considering public health and safety, and the cultural, societal, and environmental considerations.**
- **Conduct Instigations of Complex Problems: Ability to understand and solve complex economic problems by conducting experimental investigations.**
- **Modern Tool Usage: Ability to apply appropriate tools and techniques and understand utilization of resources appropriately to complex economic activities.**

Program Outcomes – B.Sc. (Hons.) (Economics)

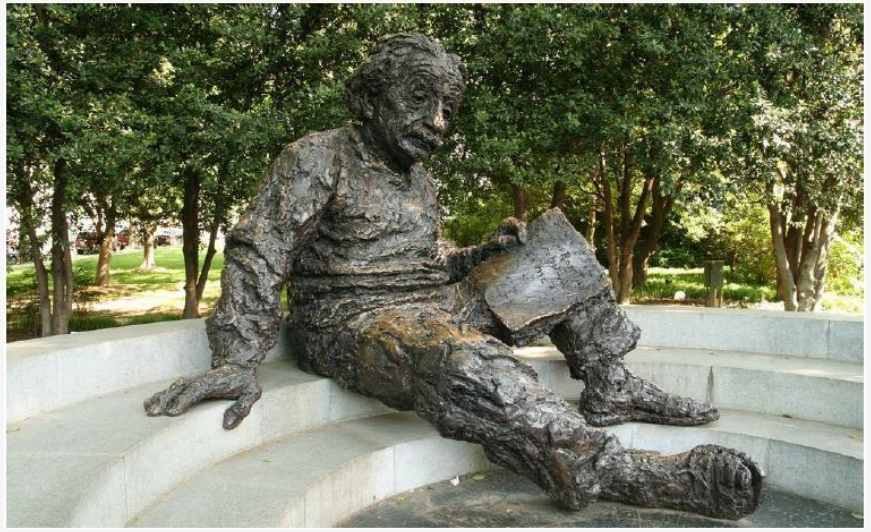
- **The Economist and Society: Ability to understand the effect of economic solutions on legal, cultural, social, and public health and safety aspects.**
- **Environment and Sustainability: Ability to develop sustainable solutions and understand their effect on society and environment.**
- **Ethics: Ability to apply ethical principles to economic practices and professional responsibilities**
- **Individual and Teamwork: Ability to work as a member of a team, to plan and to integrate knowledge of various economics disciplines and to lead teams in multidisciplinary settings.**
- **Communication: Ability to make effective oral presentations and communicate technical ideas to a broad audience using written and oral means.**
- **Project Management and Finance: Ability to lead and manage multidisciplinary teams by applying economics and management principles.**
- **Life-long learning: Ability to adapt to the changes and advancements in technology and engage in independent and life-long learning.**

NEP Implementation : UG Curriculum

Multidisciplinary and interdisciplinary learning experiences.	**Introduce at course level followed by program level. You may use guest / visiting faculty to teach these courses. You may introduce major and minor pattern, may be one major and one or two minors**

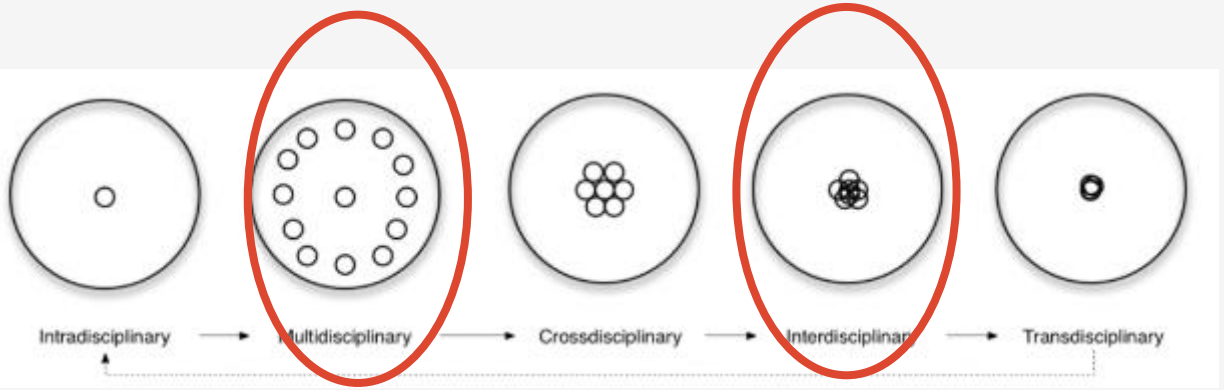
“All religions, arts and sciences are branches of the same tree. All these aspirations are directed toward ennobling man's life, lifting it from the sphere of mere physical existence and leading the individual toward freedom.”

- Albert Einstein



What are Multidisciplinary and Interdisciplinary Skills?

- **Multidisciplinary**: people from different disciplines working together, each drawing on their disciplinary knowledge. (Additive)
- **Multidisciplinary curriculum** is studying a topic from the viewpoint of more than one discipline and solving a problem(s) using a different disciplinary approach (Klaassen, 2018).
- **Interdisciplinary**: integrating knowledge and methods from different disciplines, using a real synthesis of approaches. (Integrative)
- The term ***interdisciplinary*** is applied within education and training pedagogies to describe studies that use methods and insights of several established disciplines or traditional fields of study.
- Interdisciplinary thinking was defined as the capacity to integrate knowledge of two or more disciplines to produce a cognitive advancement in ways that would have been impossible or unlikely through single disciplinary means.



UG Curriculum – Why multidisciplinary education?

- A holistic and multidisciplinary education would aim to develop all capacities of human beings - intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner.
- **Integrating** the humanities and arts with STEM have showed positive outcomes:
    - Increased creativity and innovation,
    - Critical thinking and higher-order thinking capacities,
    - Problem-solving abilities,
    - Teamwork and communication skills,
    - In-depth learning and mastery of curricula across fields
    - Increases in social and moral awareness, besides
    - Enjoyment of learning.
- India has a long tradition of holistic and multidisciplinary learning, from universities such as Takshashila and Nalanda, to the extensive literatures of India combining subjects across fields.

Why? – Two perspectives

"The difficult issues facing society today will not be solved by science and technology alone. The humanities and arts, beyond their inherent value and beauty, will help solve the great problems facing humanity. The arts and humanities can help us explore what it means to be fully human, which is something you don't learn in an anatomy class,"

- David Skorton, chair of the committee that produced the *Branches from the Same Tree* report,

and Secretary of the Smithsonian Institution,

Empathy develops as people read literature. The arts often center on not just intellectual intelligence but emotional intelligence. That is why the arts and humanities need to be integrated into STEMM, because those things are inherent in what we do. Putting students and faculty in creative exchanges provides a context for cultivating compassion and empathy. Preparing people for a job that cannot be fully anticipated requires a tolerance for ambiguity."

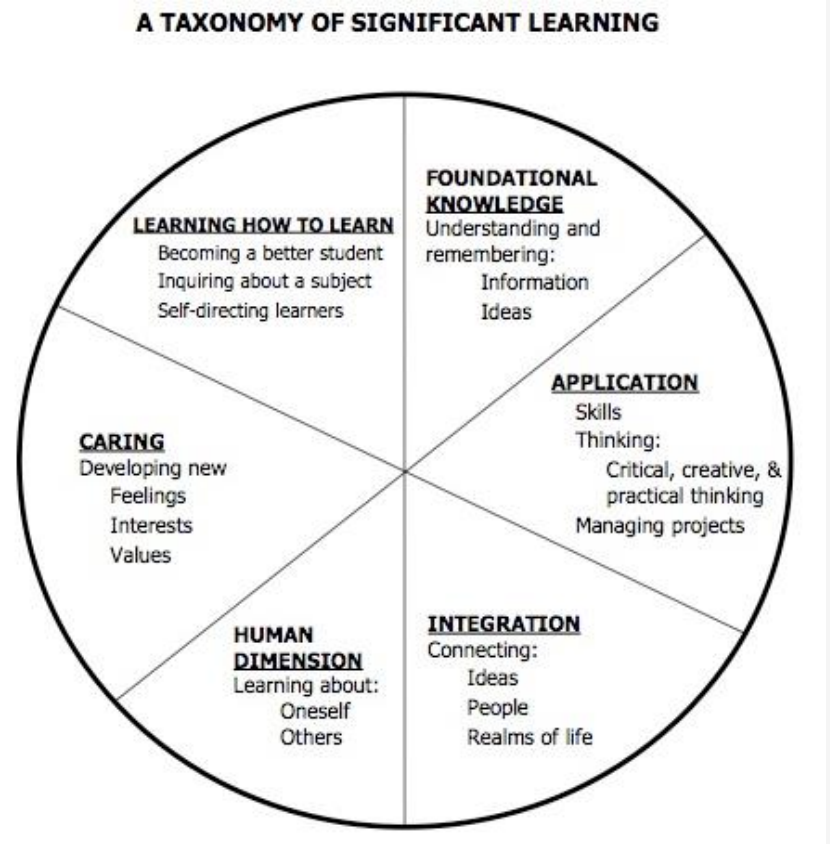
Bonnie Dill, experience as a student

Why? What do educational theories say?

Interdisciplinary Teaching Promotes *Significant Learning.*

Fink identifies 6 elements of the educational process that lead to *significant learning* and each of these is a common feature of interdisciplinary forms of instruction.

- **Foundational Knowledge** – acquiring information and understanding ideas
- **Application** – acquiring an understanding of how and when to use skills
- **Integration** – the capacity to connect ideas
- **Human Dimension** - recognition of the social and personal implications of issues
- **Caring** – acknowledgment of the role of feelings, interests, and values
- **Learning** *How-to-Learn* – obtaining insights into the process of learning



Why?

The World is Interdisciplinary

Educational experiences are more authentic and of greater value to students when the curricula reflects real life, which is multi-faceted rather than being compartmentalized into neat subject-matter package.

Real-world problems are complex, so no single discipline can adequately describe and resolve these issues. Therefore, they suggest that interdisciplinary forms of learning are prevalent and hence is required in higher education.

The Gain - Students recognize that there are a variety of perspectives what can be brought to bear in an effort to understand most issues. Thus, they find interdisciplinary forms of exploration is more compelling, which promotes engagement and learning.

Why?

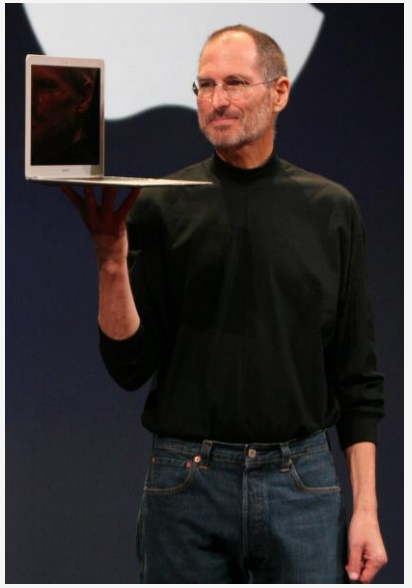
It greatly enriches one's life, and makes it so much more meaningful and joyful when one is able to appreciate many worlds.

The purpose of a liberal arts education is not simply to prepare for one's first job, but also for one's second job, third job, and beyond.

Q: Why the Macintosh computer revolutionized computing

"I think part of what made the Macintosh great was that the people working on it were musicians and poets and artists and zoologists and historians who also happened to be the best computer scientists in the world."

-Steve Jobs



How - some perspectives

"That created an opportunity for me, in terms of my teaching, to start to think about data from a humanities perspective and . . . to teach students who are in computer science or in math or statistics or other fields about the value of a humanities perspective."

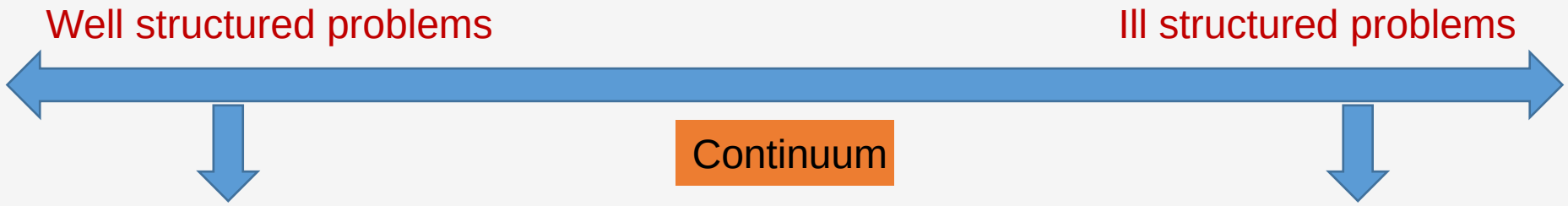
Thomas Ewing, Professor of history and associate dean of the College of Liberal Arts and Human Sciences at Virginia Polytechnic Institute and State University

- Academics have fragmented conversations in higher education into more than 8,000 different disciplines in the United States alone and more than 15,000 in the world, since scholarly disciplines are defined differently around the world.
- Avoid trying to integrate across 8,000 disciplines, which is impossible, but to look at problems on the ground.
- What is it that needs to be solved? Then bring in the relevant conversations in resolving those issues. That's what transdisciplinary science tends to do.

Prof.Paul Shrivastava, Penn State

Education and Problem Solving

Educational Problem solving is different from workplace problem solving- **Design, Decision Making, Trouble Shooting**



- Well defined initial state
- Known goal state and
- Constrained set logical operation
- Typically found at the end of the textbook chapter
- Require application of limited knowledge and skills
- Eg: Story board problems

- Encountered in everyday life and work
- Emergent, not self contained (not constrained by the content domains being studied in class rooms)
- Conflicting goals
- Multiple solutions and methods
- Solutions are not predictable
- Usually interdisciplinary
- Eg: Decision making and trouble shooting problems

Some case studies

1. Six Microbes that changed the world @ Olin College of Engineering, Boston
2. History of Materials @ Olin College of Engineering, Boston
3. Applied Statistics @ Computer Science, KLE Tech
4. Engineering Exploration @ KLE Tech

Multidisciplinary Learning…How?

- Departments in Languages, Literature, Music, Philosophy, Indology, Art, Dance, Theatre, Education, Mathematics, Statistics, Pure and Applied Sciences, Sociology, Economics, Sports, Translation and Interpretation, and other such subjects are needed for a multidisciplinary, stimulating Indian education

- Towards the attainment of such a holistic and multidisciplinary education, the flexible and innovative curricula of all HEIs shall include credit-based courses and projects in the areas of community engagement and service, environmental education, and value-based education.

- The structure and lengths of degree programmes shall be adjusted accordingly. The undergraduate degree will be of either 3 or 4-year duration, with multiple exit options within this period, with appropriate certifications,

What does NEP 2020 say …

• Convert the existing institutions into multi-disciplinary institutions – research universities, teaching universities and multidisciplinary autonomous colleges.

•Build Higher Education Clusters, forming a multidisciplinary university.

•HEIs will have the flexibility to offer different designs of Master's programmes

•Model public universities for holistic and multidisciplinary education, at par with IITs, IIMs, etc., called MERUs (Multidisciplinary Education and Research Universities) will be set up and will aim to attain the highest global standards in quality education.

•HEIs will focus on research and innovation by setting up start-up incubation centres; technology development centres; centres in frontier areas of research; greater industry-academic linkages; and interdisciplinary research including humanities and social sciences research.

NEP Implementation : UG Curriculum

Content	**Bring in content relevant to outcomes.** **Please refer to popular MOOC courses in addition to referring to other universities' curricula.**
Language component	**Kannada to be retained in four semesters**
Ethics, values and societal connect	• **NSS, NCC to be assigned credits (as per GO)** • **Initiatives like Sports, Physical Education, Scouts & Guides may also be assigned credit weightages.** • **Need to integrate ethics and values into individual courses contextually rather than offering them as separate and independent courses**

Pedagogies suitable for multidisciplinary learning

- PBL (Problem Based / Project Based)
  - The primary goal of PBL is to enhance learning by requiring learners to solve problems.
  - PBL is:
    - Problem-focused
    - Student-centered
    - Self-directed
    - Self-reflective
- Service Learning
- Experiential Learning: Internships – based on relevance
    - Industry (public /private sector and local MSMEs),
    - Government / Private / NGOs
    - Manufacturing and Service sectors

NEP Implementation : UG Curriculum

Assessment	• Limitations of present system
	  • No alignment with outcomes
	  • Constrained by duration of assessment
	  • Limited to remembering and understanding
	• What is desired?
	  • Assessment of higher order thinking skills
	  • Emphasis on formative assessment
	  • You may follow a graded approach over years (40%: 60%, 50% : 50%, 60%:40% for theory courses, 50%-50% for lab, field works, project, internship and other activities over years

NEP Implementation : Making it happen

- **It is the game of minds and mindsets**
  - Leading from front
  - Sharing Vision
  - Exposure to global best practices
  - Benchmarking
  - Empowering stakeholders – pedagogy and technology, in addition to disciplinary knowledge
- **Don’t try to implement everything at once, have a plan**
  - Identify enablers, prerequisites in the tasks
  - Prioritize
- **It is all about teamwork**
  - Build critical mass of doers
  - Identify performers, build local heros
  - Showcase local good work
  - Take away fear of failure from performers
  - Address the concerns of people getting affected, don’t bulldoze

THANK YOU