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In This Issue

Quality Assurance Measures in Distance Education System in India

Satish Rastogi* and Karen Ferreira-Meyers**

Professor G Ram Reddy (1929-1995) is the Architect of Distance Education in India. As the Vice Chancellor of Osmania University, Hyderabad in 1982 he sowed the seeds of Distance Education and became founder Vice Chancellor of Andhra Pradesh Open University (APOU) (later on known as BRAOU), Hyderabad, and in 1985, he took over as founder Vice Chancellor of Indira Gandhi National Open University (IGNOU). He also served as Vice President at Commonwealth of Learning, Canada; Chairman, University Grants Commission, New Delhi; and Chairman, Indian Council of Social Sciences Research (ICSSR), New Delhi. He was honoured as 'Father of Distance Education in India' in 1995 at the International Centre for Distance Education Conference at Birmingham, UK. Prof G Ram Reddy started the Open and Distance Education System in India with the intention of meeting a wide variety of educational needs in India. The present growth of Distance Education in the country is his contribution and vision. This paper is a tribute to Prof. G. Ram Reddy.

Today, 14 Open Universities and 12 Open Schools are imparting need-based mass education in India. The ODL system can be equated to an industry which produces graduates and learning material in bulk. The wider society does not always understand the potential of Distance Education in producing competent graduates who are in no way inferior in quality to their counterparts from the conventional system. Quality is a matter of bridging the gap between perception and expectation, revealed by the systemic analysis at input, process and output stages.

It is essential to build ODL organisations' capacity in India. This may require the (re) orientation of manpower for optimum use in order to create a conducive learning environment for the distance learners who are isolated and need academic support from the ODL system. Conventional academics may wish to join and successfully complete programmes such as the MA in Distance Education (DE) offered by IGNOU, New Delhi. The staff development programme

* *Formerly Professor & Coordinator (Research & Evaluation) IDE, UNISWA, Swaziland, Professor of Educational Psychology, EIT, Eritrea, (Africa), Professor & Director (Evaluation Division),YCMOU, Nashik, Secretary General, Indian Distance Education Association (IDEA). Res: 2, Serene Park, Serene Meadows,08 th Avenue, Anandwalli Area, Canal Side Road, PO Sawarkar Nagar,Nashik-422013 (Maharashtra). E-mail: satishrastogi11@gmail.com, satish_rastogi1@ rediffmail.com*
****Associate Professor and Coordinator, Linguistics and Modern Languages/ Literature, Institute of Distance Education, University of Eswatini, (Southern Africa). Private Bag 4, Kwaluseni, Eswatini, APSInterp (SATI) - Accredited Professional Simultaneous Interpreter (French-English-French). E-mail: karenferreirameyers@gmail.com, kmeyers@uniswa.sz*

for part-time academics working at study centres may be launched through the DE mode enabling them to understand their new role and responsibilities in an ODL system. For this, different resources (monetary and otherwise) will be needed, some of which can be managed by the Ministry of Human Resource Development of the Government of India through University Grants Commission (UGC), New Delhi. These distance learners will have to be oriented about "How to study" in an isolated situation: this can be done through a Programme Guide and other types of literature which will be discussed by the study centre staff during student orientation. Programme Evaluation is also to be conducted by seeking past learners' opinion on various activities. Conferences, seminars, symposiums and workshops should be a regular feature to provide collective wisdom for generating innovative ideas. This can be done through networking among ODL organisations. Donors may be also contacted for this purpose.

The success of this system depends upon the efforts of a 'Man-Machine' combination in creating a learning environment with and for the isolated learners. The system of distance education brings hope for mass education in India as it can attract a large number of students for different programmes and could thus fulfill the country's requirement of competent manpower. This is possible only when the system imparts quality education which is not inferior to that offered by the conventional system.

Distance education and conventional systems are different in nature. Both systems have the capacity to train people to become useful citizens in any society. The major advantage of the Distance Education system is that it is an industry which produces students/graduates and learning materials in bulk. From time to time, society enquires about the quality of Distance Education products in comparison to Conventional system products in India. Citizens sometimes raise doubts about the potential of ODL in comparison to the conventional system in India. Quality is a matter of bridging the gap between perception and expectation. It filters from top to bottom. It seems essential to examine the perceptions and expectations at various stages of the ODL system to decide which gaps are to be bridged.

International Incentives to Quality Assurance in Distance Education System

It may be fit and proper to examine global incentives before drafting a proposal for India. 'Towards a Culture of Quality' published by COL, Canada(2006) and edited by Prof. B NKoul and Prof. A S Kanwar has twelve stories from Botswana, Uganda, IGNOU (India), AVU (Africa), Nigeria, YCMOU (India), the West Indies, Hong Kong, Canada, United Kingdom, SIASOTA (Japan), Southern Queens land (Australia). In their concluding remarks the editors derived some contributing factors to Quality Assurance practices, such as Course Materials and Instructional Design, the teaching-learning transaction, learner evaluation, Learner Support Services which need to be based on a thorough understanding of learners' circumstances, abilities and requirements. In addition, the stories examined the role of the State, that of Institutional Leadership, Institutional Commitment, Innovative Management, Quality of long and short-term planning and execution, the existence of quality assurance mechanisms, the introduction of ICT in various activities in phases, and the academic fraternity for accepting multiple responsibilities. During the Asia-Pacific Quality Network Conference, Cambodia, Prof. Asha Kanwar, (2012) explained the Culture of Quality as a Culture of Care. She advocated for same regulations for ODL and Face-to-Face Education when it comes to Quality Assurance, as prevails in the UK for example. Quality Assurance agencies should assess both campus and distance education universities. She further advocated for a change in focus from input to outcomes and for appropriate regulations and recognition for transnational and private provision. The COL RIM (Review and Improvement Model of the Commonwealth of Learning) and its explanation were as cited below (Figure-1):

Fig-1: COL RIM
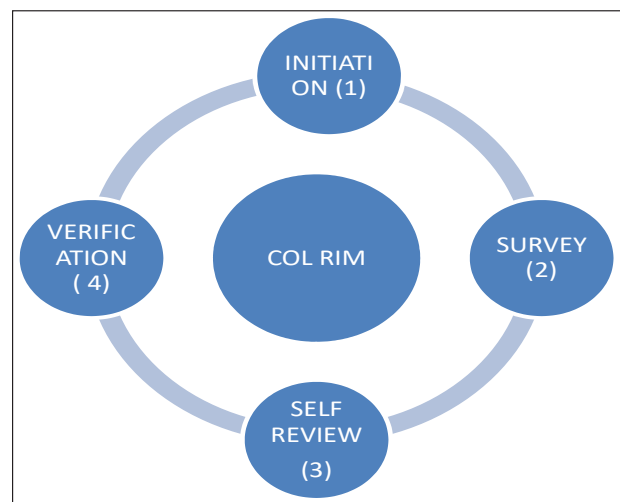
- A low-cost 'do-it-yourself' model.
- Develops systemic thinking and organisational learning
- Focuses on capacity building
- Emphasizes continuous improvement.

The Commonwealth of Learning (COL) published guidelines for Quality Assurance and Accreditation of Massive Open Online Courses (MOOCs). COL also published five case studies entitled 'Quality Assurance: Good Practices in ODL in Sub-Saharan Africa' which is a compilation by Prof. Romeela Mohee covering case studies from Eswatini, Lesotho, Zambia, Botswana and Namibia. In this report, Prof. Mohee stated 7 stages for Quality Assurance Standards (COL) as noted below:

1) Programme Design;

2) Learner Support Systems;

3) Materials Development;

4) Student Assessment;

5) Infrastructure and Facilities;

6) Staffing;

7) Open & Distance Education Systems and Structures

Professor Alan Tait (1997) compiled seven case studies regarding Quality Assurance in Distance Education which were subsequently published by COL in an article. The case studies focused on the 1) German Institute for Research on Distance Education, Germany; 2) Norwegian Association for Distance Education (NADE); 3) Open University of Israel; 4)YCMOpen University (YCMOU), Nashik (India); 5) The UK Open University; 6) The Open Learning Institute of Hong Kong (OLIHK), and 7) The University of Victoria in British Columbia, Canada. In this study, Tait states that a quality assurance system attempts to define, in consultation with the user, what services should be provided to the user. It involves the accurate analysis of what needs to be done. In a quality assurance system, one finds ways of monitoring and evaluating, and builds in procedures with users and providers, continuously seeking to improve practice. Embedded in the practice of quality assurance is the notion that expertise is widely distributed in the organisation; that is, that not only the higher levels of management understand what should be done. In fact, for many it is those working closest to the "customer" who best understands his or her needs. Tait concluded this discussion by saying that quality assurance is no longer an option in modern open and distance learning. Quality assurance represents at the same time a range of contested values about the nature of quality and the legitimate interests of stakeholders and management which need to be addressed and discussed. International case studies represent essential material for study in the context of globalised practice, but institutional solutions will be particular and individual, and, trends towards the convergence of methodologies in education, breaking down the barriers between distance and conventional education, are evident in the quality assurance field, where practitioners from both sectors can valuably learn alongside each other.

**Conventional System *v/s* Distance Education System – An Analysis**

There is still a worldwide assumption that the distance education system is inferior to the conventional system and the products of this system (students) are less competent than those of the conventional system. People prefer a classroom where a teacher delivers a long lecture every day and disseminates content in the class expecting that the learners receive it as is. In fact, neither the teacher nor the learning material enters the learner's mind. Learning takes place when the teacher creates a learning environment in the classroom and works as a facilitator for the information to enter the learner's mind which can then retain the main points known as knowledge and which the learner later uses as and when needed, with the help of his intelligence. This judicious use of retained information is known as wisdom. A teacher performs nine activities during classroom communication. These are:) Presenting the materials. 2) Identifying the Objectives. 3) Motivating the learner. 4) Exploiting learners' experiences. 5) Providing learning activities. 6) Facilitating Retention. 7) Promoting transfer of learning. 8) Providing occasions for feedback. 9) Providing guidance in various ways.

These activities can also be managed successfully by the Distance Education system with the help of a Man-Machine (mixed media) combination for a large number of students who are not in a classroom, but are at a distance from the system as well as from each other. The Man-Machine combination should be potent enough to cover these activities. The Distance Education system is a complete system, which can impart any type of need-based mass education to society. It can cover staff development also, in any

sector, if the necessary infrastructure is developed. It can cover the informal education sector successfully at a very low cost, if there are large groups of learners. China's technological advancement, for example, is based on Distance Education. The necessary infrastructure, needed by the Chinese Engineering students, was established well in advance for completing various activities. So, there is no foundation for stating that the Distance Education system is inferior to the conventional one.

What is needed in India is capacity building of the Distance Education system and continuous monitoring of the system to examine the quality of the output and finally the outcome of the whole operation before sending the product to society. Our discussion in this paper makes a systemic analysis of various activities and then examines the perceptions and expectations for various activities.

Fig-2: 5M Model of Input
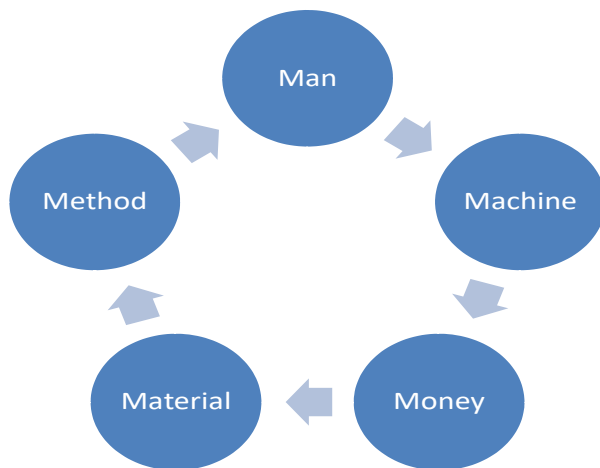
Systemic Analysis of the Distance Education System

The basic purpose of the distance education system is to create a learning environment among distant learners by using a 'Man-Machine' (Mixed Media) combination. We know that quality input will allow the process to proceed as expected and finally produce a desired and competent product which can take on various roles as needed for various social activities. The three stages in every activity are as below:

INPUT --------- PROCESS ----------- OUTPUT

It is useful to do a systemic analysis of these three stages and see how to bridge any gap between perception and expectation in order to bring about quality. According to the Science of Management, every input covers 5 M: Man, Machine, Money, Material and Method. Man plays a primary role and controls the remaining four factors (Figure-2).

It is expected that, in a distance education scenario, these 5 M should be in perfect coordination with each other to ensure a quality process and competent product capable of working successfully in society. *Man* means a group of persons working full- or part-time in the ODL system. They are from different fields, for example, Media, Technology, Material development, Academic support, Student support, Learner evaluation, conducting research on various systemic problems, as well as providing academic counselling to distance learners during contact sessions. *Machine* covers the learning material and various teaching aids (Electronic & Non-electronic). *Money* is needed everywhere. It may be in terms of fixed or variable costs. *Material* is our students: they come as raw material and go as products after programme completion. These students may be considered as customers of education. Customer satisfaction is a mark of quality. In this case continuous feedback from these customers is essential to meet their queries/confusions/questions, etc. The last but not least M is *Method*. It covers the art of communication in a distance education scenario. Using different available media for communication with students is an expectation. Feedback from/to and interaction with students using various media will make communication more effective. Interaction is the main source of learning. Peer group interaction among students is also an expectation so that immediate feedback is received when it comes to confusions/queries/questions. Feedback motivates them to study and finally also controls student dropout rates. The use of various media (like email, WhatsApp, phone, etc.) for feedback facilitates this process.

Giving strength to these 5 M is referred to as capacity building while giving strength to manpower

Fig-3: Communication Cycle During Study
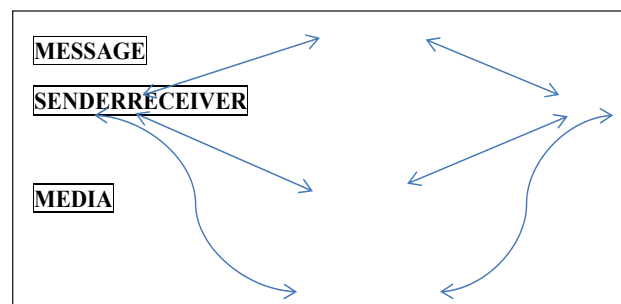
Following chart explains this communication cycle in both directions.

Forward Direction	Component	Reverse Direction
ODL System	Sender	Students
Students	Receiver	ODL System
Course Content	Message	Queries/Confusions/Questions after learning from provided learning materials
Print & Electronic Media	Media	Print & Electronic Media
Answers to learners' Queries/Confusions/Questions	Feedback	Questions by learners about their difficulties

Manpower Scenario in an Open and Distance Learning (ODL) System

	Category/Type of Manpower
A.	Full-time Academic Staff at Headquarters and Regional Centres
B.	Full-time Non-Academic Staff at Headquarters and Regional Centres
C.	Part-time Academic Staff at Study Centres
D.	Part-time Non-Academic Staff at Study Centres

Manpower Role of Category 'A' in Distance Education.

Stages Activities	Knowledge	Skills	Attitude/Abilities
Monitoring and Providing Guidance to Academic staff at the Study Centres	1	2	3
Research on systemic Issues/ Problems	4	5	6
Participation in extension work like Workshops/Seminars/Symposiums/Conferences etc. within the university and outside	7	8	9

MA programme covers the following courses in two years:

First Year Courses	Second Year Courses
1) Growth and Philosophy of D/E	1) Research in Distance Education
2) Instructional System Design	2) Curriculum Development in D/E
3) Learner Support Services	3) Staff Development in D/E
4) Management of D/E	4) Economics of D/E
5) Educational Communication	5) Project work in D/E

alone is known as staff development. The following chart explains the communication process during study.

We have to analyse the expectations as well as the perceptions at these 9 (nine) stages and organise orientation programmes to enrich the manpower to bridge the gaps (if any). All full- and part-time academics have to interact among themselves about their problems in meeting the learners' queries/confusions/questions. Seminars/Workshops/Symposiums/Conferences, etc. should be held: by inviting these academics an amicable solution for existing issues can be reached. It may be better if every Category 'A' worker take up the MA in Distance Education launched by Indira Gandhi National Open University (IGNOU), New Delhi. The Category 'B' and 'D' workers do not require any specific training

as their role is administrative in nature. But Category 'C' workers' perceptions and expectations are different. They are Academic Counsellors in distance education with a different role to play. They are expected to collect learners' Difficulties/Questions/Queries, etc. which might have arisen at the time of learning in an isolated situation. These counsellors should cover the various difficulties raised by the learners during counselling sessions. In fact, most of the content will be clear to students when they use quality Self-Instructional Materials, but the students may still need some clarifications here or there in the course content. This is a perception that academic counsellors deliver lectures on topics of their own choice from the course content prescribed in the name of counselling. But, these part-time academic workers are not at fault: as

The Emergence of Distance Education	The Distance Learners and our support
Learner Evaluation in Distance Education	Academic Counselling and your Functions
Qualities and Skills of an Academic Counsellor	Media for Counselling
How to Study – SQ3R Technique	Diagnosis and Remedy – A Challenge
You and the Learner: Need of good Human Relations	Managing Counselling Sessions – A Challenge

they come from the conventional system, they are used to deliver a lecture in a classroom situation and have very little knowledge about their different role with distance learners. The organisation has to sort out the academic needs of part-time staff on a regular basis through orientation programmes whose main purpose is to show the staff how to tone and tune the learner's mind for optimum learning in a distance education scenario. These part-time workers may require staff development using the distance education mode and covering the following topics:

After being oriented, they will understand the role of various Machines being complementary to their role and will use appropriate media and stop delivering a lecture on a topic of their own choice in the name of Academic Counselling. Category 'A' and Category 'C' workers will manage various machines in their day to day work, such as LCD Projectors, SPSS Packages, laptops, Internet access, etc. Money plays an important role in every activity. It is expected that necessary provision be made in every ODL organisation' sannual budgets for staff development, purchase of necessary machines. Also, some funds may be provided by the University Grants Commission, New Delhi, in consultation with the Ministry of HRD, New Delhi. Every ODL organisation receives annual fees from students. A portion of this should be kept in the annual budget for capacity building activities.

The students who join the ODL system can be described as *Raw Material*. When they complete their study programme successfully, they leave as quality *Products* of the system. It is expected that their quality should not be inferior to that of the conventional system. We may consider these students as the customers of education. Customer satisfaction is the responsibility of every industry. There should be orientation of these students in group before they start studying the course material. A programme guide has to be supplied to these students and it should cover the following issues which the Study Centre should communicate during the orientation session:

- The Emergence of Distance Education.

- Learner Evaluation in Distance Education.

- Academic Counselling and their role.

- Media for Counselling.

- How to Study – SQ3R Technique.

The learning material used by the students should be easy to grasp. This requires programme evaluation by seeking course users' opinion about various activities[1]. The trained manpower at the Headquarters and at Study Centres will devise their method for meeting the learners' academic needs.

The P*rocess* stage in Distance Education system is different than that in conventional system. The students may be advised to form their association covering all students in every programme. They should be motivated for peer group interaction either in person or through a variety of media like email, WhatsApp, phone, etc. The ODL system has to allot every student and every academic a unique email id which may be used to communicate with each other as well as within the group at any time. This email format may be for students: PRN@ignou.ac.in and for academic staff: Employee Number @ignou.ac.in. Full- and part-time ODL Academics and ODL students have to communicate with each other in writing. Hardly anyone uses this freely available facility for academic communication. The students are often only given written assignments. It involves them in learning through drill and practice. But it has been observed that they copy from each other. In fact, they receive the same questions and so they copy from each other. A possible solution to this could be to give each of them different questions for the same Lesson/Unit. This is possible if the teachers are oriented about Bloom's Taxonomy of the Cognitive Domain which contains six stages known as Knowledge, Comprehension, Application, Analysis, Synthesis and Judgment. It proposes a technique to convert one question into six questions. Using Blooms' Taxonomy for Question Bank development and then its computerisation is an expectation for preparing a

comprehensive question paper for final examination. Blooms' taxonomy will help in converting every long/short question into 6 questions as well as one Multiple Choice item/question into 144 items/questions. This work will produce big Question Banks for every course of each programme. This may help in controlling copying business during Final examination too as well as during assignments writing too. Bloom's Digital Taxonomy, as drafted by Churches (2008) will allow universities to include ICTs in all the steps involved.

Also, projects are allotted, but there are fewer opportunities for teacher guidance in comparison to those in the conventional system. As a model/sample, a good project report done by past students should be scanned and put on the university website so that the learners can understand the trends and styles for their own projects. Similarly, a model assignment may be prepared and put on the university website as a sample assignment. This will help them in understanding the points to be covered in assignments. The students should exploit all possibilities of getting optimum teacher support to meet their questions/queries/confusions which might have come during learning alone while at a distance. Establishing a learner association for every programme is an expectation. Such association would help them to meet or talk on phone or via email with each other during their free time. Interaction among learners may meet lot of confusions/queries/questions.

The Action Plan

Quality filters from top to bottom. Therefore, a firm determination for ODL system authorities to implement various measures is essential. A university monitoring committee with a coordinator. Below is an action plan which could help bridge gaps between perceptions and expectations for various activities as well as for manpower.

1) Full-time and part-time academics deployed for monitoring and providing human support to students may be oriented about their role and responsibilities with distance learners. A staff development programme may be prepared for them using the distance education mode. The University may want to organise Workshops/Symposiums/Conferences/Seminars for these academics. Networking among sister organisations and help from retired ODL academics may help when selecting Resource Persons for these activities.

2) Student orientation must cover their role and responsibilities in the distance education system.

For this purpose a "Student Handbook" may be (re) drafted by adding some literature. These topics may include, for example, How to study in a Distance Education Scenario; Skills for writing assignments; Generating Motivation and Interest for study; Optimum use of various media like Email, WhatsApp, Fax, Phone, etc. to contact Study Centre and Headquarters Staff, and fellow students for an early solution of academic and non-academic Queries/Confusions/Questions. Sample assignments and tips for learner-learner interactions are also to be added.

3) Course/learning material updating may be done by seeking the help of experts working either in the university or outside. This will make the learning material more enriched with the latest information and with more explanation by adding pictures, charts, examples, etc.

4) Financial requirements (Budget) need to be prepared and submitted to Donors through University authorities for allocation.

5) Programme Coordinators from study centres must make monthly reports to detail their academic and administrative problems and bring these before the University's Academic Council to seek appropriate solutions.

6) Question Banks are to be developed and computerised.

7) Students may be motivated to form 'Student Associations' for different stages of every programme. This would help for peer group interaction. The use of email and cellphones, etc. may be beneficial. Contact/discussion with past students from the same programme on various academic and non-academic issues may also be initiated at local level. The students do not need to reach out to Headquarters for each problem.

8) Strong networking is needed among sister organisations (offering programmes through the Distance Education mode) in India. It is useful to exchange views and accept best practices among them.

9) Capacity Building in Open Universities is urgently needed. Then it should also be undertaken in dual-mode universities.

Outcome of the Scheme

Distance Education emerged also to ensure mass education. A large number of students can study

at their own rate, pace and time. The success of this system depends upon the efforts of a 'Man-Machine' combination in creating a learning environment with the isolated learner. It may be essential to follow the above cited action plan to orient the manpower for optimum use of machines and fulfill the desired role and responsibilities. The plan can bridge gaps between perceptions and expectations from full- and part-time manpower. Students who have joined as raw material would become competent products. Distance education provides hope for mass education in India by attracting a large number of students for different programmes and it may fulfill the country's requirement of competent manpower. This is possible only when the system imparts quality education which is not inferior to that which is offered by the conventional system. Ensuring this type of quality education through the implementation of this action plan will be a tribute in the real sense to Prof. G. Ram Reddy.

Acknowledgement

Note

1   Programme evaluation by a third party and an opinion survey from the past students is desired. This can reveal shortcomings in the system. Programme evaluation is needed by seeking past students opinion. The student is a customer of education and his/her opinion would be of much use for making necessary changes to make various activities as learner-friendly. The learning material is also the product of ODL system, and so, an opinion survey about this product from the past students who were course users is essential for making the materials more user-friendly.

❑

Scientific Methods in Research and Sir Francis Bacon:
Contemporary Relevance
Part -II[#]

K Paddayya*

Indian Epistemological Traditions

Turning briefly to the ancient Indian traditions of knowledge acquisition, we first note the famous Upanishadic statement that minerals exist, plants feel, animals know but it is only man who knows that he exists, that he feels and that he knows. This statement clearly recognizes that consciousness is man's unique attribute. In Hindu thought *jnana*is cognition and *pramana*is valid cognition. Valid cognition is free from doubt, indefiniteness and error. Its sources are varied–perception, inference, authority, intuition, etc. The art of reasoning goes back to the Upanishads. It is however in the *Nyaya Sutra* of Gautama we get the first formal statement about knowledge acquisition as a distinct process. Anticipating Dewey's statement about scientific inquiry as originating in a problematic situation and terminating in warranted assertions, Gautama already recognized that inquiry arises from doubt or problem (*samshaya*) and concludes with a theory (*vada*). He describes the intervening process in these words: "One must consider carefully the pros and cons (*paksha-pratipaksha*) and ascertain the nature of things. For this purpose one is advised to take the help of all valid sources of knowledge… employ the five-step method of discovery and proof (*pancavayavanyaya*)… take care to avoid five kinds of material fallacies (*hetvabhasa*), three kinds of quibbles (*chala*), twenty-four kinds of false analogies (*jati*), and twenty-two kinds of self-stultifying steps, which would cause defeat in debates" (Datta, 1967: 132).

The Buddhist theory of knowledge developed its own notions of concepts such as space, time and causality. Of particular interest is its theory of causation called *paticcasamuppada*, where an happening or event is seen not as the result of one cause but as the concatenation of diverse causative factors that enter into a unique relationship with one another. The Jain thought too has its own epistemological traditions, of which *anekantavada* (multiple alternate explanations for an event or phenomenon) is well known.

Coming straightaway to the modern period, credit must go to Deccan College in Pune for taking the first firm steps both in introducing the scientific method and employing it in academic studies. Here we must remember Sir Ramakrishna Gopal Bhandarkar who served on its faculty as Professor of Oriental Studies from 1883 to 1893 (Paddayya 2018a). As a student of the Elphinstone Institute in Mumbai he had already familiarized himself with major developments in European learning. At Deccan College he widened these interests in liberal education with the inclusion of subjects like logic and philosophy; works like J.S. Mill's *System of Logic* became a part of his reading list. It was but inevitable that Bhandarkar came under the spell of the method of inquiry. He was so inspired by it positive contributions to the growth of knowledge in Europe that he selected this theme as the subject of his lecture delivered at the Free Church College Literary Society of Bombay in March 1888, later published as "Critical, Comparative and Historical Method of Inquiry, as applied to Sanskrit Scholarship and Philology and Indian Archaeology" (Bhandarkar, 1933a). He pursued this theme further in several of his later writings (Bhandarkar, 1933b).

Referring to the benefits which European learning received from the adoption of the method of inquiry, Bhandarkar writes: "The inductive method (observation and experimentation) began to be used in Europe about the end of the sixteenth century, and since that time very great progress has been made in the discovery of the laws of the physical world. The critical, comparative and historical method began to be well understood and employed about the end of eighteenth century and within a hundred years since that time, an equally amazing progress has been made in other departments of knowledge; and geology, palaeontology, comparative philology or the science of language, comparative mythology, evolution and the origin of species, scientific history, comparative

jurisprudence, archaeology, sound scholarship and even comparative religion are the grand results" (Bhandarkar, 1933a: 363). This is one of the finest statements about the origins and development of the scientific method and, what is most important from our point of view, it is the first explicit call in the academic history of modern India to partake of the advantages of the method of inquiry.

What is more remarkable is the fact that Bhandarkar not merely advocated the employment of the method of inquiry but adopted it in his own research work covering various branches of Indology. One has only to glance though the pages of his works Early History of the Deccan (1884), Vaishnavism, Saivismand Minor Religious Systems (1913) and other writings to appreciate the critical and comparative approaches he employed in handling literary, archaeological and art historical sources. It is little surprise then that, irrespective of some new facts here and there that have been added later on, these works still stand out as masterpieces of writing in the world of Indology. This scientific spirit also permeated the writings of other workers associated with Deccan College. Lokamanya Tilak's book *Arctic Home in the Vedas* is another remarkable example (Tilak, 1958). It was the final outcome of several years of hard work involving collection of source materials and their careful analysis. As advised by Max Mueller, Tilak had to seek clear empirical evidence to support his views about the Arctic home of the Aryans. Readers will note that the first three chapters of the book are devoted entirely to the newly emerged disciplines of geography, Pleistocene geology and prehistory. They will also recognize that Tilak not only employed the phrase hypothesis testing but even admitted that in scientific research new evidence calls for displacement of old theories by fresh ones (Paddayya, 2018b). It was this spirit of inquiry which V K Rajwade (1898) too adopted in his prolonged work of collection, documentation and interpretation of source materials of Maratha history.

These efforts in the use of the method of inquiry by the nineteenth-century pioneers in western India were followed by their twentieth-century successors. The critical editions of Mahabharata and Ramayana undertaken, respectively, by Bhandarkar Oriental Research Institute in Pune and The Oriental Institute in Vadodara are two well-known examples. At Deccan College itself, S M Katre published his book *Introduction to Indian Textual Criticism* (1941) which represents the first attempt of its kind in India dealing with principles and methodological guidelines for reading ancient texts. Sankalia (1973 and 1982) took up a critical study of the Ramayana story in the light of historical and archaeological evidence. Notable too is Irawati Karve's (1969) book *Yuganta* which gives a critical analysis of the personality traits of characters from Mahabharata.

Contemporary Relevance

We have said enough above about the nature of the scientific method, Bacon's seminal contributions towards its elaboration, and its use in India in the early part of modern period. The crucial issue is: What is the relevance of it all to us now? There are three considerations which render this topic very important.

Concern is frequently expressed in both academic and public circles about downward slide in the quality of research and teaching in the universities since the 1970s. This decline is bemoaned particularly on occasions like annual announcements of world rankings of universities in which Indian institutions are placed in unpraiseworthy positions. In the world listing of science cities announced by the periodical *Nature* for 2020, Beijing topped the list while Bengaluru and Kolkata stood at 97 and 99. Quality improvement is the theme of many convocation addresses delivered across the country annually. For instance, in his July, 2015 address to the graduating students of the Indian Institute of Science in Bengaluru N R Narayana Murthy lamented that Indian science entered a dull period after the 1960s. Seminars too are held at high levels to identify the ills and suggest remedies. Still the outcome of all these efforts is not clear.

Then there is the issue of competing theoretical perspectives which sometimes go to the extent of treating one another as untouchable. For instance, scholarship in historical sciences, particularly in Upper India, is a divided house. There are leftist approaches and rightist schools, each with its own aims and approaches. Ashis Nandy (2002) called Indian historians 'a garrulous lot' with varying versions of historical facts. Actually speaking, different theoretical perspectives are to be welcomed in any discipline and these are needed for an objective

assessment of evidence and its interpretations. Difficulties arise only when these schools become doctrinaire in their outlook, thereby preventing true dialogue. Consider, for instance, the statement which Professor Y. Sudershen Rao made in 2014 after taking charge as Chairman of Indian Council of Historical Research: "We will undo the Marxist twists imparted to historical scholarship in India. We will Indianize history writing and establish the historicity of events described in the *Mahabharata* and *Ramayana*". Not unexpectedly, there were quick retorts. Romila Thapar said: "It would seem that the ICHR may now turn the clock back in focusing on simple stories being accurate history… For them, a Marxist is simply someone who opposes the Hindutva ideology…"

Thirdly, there is the unwelcome resurgence of the trend of political leaders, religious heads and even some of the academics entertaining exaggerated notions of our past and also making statements which tend to create clashes of ethnic, cultural and religious identity. Let me cite a few of these:

- The human-animal body of Lord Ganesha and Karna's birth bear testimony to knowledge of plastic surgery and genetic science in India. Prime Minister Narendra Modi while inaugurating a super-speciality hospital in Mumbai in 2014.

- Indians knew the Pythagoras theorem before the Greeks and *beejganit* before the Arabs. Dr. Harsh Vardhan, Minister of Science and Technology, New Delhi, at the inaugural function of the 102nd Annual Session of Indian Science Congress, Mumbai, 2015.

- Aeroplanes and airports were known in the Ramayana period. Prof. V. Nageswara Rao (Professor of Chemistry and Vice Chancellor of Andhra University, Visakhapatnam) at the Annual Session of Indian Science Congress held in Chandigarh in 2017.

- Arjuna's arrows had nuclear power. Jagdeep Dhankar, Hon'ble Governor of West Bengal, while inaugurating a science and engineering fair in Kolkata in January 2020.

- At a point of time, the entire world was Hindu. Praveen Togadia, Vishwa Hindu Parishad leader, in Mumbai 2014.

- Every child is born a Muslim but his parents convert him to other faiths. Asaduddin Owaisi, leader of Majlis-e-Ittehadual Mustimeen, in Hyderabad in 2015.

- All the people of the subcontinent are, in one way or another, the inheritors of the Indus civilization. Dilip Chakrabarti in a lecture delivered at the India International Centre, New Delhi, in 2009.

- The ancestors of lower classes of rural society and tribal groups were the original inhabitants of India. Jitan Ram Manjhi, member of Musahar community and former chief minister of Bihar, in 2016.

Another factor causing disquiet relates to blind beliefs and superstitions which continue to prevail in the society. Pandit Nehru and other national leaders repeatedly drew attention to this negative aspect of our society. While it is true that practices like child marriage and *Sati* have been put an end to, some of the superstitious practices still continue, e.g. milk-drinking images of gods and ban on entry of women and Dalitsinto temples, to cite a few. Add to these the rise of populist religious sects which give and in fact execute death-calls to reformist thinkers and writers, as it happened in the case of Dr. Narendra Dabholkar, Comrade Pansare, Professor Kalburgi and editor Gauri Lankesh. Genuine fears are being expressed that in the din of these bazaar-based beliefs and practices the core aspects of our ancient religious and philosophical thought are being sidelined.

Could our understanding of the scientific method help us to free ourselves from this tangle of disputations, uncertainties and unreasonable beliefs prevailing in the academic and social domains. Taking a cue from the oft-cited remark in research methodology that a problem well identified is half solved, let us first look at the downward trend in the quality of higher education. The recently approved National Education Policy (NEP) has made some useful suggestions for broadening course selection at degree and postgraduate levels by providing for multiple entry and exit points. But it is practically silent about the research component. In my view this is an issue which can be dealt with meaningfully at the level of individual disciplines. While keeping in mind interdisciplinary borrowings, each discipline, as according to its subject matter and stage of development, needs to do some amount of stock-taking of its immediate and larger goals; topics already researched into and methods employed and results arrived; identification of gaps in knowledge and formulation of fresh research

schemes; revision, if necessary, of theoretical and methodological approaches for this purpose. In this respect Bhandarkar's emphasis on the "acquisition of clear ideas" assumes much importance.

Then the issue of competing schools of historical research. Surely, this blow-hot relationship between various schools does prevail in other countries too, e.g. "you frog" and "you slimy frog" exchanges of phrases that took place in North American archaeology in the 1960s and 1970s between the traditional and processual approaches. The simple message coming from our understanding of the scientific method is that reality is infinite and so no views about it are infallible. Also we must accept that true knowledge is the product of churning together of ideas of various kinds. One must look at ideas coming from various sources without any affiliational biases of political, religious or other kinds (Bacon's idols of the theatre) and judge them is dispassionately. Here we are reminded of the sage advice given by the Buddha to the Kalamakas of Nalakagrama in North India who were baffled by the divergent preachings of teachers who had visited them earlier. True to the spirit of a teacher, the Buddha calmed them down and told them to use their own powers of observation and reason and make their choices.

Next comes the case of exaggerated notions about heritage and statements tending to create identity conflicts, as reflected in the pronouncements of various kinds reproduced by me earlier. These are good instances of the distortion of human mind due to operation of Bacon's idols of the tribe and idols of the cave. Taking legitimate pride in one's own recent or remote past is natural and in fact enriches the human mind and beckons it to future attainments. Difficulties arise when these claims are stretched beyond facts, particularly when they clash with the claims of other groups. Bhandarkar's writings have some wise counsel to offer in this regard too. He already noticed and even sounded a note of warning about these overenthusiastic trends in the last quarter of the 19th century. In his famous essay of 1888, he boldly stated: "… And here I feel myself in duty bound, even at the risk of displeasing some of you, to make a passing allusion to the most uncritical spirit that has come over us of praising ourselves and our ancestors indiscriminately seeing nothing but good in our institutions and in our literature, asserting that the ancient Hindus had made very great progress in all sciences, physical, moral and social, and the arts – greater even by far than Europe had made hitherto – and denying even the most obvious deficiencies in our literature, such as the absence of historical records, and our most obvious defects…" (1933: 392). Bhandarkar winds up his essay by remarking that we can take "an honest and discerning pride in the achievements of our ancestors" only by way of equalling or surpassing the European scholarship in the application of the critical, comparative and historical method in the investigation of political, social and religious history of India. He further clarifies that the application of this method is a matter of mental adventure and required no science laboratories. One can only say that Bhandarkar's diagnosis of the problem and his remedial measures are as true and valid in the 21st century as they were in the 19thcentury.

Finally, the operation of blind beliefs and superstitions and rise of populist religious sects which tend to create fanaticism and mistrust among people. Their existence can be explained by invoking Bacon's idols of the cave which refer to perceptions and prejudices of individual persons arising from their upbringing, educational background and associational contexts. Bhandarkaronce again comes to our aid. With rare foresight, in his essay he already envisaged the use of his critical, comparative and historical method in the public domain too. As he says emphatically, this "method is necessary not only for increasing our knowledge of the world and of historical man, but also for arriving at correct views of things in ordinary practical life. I must use criticism and comparison if I wish to have a true knowledge of the character of any man, public or private, or to understand any individual action of his correctly. Criticism and comparison are necessary for the politician, the legislator, the lawyer, the merchant, and, last but not least, the newspaper writer if he is to rise above the level of scurrilous journalism" (1933a: 364). It is impossible to be more elaborate about the wide scope and relevance of the scientific method.

In Post-independence India several general books have appeared which give in outline the basic principles of the scientific method and also stress its relevance in both scientific research and social life. A B Shah's Scientific Method (1974) and Jayant Narlikar's book *The Scientific Edge* (2003) are two lucid accounts of this important topic. One person that immediately comes to one's mind in connection

with the topic of science and society is Pandit Jawaharlal Nehru. As described by him at length in 'The Discovery of India', during his tours across the country as part of freedom struggle he was struck by the knowledge which even the unread masses have of *Sanatana Dharma* or Great Indian Tradition and how its ideals shape their conduct in daily life. Nehru was equally struck by the fact that people were tied up in knots because their minds were guided by blind beliefs, superstitions and prejudices of various kinds. While he laid emphasis on the role of science and technology in the nation's development along modern lines, he developed the *Mantra* of scientific temper of mind for freeing them from 'displaced minds'.

Nehru gave expression to this theme on numerous occasions – letters to Chief Ministers, public speeches and addresses at the Annual Sessions of Indian Science Congress (Singh, 1986). He defined scientific temper as "the critical faculty in considering problems, that evenness of temper, that objective way of looking at things which if enough of us cultivated would undoubtedly help tremendously in lessening tensions, national and international, and in some way towards the solution of those problems" (Singh, 1986: 38). It was given a statutory provision when it was added to the Directive Principles of State Policy as part of the 42nd Amendment to the Constitution and this addition enjoins upon the citizens of India to 'develop the scientific temper, humanism and the spirit of inquiry and reform'. Science and scientific temper thus go hand in hand, one promoting needs of the body and the other honing and guiding the mind. These are twin keys to the development of society, as Bacon argued 400 years ago.

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❑

Teaching Mathematics with Applications in Computer Science at Master's Level through Distance Mode

Deepika Garg* and S Venkataraman**

The Disciplines of mathematics and computer science have enjoyed a very close relationship. Many of the pioneers of the computer science discipline were mathematicians like Alan Turing, Von Neumann and Donald Knuth. However, over a period, the number of mathematicians who do significant work in Computer Science has come down. This is because, barring a programming course, training in Computer Science is not a part of the Mathematics curriculum in undergraduate and postgraduate level. In this article we discuss an effort by the Mathematics Department of IGNOU as an attempt to rectify this shortcoming by offering a Masters programme in Mathematics with applications in Computer. We discuss the design considerations that were behind the programme. We also share our experience in developing and transacting the programme with a wider audience in the hope that this will be useful to those who would like to run such programmes.

Computer Science uses Mathematics and Mathematics uses computer tools more and more. The computer scientists take Mathematics courses as a part of their curriculum, but students of mathematics never get an opportunity to take courses in computer science although some of the courses are highly mathematical in nature. It is also believed that study of Mathematics inculcates logical thinking and abstract thinking skills in students, and this is particularly useful in Computer Science. The involvement of Mathematicians in Computer Science can be mutually beneficial. The skills possessed by the Mathematicians will be helpful in solving problems in Computer Science and the Mathematicians will be able to work in new areas with interesting problems that will help in the growth of the Mathematics Discipline.

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* Associate Professor, Discipline of Mathematics, School of Sciences, Academic Block-D, Indira Gandhi National Open University, Maidan Garhi, New Delhi-110068. E-mail: gargdeepika@ignou.ac.in.

Associate Professor, Discipline of Mathematics, School of Sciences, Academic Block-D, Indira Gandhi National Open University, Maidan Garhi, New Delhi-110068. E-mail: svenkat@ignou.ac.in

For some time, a problem has been brewing in the pure sciences, especially Mathematics. There has been a fall in the enrolment of pure Mathematics degrees due to lack of fruitful employment commensurate with the academic achievements.

The report by Lynn Arthur Steen, Reshaping Colleger Mathematics, (Steen, 1981) says,

"In 1970, 23,000 mathematics majors were graduated. The numbers of Bachelors, Masters, and Doctoral graduates in mathematics had been doubling about every six years since the late 1950s. The 1970 CBMS estimate for the number of Bachelors graduates in mathematics in 1975 was 50,000, but by the late 1970s only 12,000 were graduating annually. Enrollments in many upper-level pure mathematics courses declined even more dramatically in the 1970s as students turned to applied and computer-related courses. Yet while the number of mathematics majors is decreasing, the demand for broadly trained mathematics graduates is increasing in government and industry. Mathematical problems inherent in projects to optimize the use of scarce resources and, more generally, to make industry and government operations more efficient guarantee a strong future demand for mathematicians. These problems require people who, foremost, are trained in disciplined logical reasoning and, secondarily, are versed in basic techniques and models of the mathematical sciences. (Emphasis ours.)"

In the principles of curriculum design, the report says,

"Applications should be used to illustrate and motivate material in abstract and applied courses. The development of most topics should involve an interplay of applications, mathematical problem-solving, and theory. Theory should be seen as useful and enlightening for all mathematical sciences."

In other words, the demand was for a mixture of core Mathematics courses along with some training in applied areas.

Moving forward to 1991, (Garfunkel & G.Young, 1991) points out the following,

"Our study determined that each year, there are over 170,000 enrollments in advanced mathematics courses being taught outside mathematics departments. …Engineering departments recorded the largest number of enrollments (83,854) with significant mathematics."

In the same article, the perception of the other departments regarding teaching of Mathematics courses is given. Here are some of them:

"The content of most math courses focuses on theoretical development. This is not 'bad' per se but leaves most students wondering about the 'what, when, where, and why' of applications ... seldom addressed in traditional math courses."

"Applied departments use math as a tool. An individual topic is analogous to a hammer perhaps. They wish to 'hammer' with it. On the other hand, math departments often become more interested in its description and generalization of the 'hammer' itself.''

In (Jackson, 1997), Allyn Jackson recounts the experience of Mathematics Department of Rochester University which survived an existential crisis:

The crisis at the University of Rochester has become emblematic of many of the problems facing mathematics departments in this era of shrinking higher education budgets. It was in November 1995 that the university announced the "Rochester Renaissance Plan", which described a host of measures designed to improve the university's financial position and its attractiveness to undergraduates. The plan called for a reduction of 10 per cent in the number of professors and the elimination of four graduate programs (chemical engineering, comparative literature, linguistics, and mathematics). Mathematics was one of the departments hardest hit, with a reduction in faculty slated for close to 50 per cent.

Mathematics Department at Rochester survived this challenge through a two pronged strategy.

1. Improve the teaching of Mathematics. It introduced WeBWork: According to Jackson,

   "The mathematics department started making improvements in the area that had drawn the most complaints: lower-level teaching. One of the most visible manifestations is WeBWorK, an Internet tool developed by Michael Gage and Arnold Pizer. (Ironically, WeBWorK was under development even before the crisis broke at Rochester.) Earlier this year Gage received a regional prize from the Mathematical Association of America for

his role in developing WeBWorK, and he has also received an on-campus teaching award. WeBWorK supplies students with homework problems in such a way that they all have the same problems, but each has slightly different numbers. Therefore, the correct answers are different for each student. When the student keys an answer into WeBWorK, he or she is told immediately whether or not the answer is right. No hints are given, but with the immediate feedback the students become quite persistent: Eventually, 80 percent of them get all of the answers right. In addition, when a student does come to the professor with questions, he or she has usually thought about the problem quite a bit. " So the direct communication between student and professor is much more specific, much more focused, than student questions are in a traditional course," Ravenel explains.

2. *Establishing links with other departments using Mathematics and offering joint appointments. "The mathematics department has not only reached out to other departments to address teaching concerns but has also made scholarly connections. There is now a joint mathematics-physics colloquium attended by members of both departments. In addition, an applied mathematics seminar was started last year that brings in speakers from a variety of other departments to talk about the use of mathematics in their own subjects. "There is a lot of mathematics being done outside the mathematics department," says Ravenel, " and this is a very good way to get people together." There have been talks on DNA computing and chemical reactions—and even one that used flag manifolds to help explain the dance language of honeybees."*

Regarding the second point, to have fruitful collaboration, the Mathematicians should understand the language used by those using Mathematics in applications. For this, it is necessary that the students of Mathematics learn how the Mathematics is applied in the other areas.

In (Jackson, Declining Student Numbers Worry German Mathematics Departments, 2000), discusses the situation in Germany:

Figures from the Statistisches Bundesamt, the central clearing house in Germany for national statistics, show a drop of around 20 per cent in the number of beginning students in mathematics between 1992 and 1999; for students choosing mathematics

in their first semester of university studies, the drop is about 35 per cent. Interviews with faculty in mathematics departments around Germany reveal that in many places the numbers have declined further. For example, at Universität Münster, one of Germany's largest universities, the number of beginning Diploma students in mathematics dropped about 35 per cent, from nearly 300 in 1990 to around 185 in 1998. Smaller departments have not fared much better: Universität Konstanz had 35 beginning students ten years ago and now has just 10; Universität Regensburg saw its beginners decline by about three-quarters in the same period. At Göttingen, which has perhaps the most illustrious history of any mathematics department in Germany, student numbers have fallen from around 80 ten years ago to a little more than 40 today. And in the mathematics department at Bonn, generally considered to be the country's leader in terms of research, beginning student numbers dropped by more than half in just the past four years. For the first time the Bonn department is having trouble finding enough participants for seminars for students in the first year after the Vordiplom…..

"What about job prospects for those receiving the Diplom in mathematics? The job market for those in technical subjects did worsen after the reunification of Germany in 1989, though even then mathematics Diplom students tended to do fairly well compared with students in other subjects. Today mathematics faculty across the country seem generally to concur with Friedrich Götze of Universität Bielefeld, who calls the opportunities for mathematics students "splendid". "Companies like mathematicians because they are flexible, they are bright people—and they don't give up!" he remarked. Such students are quickly snapped up by banks, insurance companies, and software houses and often receive offers even before completing their degrees. One problem may be that secondary school students considering what subject to choose in university simply do not know that mathematics Diplom students have such bright prospects…"

"Views on the decline in student interest in mathematics seem to converge on two explanations. First, mathematics—and indeed the hard sciences generally—is difficult, and today's students are not seeking deep intellectual challenges. "I don't want to say that German students are lazy," said Hoffmann. "But they are looking for an easier way to get a degree" than

studying mathematics. Hermann Karcher of Universität Bonn echoes this view: "Mathematics has the reputation of being a tough field to study, and we don't get the message across that it's a lot of fun." Computer science is not an especially easy subject either, but there the image of the hacker turned billionaire is powerful, the allure of the Internet seductive. And herein lies the second explanation: the public image of mathematics. In the public eye, mathematics appears less lucrative, less modern, and less dynamic than other areas. "I can imagine that in these times mathematics is not so interesting," remarked Peter Schneider of Universität Münster. "Devoting one's self to a very abstract, basic, research-oriented subject is not fashionable. The students want to make money…."

How are German Universities coping with the challenge?

"What can German mathematics departments do to reverse the decline in the numbers of Diploma students? According to Hoffmann, departments should offer a greater range of courses that connect mathematics to other areas, such as physics, chemistry, biology, and computer science. "We have to show that mathematics is an essential part of the natural sciences as a whole," he remarked. "We still teach mathematics as we did twenty years ago. But now there is good, strong mathematics all over science, and we have to take this into account…."

"In his time at the Technische Universität München (from which he is on a five-year leave), Hoffmann worked hard to invigorate the mathematics department there. The department instituted new degrees in Technomathematik and Finanz- und Wirtschaftsmathematik, which attracted many students, as well as accolades from the university administration…"

"Topics like financial mathematics are a clear draw for students: The mathematics department at the Universität Konstanz, despite having just emerged from a battle over its very existence …. instituted a program (in cooperation with the economics department) in mathematical finance and immediately drew 45 students, more than four times the current number of beginners in its regular mathematics Diplom program…."

The trends in India was not very different. Shilpa (Shilpa Phadnis, 2019) stated that India invented the

zero, but math is seen to have suffered a decline here for several reasons. The first is a global phenomenon. In the same article the authors quote Nalini Anantharaman, chair of mathematics at the Institute for Advanced Study in the University of Strasbourg, France, and winner of the Infosys Prize in Mathematics in the year 2018 as saying, in 1970s, there was a big separation between pure and applied math, said. "It wasn't like that at the beginning of the 20th Century. Now in France it's getting better. But in India, still not quite," she says. Also in the same article,

Bhargava, a field medalist, describes it as a 'very artificial separation', because all pure science and math eventually get applied. A second reason for math's decline is seen to be India's big focus on engineering from the time of Independence. "The fact that IITs became the most prestigious place to go to put engineering on a pedestal, in a way that prevented pure science from coming up. The moment parents see their children doing well in math, they say you are going to become an engineer." says Bhargava. (Shilpa Phadnis, 2019)

Another issue is that a large number of students join Master's Programme, but very few of them are interested pursuing a career in teaching at undergraduate or postgraduate level. Apart from those who opt for teaching in Schools, the rest have very few career options that specifically require a master's degree in Mathematics.

So, if the students are taught applications of Mathematics some more career avenues may be open to them.

In 1998, the Mathematics Discipline in keeping with the global trends felt that a certificate or Post Graduate Diploma programme should be launched which provides training in the areas of Mathematics that has applications in industry. While exploring the need the Discipline Group came across a vision document prepared by the Department of Science and Technology (DST) in this regard.

In the 1990s, the importance of innovative Research and Development (R&D) in the emerging scenario of increasing globalization was realised. It was felt that Mathematics has a substantial role to play in this regard. On 29th July, 1994, the planning commission conducted a brain storming session with the objective of focusing attention on chanellisation and orientation of the existing human resource trained in Mathematical Sciences for its optimal and active participation in the process of national development. One of the recommendations of the session that a task group be formed to make an in-depth study of the problems and issues raised and formulate strategies and recommendations for implementation so as to achieve the desired objectives and expectations.

Designing of the Programme

A programme advisory committee on Mathematical Sciences assisted the Science and Engineering research council of Department of Science and Technology, Government of India prepared a vision document in which ten thrust areas were identified. To give wide publicity to the vision document, the document was published in (Dixit, 1996). The ten areas identified were:

1) Computational Aspects of Geometry and Algebra.
2) Numerical Schemes and Qualitative Properties of Solutions of Differential Equations.
3) Stochastic Process Modelling.
4) Deterministic Control Theory.
5) Exploratory Data Analysis.
6) Dynamical Systems.
7) Game Theory.
8) Combinatorial Optimization.
9) Spectral and Inverse Spectral Theory.
10) Wavelet Analysis.

With this background, in 2002, the Mathematics Discipline group, as suggested in 21st School board of School of Sciences, convened an expert committee meeting to conceptualise a programme in Mathematics that lays emphasis on applications. The following are the salient outcomes of the Expert Committee:

- Given the aims of the programme, a Post Graduate Diploma is insufficient and a full-fledged Masters Programme has to be created.
- The courses should not be purely theoretical. Practical aspects should also be taught though computer-based laboratory experiments.
- The programme should be worth 64 credits with 34 credits worth of core courses, 26 credits worth of elective courses based on applications and a 4-credit project.

The committee also identified nine core courses and tentative list of 15 elective courses. The syllabus

of these courses was to be framed in separate meetings organised for the purpose.

It was decided that the following three streams will be launched:

1) M.Sc. (Mathematics with Applications in Computer Science)

2) M.Sc. (Mathematics with Applications in Finance and Economics)

3) M.Sc. (Mathematics with Applications in Emerging Areas)

It was decided that the core courses will be developed in such a way that they provide the mathematical background necessary for all the three streams. With this in mind the following core courses were designed:

1) Programming and Data Structures.

2) Linear Algebra.

3) Algebra.

4) Real Analysis.

5) Complex Analysis.

6) Functional Analysis.

7) Differential Equations and Numerical Solutions.

8) Probability and Statistics.

9) Mathematical Modelling.

Even in the conventional courses, like Linear Algebra, Algebra and Probability and Statistics, emphasis was on those topics that have applications and the presentation of the topics was also in keeping with the goal of teaching applications. Moreover, courses like Differential Equations and Numerical Solutions and Probability and Statistics were designed with computer based practical components, which is unusual in the conventional Post Graduate Degree Programmes in Mathematics.

The Programme Team decided to launch the stream, Applications to Computer Science, first. The following were the elective courses designed for this stream:

1) Graph Theory.

2) Design and Analysis of Algorithms.

3) Pattern Recognition and Image Processing.

4) Computer Graphics.

5) Coding Theory.

6) Cryptography.

7) Soft Computing and its Applications.

When we started the programme it was a unique programme. As far as we know, none of the open universities in the world is offering this kind of a programme. However, it is encouraging to note that some conventional universities in India have recently started similar type of programmes. Some programmes are named differently like M.Sc (Tech.). There are also programmes that have the same name as our programme. While it is difficult to conclude that they are inspired by our example, it is still gratifying to know that the concept is gaining popularity.

Benefits of the Programme

Many academics have spoken about the need of computer science courses in mathematics curriculum. For example, in (Madhavan, 2005) Madhavan, one of the experts who helped the Mathematics Department in Designing the programme says,

"Many applications draw heavily upon existing body of mathematical results and occasionally demand new mathematics. Contemporary computing science provides a new form of engendering new mathematical results. It provides new ways of looking at classical results.."

He also mentioned that the notion of proofs in mathematics and the role of computers and computing in this context.

We discuss the issues of correctness and computational complexity in the context of design and analysis of algorithms. It is here that many fascinating connections between mathematics and computing science appear in many surprising ways. These connections have led to very exciting developments in both fields of inquiry.

It is worth pointing out that this design is beneficial in the following ways:

Although the core courses are designed with applications in mind, the syllabus covered is comparable to similar courses offered in conventional universities at this level. So, if the students want to pursue research in the traditional areas like Algebra, Differential Equations or Analysis, they will be able to do so.

The students pursuing traditional Master's Programme in Mathematics do not get an opportunity to study the applications of many topics in Mathematics.

The students who complete this programme may be able to teach better because they can motivate the topics in Mathematics by discussing the applications of the topics.

Those who pursue a career in undergraduate or postgraduate teaching after completing this programme will be able to interact with their colleagues in Computer Science and Electrical Engineering. This will lead more cooperation between department and provides avenues for joint research projects.

The graduates of the programme may be able to teach some of the courses related to applications and this will enhance their value in the eyes of the potential employers.

Many of the courses of programme have a programming component and this gives a thorough grounding in computer programming principles and logical thinking. The software companies often look for people who have a thorough grounding in broad programming principles and logic rather than just proficiency in a particular programming language. Such people can be easily taught any other new programming language that the software companies want to use in creating applications.

The compulsory project component provides the students an opportunity to undertake hands on work in some industry/organization/R&D institutions. This prepares them for work in the real-world problems.

Delivery Mechanism of the Programme

The programme is offered in ODL mode. The programme is worth 64 credits, where for earning one credit a student has to spend 30 hours of activities related to the course. This includes all the activities in the course, like attending counselling sessions, attending practical counselling sessions preparing the assignment response, studying the course material and accessing multimedia component. The theory counselling sessions are optional. However, the student has to complete 70 per cent of the practical sessions prescribed for the course. A four-credit course with practical component is split into three credits of theory and one credit of practicals. Seven of the courses have a practical component. The practicals are conducted in the study centres under the supervision of counsellors who are identified for this purpose.

We had adopted two models of study material.

One is the self-learning material of the traditional kind used in Distance Education courses. In the other model, a standard textbook was sent to the learners along with a study guide that guides the student through the book, provides extra explanations, examples and exercises as needed.

Given the nature of the programme, it was decided that there should be a Programme Facilitator to look after the programme. It was also decided that the Programme Facilitator should be Mathematics Teacher of considerable stature, so that he/she will be able to find suitable counsellors for this somewhat non-standard programme as well as publicise the programme.

In the case of project, the student has to choose a supervisor and send a project proposal, duly signed by the programme facilitator, mentioning the title of the project. If the supervisor hasn't guided an IGNOU project before, a bio-data of the supervisor has to be sent for the approval of the programme team.

In the project component, the student is expected to choose a problem, preferably one in which the tools learnt in the programme can be used. Theoretical surveys were also allowed after some time because of the paucity of project supervisors. The student submits a project report of roughly 7000-8000 words in which the student describes the work done in the project. This is then sent to an external examiner who evaluates the project and conducts the Viva Voce of the student.

Evaluation Methodology of the Programme

In the theory courses, the procedure followed in other traditional Mathematics Courses is followed. In these courses, 30 per cent weightage is for continuous assessment in the form of an assignment. The academic counsellor assigned for a particular course evaluates the assignment and gives tutor comments for feedback. There is a Term Examination with a weightage of 70 per cent. The students are supposed clear both the components separately to successfully complete course.

In the courses with practical component, the practical component has a continuous assessment component as well as a Term End Practical Examination. The continuous assessment is done by the counsellor for the practical counsellors. The student has to prepare a file in which she has to present the computer

programme meant to be written for each practical session. The counsellor has to sign each practical session after examining the student and making sure that the student has understood the programme. Once this is done for a session, the student is deemed to have completed that session. Only those students who attend 70 per cent of the practical sessions is eligible to appear in the Term End Practical Examination.

In the case of projects, the evaluation is done by external examiners, identified locally at each study centre and duly approved by the School Board.

Challenges Faced in Running the Programme

One of the main challenges was getting suitable course writers, content editors, etc. In the case of core papers, very few experts, who are mathematicians by training, are capable of writing on topics which have applications. On the other hand, people working in application areas were unable to present the topics in a mathematically oriented way. The approach in this case was more that of engineers. Also, some of the persons working in application areas, who are in high demand, found the honorarium that University offered was not attractive enough.

The same difficulty was faced in finding counsellors, practical counsellors, paper setters, evaluators and moderators. The reasons were also the same, namely we could not find qualified people and if we did manage to find qualified people, they were not willing to get involved in the programme for many reasons, including the honorarium paid.

Most of our students are from the conventional system and are well set in their ways. They found self-study difficult. Although most of the students from a science background who usually do a computer programming course at undergraduate level, they struggled with programming exercises although they have a C programming course that starts from the basics.

Another aspect was that many of the students were High School teachers and they were not interested in applications *per se.* They simply wanted a post graduate degree in Mathematics that will help them in their teaching career.

In (Leigh Norma Wood, 2012), is mentioned that "It is disappointing that in the present climate where qualifications for a career are increasingly important, too many students who study mathematics appeared to have little idea about their future use of mathematics.".

A large number of engineering graduates have shown interest in joining the programme. The programme team felt that the mathematical training given to engineering graduates is not the same as the one pursues an undergraduate programme in Mathematics. So, we could not accommodate them. However, the programme team hopes to accommodate the engineering students in the future by adding bridge courses for engineering students.

Conclusions and Recommendations

In spite of the problems that we have faced, we still feel it is a programme worth continuing. Some of the measures that could solve some of the problems are:

- Regarding the problem faced in getting resource persons

- Provide online counselling for the programmes.

- Recording video lectures and uploading them will also be useful. This could alleviate the problems in finding suitable counsellors.

- Offer a pure stream along with the application stream. This will help students who are not comfortable with programming and are not interested in computer applications.

- Regarding admitting engineering students, it is felt that a summary of the undergraduate level material should be provided in the course material. For example, while preparing the course material in Algebra it is assumed that the students are comfortable with topics like elementary group theory and ring theory. Instead, it will be better to provide a quick recall of the topics, guiding them to suitable materials of undergraduate level for the topics where more explanation is necessary. This will be useful to students with an undergraduate degree in undergraduate courses also since some of the students finished their graduation more than three years back and their knowledge of the basics is rather rusty.

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Mass Psychology of Traders and Investors: A Study

Anant Prasad Harichandan* and Sangeeta Pawar**

Psychology plays an important role in any investment decision. Emotions that affect investments are fear and greed, but are more diverse and can significantly impact results. Investors psychological profile affect how an investor's portfolio performs because investing decisions are directly linked to emotions. The study of investor's psychology is about understanding the shortcomings in how they feel about the markets and why they may do.

Mass Psychology is an old phenomenon and has been around forever. However, it has only been brought to light recently. We tend to feel comfortable when we do something together. This phenomenon is encoded in all creatures--- a flock of birds, a herd of beasts, a shoal of fish, etc. they all follow a leader.

Being a good investor takes a lot more than just being good with numbers. There are a lot of hidden depths that define the stock markets. If financial markets were only based on numbers, good traders would not need nearly as much education and knowledge. Psychology is a big key to success. Investors need to use their instincts when making decisions, rather than using their emotions. The level of success for individuals in the stock market is heavily leaned upon human psychology in uncovering random events in the stock market. The root of this comes from a Chinese philosophy known as Taoism, a theory that recognizes that the world and its aspects may be evolving, but the phenomenon that dictates this evolution stays put. It enables investors to operate with an in-depth understanding of the environment, not just based on emotions or sudden changes in price. These strategies have been used by many successful investors, arguing that human psychology is more valuable than any form of analytics. Traders need to use data that they are self-aware of, and they also need a basic understanding of the market they are investing in. As a result, markets have a tendency to confirm to the average. The psychology of individuals is to copy one another, leading to what's known as conventional judgment. A problem with this is that the humans are so error prone, financial markets are somewhat risky. Another aspect of psychology is the aspect of greed. Most investors in the trade market seek risk in one way or another which is not necessarily

* Research Scholar, Department of Commerce (Business Policy and Administration), University of Mumbai. Vidyanagari, Mumbai-400 098. E-mail: anant.we@gmail.com
** Professor, Department of Commerce, University of Mumbai, Vidyanagari, Mumbai-400 098.

a negative thing, as being too cautious can cost you opportunities in life. Hope and profit are other factors that traders take into account, as one always hopes to maximize his/her profits. The last factor is that of fear, as no one likes losing money, resulting in some people either not investing, or even going bankrupt. Human psychology is still an understated aspect of trading, but it has a huge effect on any traders throughout the world, as it is still widely used by the investors. In order to study the Mass Psychology of Traders and Investors, a survey was conducted. Objectives of the Study were:

- To study the mass psychology of investors towards investment
- To study the trend towards investment
- To study the indicators of investment
- To study the interest of investors in learning price chart

Methodology

In order to study the Mass Psychology of Traders and Investors, a survey was conducted through email. Descriptive analysis of the data has been done based on the feedback received from the investors/traders to whom the survey questionnaire was sent via e-mail. It is also important to note that e-mail questionnaires were sent to approximately 500 investors obtained from different sources like friends, colleagues, professional references etc. who were located across the country in many states. The e-mails were sent to investor in the month of February, 2020 and by the end of the month a total response of 200 were received. Finally, the number of responses reached to 261 by the first week of March, 2020 which was sufficient for research as per norms. Now let us see how the data has unfolded/emerged from the analysis. The responses received have been analyzed qualitatively.

Analysis of Data

Age Group of the Participants who have Responded to the Questionnaires

It has been seen that more than 60 per cent of the respondents belong to age group of 18-30 indicating that younger people are actively participating in filling up the questionnaires. It seems they have some expectations from this study and they wanted to know about reading price charts. Very insignificant percentage of respondents belonged to the age group of 60 and above which indicates they aren't interested so much.

Occupation-wise Respondents

It is observed that 60 per cent of them either work in a private sector or public sector firm. Around 15 per cent are in some vocations and approximately 12 per cent have their own business.

The category others represent people who are either students or not employed. 15 per cent seems to be a significant number as they intend to explore the possibility of trading/investments.

Income of an Individual is an Important Indicator for Investments

32 per cent of the respondents are in the range of 1-5 lakhs, 41 per cent in the range of 5-10 lakhs, 21 per cent in the range of 10-25 lakhs and 5 per cent in the range of 25 lakhs –1 crore. Since only 5 per cent response has been from higher income groups, it can be said that more people in this income are interested in trading.

Avenues of Investment

It is seen that around 40 per cent of them use Fixed Deposits for investment as it provides a fixed secured return. Approximately 50 per cent of the respondents still believe in physical assets like gold and real estate for investment. Real Estate prices have increased in the past mainly in metropolitan cities like Mumbai and gold prices mostly as a security for family or safe haven.

Frequency of Trades done by Investors in the Stock Market

Trading is based on day to day activities and markets change every now and then. Hence it is prudent to keep a watch on its activities on a daily basis. Let us now analyse the data received on the frequency of trades done by investors in the stock market.

Fifty percent of the investors trade once in a month and can be said they are casual investors. The rest 50 per cent at least trade once a month out of which 20 per cent make trade at least once a week.

Investment Analysis

Using analysis of investment is a technical question and can be answered by those who are doing regular trades/investment and probably it may go beyond the comprehension level of the casual investors who trade occasionally or once in a year.80 per cent of our participants used both technical analysis as well as fundamental analysis before selecting any stock for investments. However, there are around 15 per cent who use only fundamental analysis for selecting any stock and 5 per cent use only technical analysis to select a stock.

Importance of Reading Price Charts

Knowledge and understanding of price charts are an important thing to be considered while investing to make a proper judgment. The data shows that 80 per cent of the respondents look at the price charts before making their investment decision rather than just buying it blindly.

Interest In Learning the Skill of Reading Price Charts

Reading price charts is a skill and it needs time to master any skill. 70 per cent of our respondents were interested in learning the skill of reading price charts which shows their interest in learning a skill to make their trades more profitable. 30 per cent were not interested in learning price charts.

Use of Indicators for Selection of Trade

Indicators are very important in the markets and there are some leading and lagging indicators in the market. In the survey we see that 60 per cent of our respondent use moving averages as an indicator very often. 25 per cent of them use Relative strength index and approximately 15 per cent use MACD indicator.

Frequent Usage of Indicators

Indicators can be classified as lagging and leading indicators; leading indicators generally give you a direction ahead of the market. Around 49 per cent of our respondents haven't used any indicators for their trades and 51 per cent of them have used it at least for one of their trades.

Can only Indicator be Enough to Make a Trade?

Is it reliable to depend only on indicators to trade? It was found that 75 per cent people don't use only indicators to finalise their trade. However, approximately 25 per cent people use only indicators to make a trade.

Time Frame of Investment

Time horizon of one's investment is a very crucial factor for making investment/trades. It was found that 30 per cent of the respondents have a time frame of 6 months – 1 year, 22 per cent of them invest for a period of 3 years and more. 16 per cent of them invest with a 1-3 years view and only 13 per cent have a horizon of less than a month.

Return Expectation of People

It is very important to make returns more than the inflation to earn any kind of real returns. Hence the return expectation of people plays an important role in

selecting their trade/investment. Study shows that 56 per cent of the people have an expectation of making 10-20 per cent return. 15 per cent of the respondents have an expectation of making 20-40 per cent returns annually. Only 8 per cent of them believe they can earn more than 40 per cent return annually. Greed and fear play an important role in the market. Whenever markets are rising there is greed in the market to make more returns and whenever markets fall there is fear of losing more. It is found that 65 per cent of the respondents prefer to invest when markets are falling and 35 per cent prefer to invest in a rising market.

Findings of the Study

In brief the survey result points out:

- Most of the traders/investors want to take advantage of the falling markets and hence prefer to invest in falling markets.

- People have an expectation of 10-20 per cent return from the markets which is line with the average returns of sensex over last 3 decades.

- Traders have used indicators before selecting their trade, moving averages being the most used out of all; however, they don't use only indicators to finalize their trade.

- Most of them who don't use price charts/indicators for their analysis are interested in learning the same.

- Traders/Investors use both fundamental as well as technical analysis before making their decisions.

Implications of the Study

- It is considered wise to invest some portion of one's savings in stock markets because it is one of the asset classes which can give good inflation adjusted return.

- Generally, people invest in the markets when markets are at high and sell when markets are down. To make the best returns one should do the opposite as the quote goes 'Buy when others are fearful and Sell when others are greedy'.

- Returns in market for long term are aligned with the nominal growth of our country i.e. GDP growth + Inflation and people should therefore not expect returns of 25-30 per cent from stock markets.

- Only 5 per cent of the population make money in stock markets because they are professionals and do a proper analysis before selection of a stock unlike the 95 per cent of people who buy/sell on the basis of news articles, tips from friends/relatives etc. Hence, reading price chart becomes important before buying any stock.

- Indicators can be used for buying/selling a stock; however, one should also look at the trend and price charts before making decision.

Conclusion

Mass psychology is not a complex field and in fact it is very easy to understand. All one needs is a bit of common sense. Once we understand the basics, it becomes easy to see why the masses are on the wrong side of the markets. When one combines Crowd Psychology with Technical Analysis, the risk to reward ratio improves significantly. This combination provides one with the opportunity to consistently be on the right side of the market. Mass Psychology comes to identifying the emotion that is driving the markets. Once you identify the emotion, it is very easy to spot a new trend.

There is no tool more powerful than mass psychology; it is the crowd that drives the market and the driving force behind the masses is emotions. Therefore, it is imperative that one understands what emotions are driving the masses at any given moment in time to know the market. Only then should one look into trying to master technical analysis. Fundamental analysis is fundamentally flawed as the data is provided in a standard format which means that anyone looking at the data will arrive at the same conclusion.

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Indigenous Health Care System of India: Relevance for Present Times

M Venkaiah Naidu, Hon'ble Vice President of India delivered the Convocation Address at the 10th Convocation of JSS Academy of Higher Education and Research, Mysuru, Karnataka on November 02, 2019. He said, "One of the things, I have noticed in the wake of technological advancements in the medical field is the gradual erosion of human touch or human element in doctor-patient relationship. I feel that today's doctors are not communicating adequately with the patients and rather performing their duty in a mechanical fashion—probably due to work pressure. I think there should be an effective communication between the doctor and his/her patient. It should be remembered that doctors are treated like God by patients and the latter should always be treated with empathy and humanism. It is quite important to always uphold highest standards of ethics morals. Medical courses curriculum should also include subjects like bio-ethics, humanities and communication skills." Excerpts

I am pleased to be with you all today to deliver the convocation address at the 10th Convocation of JSS Academy of Higher Education and Research, Mysuru. This day is indeed very special for all the graduating students who have gathered here. Graduation ceremony marks a momentous occasion in your lives. As you celebrate, it is also important to acknowledge a new beginning. I believe that after passing out today, some of you might opt for higher studies, some may start working as healthcare professionals and some others might set up their own ventures.

Dear Students, whatever you choose, always dream high and strive hard with unwavering commitment and passion to realize your goal. Never falter, remain sincere and steadfast in pursuing your dreams. Always remember that true wisdom consists not only seeing before your eyes but the foreseeing. As I see, most of you will be in the medical profession–may be as a doctor, pharmacist or researcher, in whatever capacity you are working, your role will be very important.

India has achieved significant progress since Independence on various health indicators. With successive governments according high priority to health and the wellbeing of the people, the average life expectancy has increased to 69 years and India's disease burden due to communicable, maternal, neonatal, and nutritional diseases has dropped from 61 per cent to 33 per cent between 1990 and 2016. There are noteworthy improvements in health indicators relating to Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR) due to increasing penetration of healthcare services across the country, extensive health campaigns, sanitation drives, increase in the number of government and private hospitals in India, improved immunization and growing literacy,

India's health sector has a number of competitive advantages--, from a large pool of well-trained medical professionals to a flourishing Pharma industry which excels in generic drug manufacturing, to cost effective and quality medical procedures. The cost of surgery in India is substantially less when compared to the US or Western Europe, which makes India a healthcare destination of choice. In spite of all these advancements, there is a long and arduous road ahead of us.

Our health sector still grapples with inadequate public spend, low doctor-patient ratio, high share of out-of-pocket expenditure, inadequate infrastructure in rural areas, lack of penetration of health insurance and inadequate preventive mechanisms. Despite the progress made by the nation in various fields and the advancements made in modern medicine, we still face a huge shortage in the number of qualified medical practitioners in India, especially specialist doctors. It has been estimated that India is facing a shortage of 6 lakh doctors and 20 lakh nurses. The National Health Profile 2018 says that there is just one allopathic government doctor available for around 11,082 people across the country-- more than 10 times the WHO recommended ratio of 1:10

There are around 71,000 MBBS seats in the 500-odd medical colleges, whereas we only have 32,000 postgraduate seats. The newly constituted National Medical Commission (NMC) is a step in

right direction. I hope this Commission will provide for a medical education system that is inclusive, affordable, and ensures availability of adequate and high quality medical professionals in all parts of the country.

India is witnessing a troubling transition, from Communicable Diseases to Non-Communicable, lifestyle diseases (NCDs). A WHO report attributes nearly 61 per cent of deaths in India to non-communicable diseases. Studies show that the contribution of cardiovascular diseases to mortality increased by 34·3 per cent from 1990 to 2016. During the same period, the age-standardized diabetes prevalence rose by 29·7 per cent in India. Also, we need to keep in mind that this data was largely based on self reporting by people.

A Lancet study finds the NCDs are typically present in individuals aged 55 years or older in many developed countries, but their onset occurs in India a decade earlier at the age of about 45 years. This is mainly because of genetic predisposition, changing lifestyle and factors like pollution. Eating unhealthy food and leading a sedentary lifestyle were contributing to increase in NCDs. To counter this prevalence of Non Communicable Diseases, we must adopt a healthy lifestyle and good dietary habits.

I feel that there is a need to establish NCD clinics in both urban and rural areas and the private sector must play a prominent role in setting up such clinics. I would also like call upon the doctors in both public and private sectors to visit the nearest schools in their localities and conduct awareness campaigns on the need to maintain healthy lifestyle.

One of the things, I have noticed in the wake of technological advancements in the medical field is the gradual erosion of human touch or human element in doctor-patient relationship. I feel that today's doctors are not communicating adequately with the patients and rather performing their duty in a mechanical fashion—probably due to work pressure. I think there should be an effective communication between the doctor and his/her patient. It should be remembered that doctors are treated like God by patients and the latter should always be treated with empathy and humanism. It is quite important to always uphold highest standards of ethics morals. Medical courses curriculum should also include subjects like bio-ethics, humanities and communication skills.

Society regards a doctor as 'God' because he saves life. But we often keep reading the stories of exploitation, especially in private medical sector. For example, take the case of increasing number of Caesarean section (C-section) deliveries in India. A study by IIM, Ahmedabad found that many of these C-section deliveries were unnecessary and were driven mainly by financial motives. It is also observed that quite often unnecessary tests and expensive medicines are prescribed putting much pressure on the pocket of poor patient. This is unacceptable. This is unethical. This is not expected of a conscientious doctor.

So Dear Students, I call upon you to raise your voice and protest wherever you come across such malpractices. Your heart should always be filled with empathy for those who are suffering. I have also observed that focus of medical education has been on curative aspects rather than preventive aspects. I personally feel that the old saying 'Prevention is Better Than Cure' is very true and essential in today's era.

The Prime Minister has launched Ayushman Bharat with an objective to provide accessible and affordable healthcare for the common man. This is the world's largest government funded healthcare program. I hope that Ayushman Bharat will address the issues of people getting pushed into the vicious cycle of debts due to out-of-pocket expenses and high treatment costs.

As you all are aware, India is blessed with a unique advantage—about 65 per cent of our population is below the age 35 years. We have to fully realize this demographic dividend. The young population can contribute to nation-building only when it is motivated, adequately trained and skilled and most importantly when this population is healthy and fit. That is why, I feel that role of health professionals is very important. A nation with unhealthy population cannot progress. Encouraging the youth to take part in regular physical activities, encouraging them to learn and practice Yoga would entail better results.

Here, I would like to draw your attention to the fit India campaign launched by Prime Minister

Narendra Modi. I appeal to all of you to take this mission forward and make it a people's movement to build India that was both healthy and happy. As said by the father of our nation Mahatma Gandhi, "It is health that is real wealth and not pieces of gold and silver." We must revisit our age-old traditions. Our youngsters need to be made aware of the important role diet plays in leading a healthy lifestyle. The food prescribed by our ancestors was time tested and was in accordance with the requirements of the geographical regions, climate and seasons.

I also advise the youth to take a break from the technology-driven lifestyle and spend some time in the lap of nature as it will re-energize and rejuvenate them. It's time for not just returning to our traditional healthy lifestyle but also to re-explore our history. We need our own sense of history that is reflective of Indian perspective and Indian values. This right sense of history and pride in one's cultural heritage is very important for a nation that aspires to become a world power. I am very pleased to see that under able guidance of His Holiness Swami ji, JSS group of institutions is promoting Indian values

and serving the society in the true spirit of Sri Suttur Math has been guiding light of humanity since ages, showing us the path of transforming societies with compassion and humanity.

I am happy to know that JSS Academy of Higher Education & Research, Mysuru has been ranked among the top 50 universities/Higher Education Institutions in India by National Institutional Ranking Framework (NIRF) by MHRD, Government of India. In the end, I would say that this is also very special day for the parents as they see their young children successfully completing one phase of their life and move on to the next and more independent phase of their life.

Always remember that your parents have sacrificed a lot for your education. They have made innumerable silent sacrifices so that you have a bright and prosperous future. So always work to make your parents, teachers and the alma mater proud.

My best wishes and congratulations once again to all the graduating students!

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CAMPUS NEWS

International Webinar on Digital Possibilities

An International Webinar on 'Digital Possibilities to Improve the Quality of Language Learning' was organized by the Faculty Development Cell, Central University of Tamil Nadu, Thiruvarur, recently to explore the digital possibilities for improving the Quality of Learning in general and language teacher in particular. Experts from Nanyang Technological University, Singapore, City University, Dhaka, Central Universities and National Institutes like NCERT served as Resource Persons. Prof. A P Dash, Vice Chancellor, Central University of Tamil Nadu inaugurated the Webinar and he highlighted the significance of the Webinar in the backdrop of COVID-19 as a paradigm shifting phenomenon opening immense possibilities in the entrenched institutional practices in teaching and learning. Prof. Dash elaborated, in his inaugural address how the outbreak of the corona virus has caused problems in the functioning of all countries of the world and how Health, Medicine, Education, Business, Economy, etc. are all affected badly. Envisaging that the governments of all countries, institutions, doctors, experts and academicians are working together on the construction of a new path for the future in accordance with the present scenario, he stressed that this is the right time to vindicate the four pillars of education: Learning to Know (*Jyanyog*), Learning to Do (*Karmayog*), Learning to Live Together (*Sahayog*) and Learning to Be (*Atmayog*).

Prof. Karpaga Kumaravel, Director of the Webinar and Dean, School of Education and Behavioural Sciences, in his Keynote Address observed that since World War II, it has never happened worldwide that all schools and educational institutions have gone into lockdown at the same time and for the same reason. He underscored how the impact of the virus will be far-reaching and what it may mean in the long term in the field of education in terms of implications. Prof. Kumaravel has enumerated in detail how the society is shaped by the rapid diffusion of sophisticated digital devices, applications and trends like Web 2.0 Technologies and Social Media leading to a changing social order and culture, ushering in new opportunities for communication, collaboration and active participation in the current post COVID-19 scenario.

In his Presidential Address, Prof. S Subbiah, Former Vice Chancellor, Alagappa University, dwelt on length how Technology has opened new vistas in Language Learning, especially in developing Communication Skills and received pronunciation on par with the native speakers. Illustrating from the best practices of the developed countries in the application of technology for quality assurance in language learning, he stressed the need for the effective use of digital technology by the teachers of language. Dr. S Bhuvaneswari, Registrar in her felicitation address complimented the relevance and significance of the focal theme of the Webinar.

Dr. Seetha Lakshmi, Nanyang Technological University, Singapore made an elaborate presentation on E-Learning Trends in Europe and Singapore in the Post COVID-19 phase. She substantiated in her presentation how globalization has extended the opportunities for transnational migration, structural employment and unemployment, knowledge creation, upward movement in socio-economic status of marginal communities. Prof. Mustafizur Rahman, Pro Vice Chancellor, City University, Dhaka, Bangladesh in his presentation highlighted the potential of technology in increasing the quality and quantity of practice that students undertake both inside and outside the classroom and also dwelt upon the relationship between technology, motivation and achievement. Interesting Interactive Presentations were made by Prof. V Sudhakar, Dean, Central University of English and Foreign Languages, Hyderabad on 'Artificial Intelligence and Learning', Prof. G Viswanathappa, NCERT on 'Open Educational Resources', Prof. Sulochana, Central University of Tamil Nadu on 'Quality Assurance in Learning', Prof. G Singaravelu, Dean, Bharathiar University on 'LSRW', Prof. Jagitha Begum, Gandhigram Rural Institute on 'Neuroscience and Language Learning', Dr.G R Angadi, Central University of Gujarat on 'Education in Post-COVID 19 period', Dr. R Parameswaran, Central University of Tamil Nadu on 'E-Resources for Self-Learning', Dr. K Thiyagu, Central University of Kerala on 'Digital Possibilities in Teaching and Learning' and Prof. Mumtaz Begum, Dean, Pondicherry University on 'Issues and Concerns in Learning'.

The Valedictory Address was delivered by Dr. V Nithya, Syndicate Member, Bharathidasan University

in which she lauded the growth rate of self-paced e-Learning in India as 55%, which is higher than China (52%) and Malaysia (41%). But, she pointed out that the quality assurance mechanism through e-Learning has been given far less consideration. Dr. V Nithya also elucidated how the creation, utilization and support of e-learning have been a complex multidisciplinary activity, increasing the tensions between technical, organizational and pedagogical considerations. In conclusion, Prof. Karpaga Kumaravel, Director of the webinar presented the report of the event and underscored that the deliberations of the webinar assumed significance in the critical context of COVID-19 and will contribute greatly to the Theory and Practices of the escalated Digital Learning efforts to keep pace with the situation arising out of the present crisis with flexibility. Prof. Kumaravel has recommended that there is a need to work in this direction to bring institutional flexibility in higher education without diluting the Quality of Education and also to give impetus to new designs of pedagogy.

Online Workshop on LaTeX for Engineers and Researchers

A five-day Self Sponsored Online Workshop on 'LaTeX for Engineers and Researchers' is being organized by the Department of Chemical Engineering, Maulana Azad National Institute of Technology Bhopal Madhya Pradesh during November 09-13, 2020. The event is open to the faculty members, UG, PG and Ph.D. scholars.

LaTeX is a document preparation system which is effectively used in many scientific fields like Mathematics, Statistics, Computer Science, Engineering, Chemistry, Physics, Economics, Linguistics, etc. to produce high quality documents, like articles, books, dissertations, technical reports, etc. It is an essential, powerful and open-source system that provides numerous facilities for automating typesetting of the document. The Contents of the event are:

- Basic Tools for Formatting Texts.
- Handling Different Types of Documents.
- Document Layout and Organization into Different Sections, Subsections, etc.
- Writing of Complex Mathematical Formulae.
- Systematic Management of Tables, Figures and Images.
- Conversion of Latex Mathematical Formulae into MS Word Formulae.

- Error Messages and Their Rectification.
- Bibliographic Database Collection and Citation Using Different Tools and Techniques.
- Presentation Using Beamer.
- Latex in HTML.

For further details, contact Dr. Pushpendra Kumar, Assistant Professor, Department of Mathematics, Bioinformatics and Computer Applications, Maulana Azad National Institute of Technology Bhopal-462003 (Madhya Pradesh), Mobile No: +91 9759720891, E-mail : *pkumarfma@manit.ac.in* **or** *lerworkshop2020@gmail.com* For updates, log on to: *https://sites.google.com/view/ler2020/home*

Programme on Strategic Human Resource Development

A One-week Quality Improvement Programme on 'Strategic Human Resource Development for Competitive Advantage' is being organized by Department of Humanities and Social Sciences, Indian Institute of Technology Kharagpur during November 16-22, 2020. The Faculty teaching in AICTE approved institutions and interested in HRD activity of students and teaching of HRD course may participate in the programme.

The QIP sponsored programme on Strategic Human Resource Development for Competitive Advantage is aimed to develop an understanding in designing strategic HRD system and its contribution in organizational performance. This course offers a mix of theoretical and case based practical hands on approach to understand the dynamics of strategic HRD. It will provide a comprehensive understanding of strategic issues in human resource development, its alignment with business activities and linking it with performance that can better equip people to plan, teach, and research in the area of strategic HRD, and also for executives who are responsible to design , develop, and execute effective HRD system in their organizations. The Contents of the programme are:

- Theoretical and Practical Models of SHRD.
- Defining Strategic HRD and its Characteristics, Traditional and Strategic HRD Systems.
- Aligning Strategic HRD with Business, SHRD.
- Role of Line Managers, HRD Professionals.
- Developing Strategic HRD Systems and Practices Culture and Strategic.

- HRD Knowledge Management and Strategic HRD Factors Facilitating and Enabling Strategic HRD in Organizations.

- Linking Strategic HRD, Learning and Change.

- Case Studies, Assignment and Presentations.

For further details, contact, Principal Co-coordinator, Dr. KBL Srivastava, Department of Humanities and Social Sciences, Indian Institute of Technology Kharagpur-721302 (West Bengal), Phone: +91-3222-283624, E-mail: *kbls@hss.iitkgp.ac.in.* For updates, log on to: *www.iitkgp.ac.in*

Online University Education and English Language Teaching

A two-day Virtual Conference on 'Online University Education and English Language Teaching: Scope and Challenges' is being organized by Department of English, School of Social Sciences and Languages, Institute of Technology, Vellore, Tamil Nadu during November 13-14, 2020. The event may bring together researchers, teachers and professionals of english literature and language in India and abroad to come up with innovative teaching-learning methodologies, evaluation and assessment techniques, effective and holistic student-teacher learning experience and policy guidelines for Online Education of English Literature and Language across Universities.

The COVID-19 pandemic has affected and disrupted all aspects of life globally. Along with other sectors, higher education sector has also been severely impacted. Due to this, the traditional Teaching-learning methodologies and student-teacher interactive experience has been replaced with online education. Though not a permanent replacement to the traditional classroom teaching, online education will be the mode of teaching and learning until the vaccine is invented. Governments and health experts have advised Universities, Colleges and Schools to commence classes with a combination of online and tradition teaching. Further, virtual and online education is being advocated and to some extent made mandatory at least by some higher education institutes for the next academic year. With the lack of any foreseeable medical solution in the immediate future for this pandemic, the higher education institutes are left with no other option but to shift to online education to minimize health risk of students and staff. Two decades ago, technology was not optimal for online education, however, the latest technology of internet, telecommunications, etc., have paved the way for online education and virtual classrooms connecting student –teacher across the globe with a few limitations. Since, there is a sudden shift from traditional education to online education, there is a need to understand online education methodologies, to measure its effectiveness, as well as to prepare a shift to a new system. There is a need to examine Teaching-learning approaches, evaluation and assessment methodologies and educational experience for students and attitude change among teachers.

Though online learning of English Literature and Language has better scope and development, it is important to understand the issues like teaching-learning methodologies, specific approaches and adaptations for various courses like teaching text, prose, poetry, drama, novel for literature and communication skills and language skills. Further, there is also a need to come up with novel evaluation assessment procedures and motivate student-teacher to prepare for online education ecosystem. The onus is on English Literature and Language Teachers to take up this challenge of online education due to the COVID-19 pandemic for effective and holistic learning experience for both teachers and students. There is an urgent need to address these issues especially for engineering and management education. The Themes and Subthemes of the event are:

- Online Education for English Literature: Methodologies and Innovative Teaching Practices.

- Online Education for English Language Teaching: Methods, Approaches and Techniques.

- Online Education –Assessment and Evaluation for Literature and Language Courses.

- Online Education for Innovative Technologies, Audio-visual aids Social Media for Literature and Language Teaching.

- Online Education Effective and Holistic Teaching-learning Experience: Teacher-Student Motivation, Engagement and Satisfaction.

For further details, contact Dr. S Rukmini, Assistant Professor (Senior), Department of English, School of Social Sciences and Languages, Vellore Institute of Technology, Vellore-632014 (Tamil Nadu), Mobile No: +91-8790984172, +91-7981247113, E-mail: *onlineng.edu@gmail.com*. For updates, log on to: *www.vit.ac.in* ❑

THESES OF THE MONTH

SCIENCE & TECHNOLOGY

A List of doctoral theses accepted by Indian Universities
(Notifications received in AIU during the month of July - August, 2020)

BIOLOGICAL SCIENCES

Biochemistry

1. Kadam, Ashlesha Ashokrao. **Role of apoptosis inducing factor in cell survival and mitochondrial dynamics in dictyostelium discoideum**. Department of Biochemistry, M S University of Baroda, Vadodara.

2. Raimalani, Varsha Mohan. **Studies on mutant forms of the ubiquitin conjugating enzymes UBC1 AND UBC4**. Department of Biochemistry, M S University of Baroda, Vadodara.

Life Science

1. Amit Kumar. **Biosystematics studies on Indian ocimum**. (Dr.Velusamy Sundaresan), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

2. Chinmayee, C V. **Microbial milk clotting enzymes: Specificity, structure and food applications**. (Dr Sridevi Annapurna Singh), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

3. Ghose, Subhoshree. **Perspectives on vitamin B12 deficiency induced DNA methylation alterations and cardiometabolic risk**. (Dr Shantanu Sengupta), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

4. Gupta, Charu. **Role of adipocytokines in diabetes induced cardiomyopathy in wistar rats**. (Prof. Bano Saidullah and Dr. Parvesh Bubber), School of Sciences, Indira Gandhi National Open University, New Delhi.

5. Pal, Sreetama. **Lipid-protein interactions in membranes: Role of negatively charged lipids**. (Dr Amitabha Chattopadhyay), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

6. Pandit, Saritha G. **Evaluation of red pigment from Tala romyces purpureogenus CFRMO2 against Alcohol-induced Liver Disease (ALD) and its toxicology**. (Dr. Mohan A Dhale), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

7. Reddy, P Anuradha. **Elucidating population dynamics of Tiger (Panthera tigris tigris) using DNA-based genetic analysis**. (Dr Karthikeyan Vasudevan), Faculty of Biological Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

8. Sandhu, Baljinder Kaur. **Antimalalarial treatment practices and quality check of drugs and diagnostic procedures at selected study sites**. (Prof. Neera Kapoor and Dr. Neelima Mishra), School of Sciences, Indira Gandhi National Open University, New Delhi.

Microbiology

1. Shah, Hiral Bharat. **Characterisation of genes involved in the development and virulence of pathogenic fungi**. Department of Microbiology, M S University of Baroda, Vadodara.

EARTH SYSTEM SCIENCES

Environmental Science

1. Tailor, Manthan Atulkumar. **Assessment of nutrient dynamics and physic-chemical status of freshwater reservoirs of Vadodara District, Gujarat, India**. Department of Environmental Science, M S University of Baroda, Vadodara.

ENGINEERING SCIENCES

Chemical Engineering

1. Bhattacharjee, Chiranjit. **Studies on watermelon juice concentration using ultrafiltration**. (Prof. Suman Dutta and Prof. V K Saxena), Department of Chemical Engineering, Indian Institute of Technology, Dhanbad.

Computer Science & Engineering

1. Kanapala, Ambedkar. **Legal information retrieval: Techniques and evaluation**. (Prof. Rajendra Pamula and Dr. Sukomal Pal), Department of Computer Science & Engineering, Indian Institute of Technology, Dhanbad.

2. Pramanik, Rahul. **Devising efficient preprocessing and recognition strategies for offline Bangla OCR systems**. (Prof. Soumen Bag), Department of Computer Science & Engineering, Indian Institute of Technology, Dhanbad.

3. Surendra Singh. **Design of security aware packet scheduling techniques**. (Prof. Sachin Tripathi), Department of Computer Science & Engineering, Indian Institute of Technology, Dhanbad.

Electrical & Electronics Engineering

1. Datta, Tanmoy. **Slotted photonic crystal waveguides based all optical logic devices for photonic integrated circuits**. (Prof. Mrinal Sen), Department of Electronics Engineering, Indian Institute of Technology, Dhanbad.

2. Mishra, Deepak. **Advances in Polarization Depolarization Current (PDC) measurement and analysis for effective diagnosis of power transformer**. (Prof. Arijit Baral), Department of Electrical Engineering, Indian Institute of Technology, Dhanbad.

3. Pattapu, Uday Bhaskar. **Design of rectenna systems for wireless energy transfer/ energy harvesting**. (Prof. Sushrut Das), Department of Electronic Engineering, Indian Institute of Technology, Dhanbad.

4. Saurabh. **Effect of temperature on dielectric response of oil paper insulation system**. (Prof.Arijit Baral), Department of Elecronics Engineering, Indian Institute of Technology, Dhanbad.

5. Suthar, Hareshkumar Amrutlal. **Multiobjective optimization of 2DOF controller using evolutionary and swarm intelligence**. Department of Electrical & Engineering, M S University of Baroda, Vadodara.

Electronics & Communication Engineering

1. Smitha, P S. **Investigations on nanocapacitors as energy storage device**. (Dr. Suresh Babu V and Dr. Shiny G), Department of Electronics & Communication Engineering, APJ Abdul Kalam Technological University, Thiruvananthapuram.

Mechanical Engineering

1. Bhakta, Amit Kumar. **Thermo-hydraulic performance analysis of parabolic concentrating solar water heater with twisted tape insert in the absorber tube**. (Prof.S N Singh), Department of Mechanical Engineering, Indian Institute of Technology, Dhanbad.

2. Kumar Sourav. **Free vibrations of square and elliptic cylinders at low Reynolds numbers**. (Prof. Subhankar Sen), Department of Mechanical Engineering, Indian Institute of Technology, Dhanbad.

Metallurgical Engineering

1. Pradeep Singh. **Ti alloy foam synthesized using mechanically alloyed powder through space holder technique: Study of compressive deformation and corrosion behaviour**. (Dr. D.P. Mondal), Faculty of Engineering Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

Petroleum Engineering

1. Mandal, Arnab. **Study of organic solid deposition in the petroleum reservoir rock**. (Prof.Vikas Mahto), Department of Petroleum Engineering, Indian Institute of Technology, Dhanbad.

2. Pal, Nilanjan. **Gemini surfactant assisted enhanced oil recovery: Synthesis, formulation design and performance assessment**. (Prof. Ajay Mandal), Department of Petroleum Engineering, Indian Institute of Technology, Dhanbad.

Textile Technology

1. Pannu, Sunny. **Designing and manufacturing of the high quality stretch fabric**. (Dr. Rishi P Jamdagni and Dr. B K Behra), Department of Textile Engineering, Maharshi Dayanand University, Rohtak.

MATHEMATICAL SCIENCES

Mathematics

1. Ansari, Zamir Ahmad. **Study of certain integral operators in the framework of linear canonical transform domain**. (Prof.Akhilesh Prasad), Department of Mathematics and Computing, Indian Institute of Technology, Dhanbad.

2. Ashish. **Iterative approximations to convex feasibility problems for nonlinear operators**. (Dr. Renu Chugh), Department of Mathematics, Maharshi Dayanand University, Rohtak.

3. Babli Kumari. **Generalized convexity and optimization problems on Riemannian manifolds**. (Prof. Anurag Jayswal), Department of Mathematics and Computing, Indian Institute of Technology, Dhanbad.

4. Savalia, Rajesh Vasantbhai. **A system of p-polynomials and its Q-analogue**. Department of Mathematics, M S University of Baroda, Vadodara.

5. Sheetal. **Reliability modeling of systems with effects of time and temperature on operation and repair**. (Dr. Dalip Singh), Department of Mathematics, Maharshi Dayanand University, Rohtak.

MEDICAL SCIENCES

Biochemistry

1. Shetty, Shilpa S. **Association of Fatty Acid Desaturase (FADS) gene polymorphism, insulin resistance and fatty acid composition in type 2 diabetes mellitus**. (Prof. Suchetha Kumar), Faculty of Allied Health Sciences, Nitte University, Mangaluru.

2. Ullal, Harshini Devi. **Association of inflammatory markers C – reactive protein & interleukin – 6 and fatty acid desaturase gene variant on type II diabetes mellitus**. (Prof Suchetha Kumari N), Faculty of Allied Health Sciences, Nitte University, Mangaluru.

Biotechnology

1. Jakhar, Renu. **Cloning and characterization of aminopeptidase N in anopheles culicifacies (Diptera: Culicidae) for malaria transmission blocking activity**. (Dr. S K Gakhar), Department of Medical Biotechnology, Maharshi Dayanand University, Rohtak.

Dentistry

1. Hegde, Chethan. **Evaluation of peri-implant bone level around implants with standard abutments and platform-switched abutments: A prospective clinical study**. (Prof. Manoj Shetty), Faculty of Medicine, Nitte University, Mangaluru.

2. Nagendran, J. **Assessing the behaviour of children based on dietary consumption of processed food**. (Prof. Amitha M Hegde), Faculty of Dental Sciences, Nitte University, Mangaluru.

3. Samuel, Soumi. **Assessment of life style of parents in incidence of orofacial clefts**. (Prof B Rajendra Prasad), Faculty of Dental Sciences, Nitte University, Mangaluru.

4. Shetty, K Heeresh. **A CBCT evaluation of apexogenesis /maturation induced by a regenerative endodontic procedure in necrotic, infected or non-vital immature permanent teeth: A clinical study**. (Prof. Shishir Shetty), Faculty of Dental Sciences, Nitte University, Mangaluru.

Genetics

3. Kusum. **Development and validation of age estimation statistical tools using digital dental radiographs: A forensic study**. (Dr. Neelkamal), Department of Genetics, Maharshi Dayanand University, Rohtak.

4. Meenakshi, A. **Evaluation of role of genetic factors in male infertility**. (Prof. D Prashanth Shetty), Faculty of Allied Health Sciences, Nitte University, Mangaluru.

Medicine

1. Preethika, A. **Association of ALPHA-1 antitrypsin, omega fatty acids and single nucleotide polymorphism of fatty acid desaturase gene in breast cancer**. (Prof. Suchetha Kumari N), Faculty of Medicine, Nitte University, Mangaluru.

2. Shenoy, Rathika D. **Associated anomalies in children with orofacial clefts: A descriptive study with cytogenetic characterisation**. (Prof. Vijaya Shenoy), Faculty of Medicine, Nitte University, Mangaluru.

Nursing

1. Laxmi. **A study on effectiveness of self learning material on knowledge, attitude and practices regarding behaviour change communication related to reproductive and child health issues among pre-service and in-service ANMs of selected training & health Units of Delhi**. (Prof. Bimla Kapoor), School of Health Sciences, Indira Gandhi National Open University, New Delhi.

2. Nalini, M. **Relationship between nicotine dependence with urinary cotinine, psychological wellbeing and effectiveness of tobacco cessation programme**. (Prof. Chitta Ranjan Chowdhury), Faculty of Nursing, Nitte University, Mangaluru.

Pharmaceutical Science

1. Gupta, Prashant. **Bioimmunotherapy of tuberculosis: Co-treatment with recombinant mouse granulocyte-macrophage colony-stimulating factor and methaionine-Enkephalin**. (Dr. Prati Pal Singh), Department of Pharmacology and Toxicology, National Institute of Pharmaceutical Education and Research, Hajipur.

2. Mascarenhas, Shanon Ben. **Development and investigation of polysaccharide coated liposomes via gastro protective particulate carriers for colon delivery of anti inflammatory drugs**. (Prof. Marina Koland), Faculty of Pharmaceutical Sciences, Nitte University, Mangaluru.

3. Pandya, Charu Paresh. **Development of stability indicating assay method and study of degradation behaviour of some drugs and formulation**. Department of Pharmacy, M S University of Baroda, Vadodara.

4. Praveen Kumar. **Studies on the potential of transepidermally delivered neuroprotective agent(s) loaded nanoconstructs through microneedle induced skin micro conduits in management of dementia**. Department of Pharmacy, M S University of Baroda, Vadodara.

5. Ravi, G S. **Development and investigation of phytosomal nanocarriers for hepatoprotective activity**. (Prof. Narayana Charyulu), Faculty of Pharmaceutical Sciences, Nitte University, Mangaluru.

6. Saini, Meenu. **Synthesis and biological studies of pyridine N-fused heterocyclic derivatives as topoisomerase II-inhibitors**. (Dr. Sankar K Guchhait), Department of Medicinal Chemistry, National Institute of Pharmaceutical Education and Research, Mohali.

7. Singh, Neeraj. **Design and development of nanotechnology based oral formulation (s) of some antidiabetic drug (s) using biodegradable polymer**. (Dr. Parbhakar Kumar Verma and Dr. Sanju Nanda), Department of Pharmaceutical Science, Maharshi Dayanand University, Rohtak.

8. Sofi, Firdoos Ahmad. **New method development for the synthesis of N-heterocycles**. (Dr. P V Bharatam), Department of Medicinal Chemistry, National Institute of Pharmaceutical Education and Research, Hajipur.

9. Tiwari, Shweta. **Synthesis and biological evaluation of phloroglucinol derivatives and nitrogen containing heterocycles**. (Dr. Inder Pal Singh), Department of Natural Products, National Institute of Pharmaceutical Education and Research, Hajipur.

Physiotherapy

1. Srivastava, Saumya. **Efficacy of muscle energy technique versus mechanical diagnosis and therapy on patients with sacroiliac joint dysfunction: A randomized clinical trial**. (Dr Dhanesh Kumar), Faculty of Physiotherapy, Nitte University, Mangaluru.

PHYSICAL SCIENCES

Chemistry

1. Rao, N Naga Malleswara. **Glucose and its epimers-based multivalent glycopolymer architectures: Synthesis and characterization for their nanoparticles formation and biocompatibility**. (Dr. A V Sesha Sainath), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

2. Boruah, Purna Kanta. **Reduced graphene oxide sheets decorated with magnetic metal oxide nanoparticles and its application in environmental remediation**. (Dr Manash R. Das), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

3. Das, Tamal Kanti. **N-heterocyclic carbene-catalyzed urnpolung of aldimines for the synthesis of nitrogen heterocycles and related chemistry**. (Dr. Udaya Kiran Mareeli), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

4. Durgapal, Sunil Dutt Keshav. **Studies in synthesis and applications of chromene derivatives**. Department of Chemistry, M S University of Baroda, Vadodara.

5. Ghotekar, Ganesh. **Asymmetric synthesis of biologically important compounds and development of synthetically useful C-C and C-O bond forming reactions via transition metal free conditions**. (Dr. M. Muthukrishnan), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

6. Goudappagouda. **Modulation of ground and excited state properties of donor acceptor organic small molecules towards lighting, light harvesting and electronic applications**. (Dr. Santhosh Babu Sukumaran), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

7. Gupta, Riddhi. **Synthesis and study of conformationally twisted molecules and chiral roof shape amines**. Department of Chemistry, M S University of Baroda, Vadodara.

8. Kallayi, Nabeela. **Nanocellulose fibers as green platform for functional hybrid materials and their applications**. (Dr. Saju Pillai), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

9. Karkare, Pavankumar Prakashbhai. **Studies on synthesis of linear and block copolymers of vinyl monomers via ARGET-ATRP**. Department of Chemistry, M S University of Baroda, Vadodara.

10. Mohanta, Santosh Kumar. **Surface pre-treatment for efficient tribo-electrostatic separation of coal and minerals**. (Dr. R K Dwari), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

11. Rai, Surabhi. **Proton and water reduction by cobalt and copper based molecular catalysts**. (Prof. Sumanta Kumar Padhi), Department of Chemistry, Indian Institute of Technology, Dhanbad.

12. Sadasivan, Rajesh. **Copper substituted phosphotungstates: Design, characterization and catalytic activity**. Department of Chemistry, M S University of Baroda, Vadodara.

13. Samui, Arpita. **Development of nanoporous materials for biocatalysis and organocatalysis**. (Prof. Sumanta Kumar sahu), Department of Chemistry, Indian Institute of Technology, Dhanbad.

14. Surendra Kumar. **Synthesis and characterization of aromatic conjugated and non-conjugated fluorescent compounds and their applications**. (Dr. Rajesh Kumar Malik), Department of Chemistry, Maharshi Dayanand University, Rohtak.

15. Upadhyay, Gourav. **Synthesis and study of carbazole derived helicenes**. Department of Chemistry, M S University of Baroda, Vadodara.

16. Vir Bahadur. **Acyl transfer reactions in molecular crystals, cocrystals and associated studies**. (Dr. M.S. Shashidhar), Faculty of Chemical Sciences, Academy of Scientific and Innovative Research, Ghaziabad.

17. Vithalani, Ravi Shashikant. **Modification of exterior oxidative debris: Towards the development of conventional catalysts**. Department of Applied Chemistry, M S University of Baroda, Vadodara.

Physics

1. Nilkamal, Som Narayan. **Tailoring electronic, mechanical and dynamical properties of two dimensional materials using density functional theory**. Department of Physics, M S University of Baroda, Vadodara.

2. Pandey, Shashi Kant. **Design of fractal based microstrip antenna for modern wireless systems**. (Prof. P M Sarun), Department of Physics, Indian Institute of Technology, Dhanbad.

3. Roondhe, Basant. **First principles study of bio-conjugated boron nitride nanostructures**. Department of Physics, M S University of Baroda, Vadodara. ❑

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ANNOUNCEMENT

Special Number on Implementing National Education Policy–2020 to Transform Higher Education in India

A **Special Number of the University News** on the theme **'Implementing National Education Policy -2020 to Transform Higher Education in India'** is being brought on 30th November, 2020.

The **Special Issue** will cover articles of eminent educationists and policy makers. Readers of the University News are also invited to contribute to the Special Number by submitting papers/articles on above theme by November-10, 2020. The papers will be published in the Issue subject to the approval of the Editorial Committee of the University News.

Manuscripts may be emailed to the Editor, University News, Association of Indian Universities, AIU House, 16 Comrade Indrajit Gupta Marg (Kotla Marg), New Delhi-110 002. E-mail: unaiu89@gmail.com /universitynews@aiu.ac.in/rama.pani2013@gamil.com, Fax: 011– 23232131 on or before November-10, 2020.

GUIDELINES FOR CONTRIBUTORS

The *University News*, a Weekly Journal of Higher Education, provides an avenue for publishing Articles on topics related to different dimensions of higher education; Convocation Addresses; Book Reviews; Reports on Seminars, Symposia, Conferences, Refresher and Orientation Courses and various other events held in the university campuses; News related to higher education; and Communications on new ideas, concepts, innovations and recent trends in higher education, by its practitioners and stakeholders. Following are the guidelines applicable to contributions:

- Articles submitted for the Journal should be original contributions and should not be under consideration for any other publication at the same time. A declaration is to be made by the author in the covering letter that the paper is original and has not been published or submitted for publication elsewhere.
- Manuscripts including tables, figures and references should be around 3000-4000 words for articles and 600 words for Communications.
- All the manuscripts should type in double-space with 12 point font and ample margin on all sides on A 4 size paper.
- The cover page should contain the title of the paper, author's name, designation, official address, address for correspondence, contact phone/fax numbers and e-mail address.
- The main text should not contain footnotes. References should be given at the end of the manuscript and should contain only those cited in the text of the manuscript. The full reference should be listed at the end in alphabetical order running the following style:
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  Miles, M., and Huberman, M.,(1994). *Qualitative Data Analysis*. London : Sage.
- **Articles**

  Over, R.(1982). Does research productivity decline with age? *Higher Education,* 11, 511-20.
- **Chapter in a Book**

  Rendel, M. (1986). How many women academics 1912-1977? In R. Deem (ed.), *Schooling for Women's Work*. London: Routledge.
- **Article Retrieved from Website**

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Dr. S Rama Devi Pani
Editor,
University News, Association of Indian Universities
AIU House, 16 Comrade Indrajit Gupta Marg (Kotla Marg) New Delhi-110 002
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NATIONAL SANSKRIT UNIVERSITY: TIRUPATI
(A Central University established by an Act of Parliament)
(Erstwhile Rashtriya Sanskrit Vidyapeetha)

NOTIFICATION

National Sanskrit University (A Central University established by an Act of Parliament), Tirupati invites applications from eligible candidates for the following Teaching and Non-Teaching positions to be filled by direct recruitment.

Teaching Posts

S. No.	Name of the Post	No. of Posts Vacant	No. of Posts & Reserved categories						Level in Pay Matrix (7th CPC)
			SC	ST	OBC	PwD	EwS	UR	
	Professor - Academic Pay Level -14 (Rs.1,44,200-Rs.2,18,200)								
1.	**Professor in Advaita Vedanta**	01	-	-	-	-	-	01	Level-14
	Associate Professor – Academic Pay Level - 13 A- (Rs.1,31,400-Rs.2,17,100)								
2.	**Associate Professor in Sanskrit Education**	01	01						Level-13A
3.	**Associate Professor in Research & Publications**	01		01					Level-13A
4.	**Associate Professor in Yoga**	01						01	Level-13A
5.	**Associate Professor in Advaita Vedanta**	01						01	Level-13A
6.	**Associate Professor in Sahitya**	01	01						Level – 13A
	Assistant Professor – Academic Pay Level -10 (Rs.57,700 -Rs.1,82,400)								
7.	**Assistant Professor in English**	01					01		Level-10
8.	**Assistant Professor in Visistadvaita Vedanta**	01			01				Level-10
9.	**Assistant Professor in Advaita Vedanta**	01					01		Level-10

Non-Teaching Posts

S. No.	Name of the Post	No. of Posts Vacant	No. of Posts & Reserved categories						Level in Pay Matrix (7th CPC)
			SC	ST	OBC	PwD	EwS	UR	
1.	**Registrar** (for a tenure of five years)	01	-	-	-	-	-	01	14
2.	**Finance Officer** (for a tenure of five years)	01	-	-	-	-	-	01	14
3.	**Deputy Registrar**	01	-	-	-	-	-	01	12
4.	**Deputy Librarian**	01	-	-	-	-	-	01	13A
5.	**Private Secretary**	01	-	-	-	-	01	-	07
6.	**Group – C 'MTS'**	02	-	-	-	-	02	-	01

Separate applications along with prospectus for Teaching and Non-Teaching posts can be downloaded from the National Sanskrit University website: **nsktu.ac.in** Applicants are required to enclose a Demand Draft of Rs.800/- for UR/OBC/ EWS candidates and Rs.200/- for SC/ST candidates drawn on any nationalized bank in favour of the **Registrar, National Sanskrit University, Tirupati** from **14th October, 2020** onwards. **The PwD candidates are not required to pay any fee**. Separate application form should be submitted for each Post along with the prescribed fee. The applicants are required to send the downloaded filled in applications along with prescribed fee to the **Registrar, National Sanskrit University, Tirupati - 517 507, Chittoor (Dist.), Andhra Pradesh.**

The Last date for submission of duly filled-in downloaded application form is 16th November, 2020 by 05.30 pm.

Advt.No.NSKTU/Estt./T&NT/2020 dated 14.10.2020

REGISTRAR i/c

The Maharaja Sayajirao University of Baroda

Multidisciplinary Education & Research University (MERU)

Accredited 'A' Grade by National Assessment & Accreditation Council with CGPA 3.16 in the year 2016

Times Higher Education World University Ranking (Band)

2016	801+
2017	1001+
2018	1001+
2019	1001+
2020	1001+

QS Ranking

Asian University Ranking (Band)

2019	401-450
2020	401-450

Indian University Rank

2019	69
2020	78

The Maharaja Sayajirao University of Baroda (MSUB) is recognized as one of the premier institutions of higher learning and research in the country. Educational institution which preceded the Maharaja Sayajirao University of Baroda forming a part of its foundational legacy, included the "Baroda College", one of the oldest centers of learning in Western India, founded in the year 1881 by His Highness Maharaja Sayajirao Gaekwad-III. His Highness Maharaja Pratapsinhrao Gaekwad pursued the idea of establishing a University which became a reality in the year1949 and came into existence on 30th April, 1949.

43000+ STUDENTS IN CAMPUS

5000+ SCHOLARSHIPS PER YEAR

900+ BOOKS AUTHORED

10000+ RESEARCH PAPERS PUBLISHED
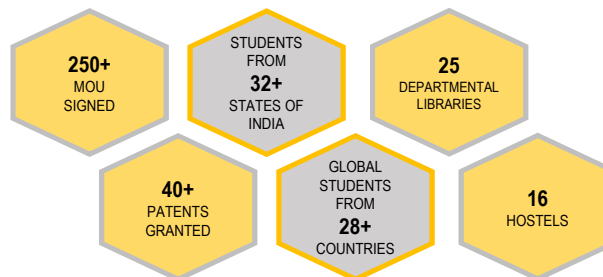
3800+ PHD HOLDERS

500+ RESEARCH PROJECTS

Notable alumni of the University includes Shri Vinobha Bhave (Bharat Ratna), Shri Aurbindo, Dr. Bhimrao Ambedkar, Shri Dadasaheb Phalke, Shri K m Munshi, Kakasaheb Kalelkar, Shri. Rajendra Shah (Gyanpith), Dr. Venkatraman Ramkrishnan (Nobel laurate), Dr. I. G. Patel, and many others.

Academic exchange programs are funded by some of the well known and prestigious funding agencies like German Academic Exchange Service, British Council, European Union, Max Planck, and Fulbright to name a few. The university has been accorded the prestigious membership of the United Nations Academic Impact (UNAI).

The University has signed more than 50 MoUs in the last three years with international Universities/Institutes which includes University of Cambridge, University of Laval, University of Stuttgart, University of Cornell, Ithaca, University of South Carolina, Keio University etc. for academic and research exchange programmes for students and teachers.

University has established specialised institutes like: Institute of Leadership and Governance (ILG), Dr. Vikram Sarabhai Institute of Cell and Molecular Biology, Atal Bihari Vajpayee Institute of Policy Research and International Studies, Oriental Institute, Institute of Fashion Technology, The Maharaja Ranjitsinh Gaekwad Institute of Design (MRID), Institute of Interdisciplinary studies.

It has dedicated offices like Office of International Affairs, Office of Corporate Affairs, Office of Alumni Affairs and Donors Relations, Office of Career Advancement for Students. The University has developed exclusive cells like Internal Quality Assurance Cell, Research and Consultancy Cell, Directorate of Students' Welfare, Communication Cell, Career & Counselling Cell, Placement Cell, Human Resource Development Cell,, MSU Start-Up and Entrepreneurship Cell.

The University has set up distinctive centers like: Centre for Biotechnology, Prof. Bharat Chattoo Genome Research Centre, Centre for Molecular Genetics, Cluster Innovation Centre, Management Development Centre, Siemens Centre of Excellence for industry automation, Urban Studies Centre, Population Research Centre, Women's Studies Research Centre, Centre for Intellectual Property Rights, Centre for Incubation, Shri Sayaji Pratishthan, Centre for Life Long Learning & Extension, All India Civil Services Training Centre etc. The Centre for Life Long Learning and Extension offers short term & long terms Certificate Courses / Diplomas in the area of Ancient Indian Studies, Art and Craft, Language Proficiency, Hotels/ Cookery, Personal Grooming etc. The All India & Central Services Training Centre conducts classes for preparation of UPSC, State PSC & Staff Selection Commission pattern Examinations and provide guidance for Examinations like NDA, CDS, IB, Police, RBI & other banks.

250+ MOU SIGNED

STUDENTS FROM 32+ STATES OF INDIA

25 DEPARTMENTAL LIBRARIES

40+ PATENTS GRANTED

GLOBAL STUDENTS FROM 28+ COUNTRIES

16 HOSTELS

The University offers a wide range of academic programmes from early childhood to Under-Graduate and Post-Graduate levels Degrees and Diplomas as well as Ph.D., with adoption of Choice Based Credit System (CBCS) for UG & PG students enabling them to select value added subjects of their interest.

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