



VPM (THANE)

**A Half Day Interaction Meeting
Scientific Temper & Spirit of Inquiry**

14th March 2014





A Half Day Interaction Meeting
SCIENTIFIC TEMPER AND SPIRIT OF INQUIRY
Friday, 14th March, 2014
2:00 pm onwards

**VENUE: Room No. 10, First Floor, Dr. V. N. Bedekar Institute of Management Studies
(DR VN BRIMS)**

Sr. No.	Time	Speakers	Topic
1.	2:00 pm to 2:10 pm	Dr. Guruprasad Murthy	Preamble
2.	2:10 pm to 2:35 pm	Dr. Vijay V. Bedekar <i>Chairman, VPM, Thane</i>	Scientific Temper and Spirit of Inquiry
3.	2:35 pm to 3:05 pm	Dr. P. M. Kelkar	Role of Scientific Temper and Spirit of Inquiry in Research and Development.
4.	3:05 pm to 3:35 pm	Dr. S. Kulkarni	ICT as a Tool for Use of Scientific Methods for Business Solutions
	3:35 pm to 3:50 pm	TEA BREAK	
5.	3:50 pm to 4:10 pm	Presentation on Case 1: Sigmund Freud (1856 - 1939)	Delegates from VPM's B. N. Bandodkar College of Science
6.	4:10 pm to 4:30 pm	Presentation on Case 2: Jean Piaget (1896 - 1980)	Delegates from VPM's K. G. Joshi College of Arts and N. G. Bedekar College of Commerce
7.	4:30 pm to 4:50 pm	Presentation on Case 3: Abraham Maslow (1908 - 1970)	Delegates from VPM's Polytechnic
8.	4:50 pm to 5:10 pm	Dr. S. C. Agarkar, Dr. P. M. Kelkar, Dr. S. Kulkarni and Dr. Guruprasad Murthy	Discussions on Presentations
9.	5:10 pm to 5:40 pm	Dr. S. C. Agarkar	Response to Presentations
10.	5:40pm onwards	Dr. S. C. Agarkar, Dr. P. M. Kelkar, Dr. S. Kulkarni and Dr. Guruprasad Murthy	Open Forum

GENESIS

Following the proactive and positive response of all stakeholders to the two conferences held on Rising Above and Beyond Excellence for VPM's Group of Institutions (GOI) and other developments in the course of time between the conferences viz. October, 2013 and February, 2014 VPM's GOI visualised a different dimension to its own self. This time it was an effort to bring about a rejuvenated mindset and revisit the approach and attitude to all that happens in the lives of teachers who are supposed to set the pace for themselves and through that for others- peers, superiors, students and in general other stakeholders too.

To start with the two conferences brought teachers from VPM's GOI together in two different branches in June and October, 2013 respectively. The conferences which were of two days duration each provided a platform for brainstorming and discussion on a wide variety of issues and topics of relevance with focus on academic excellence and beyond, creativity and innovation as a key input, teaching pedagogy and teaching learning processes and a host of topics related to student centric learning, faculty development and institutional development in particular and management of educational institutions in general.

These two conferences acted as a rendezvous for cross fertilization and cross materialisation of ideas, evolving in the course of the deliberations, leading to potential research papers and also a platform for identifying ways and means of developing symbiotic alliances leading to useful synergies. This, in turn, has helped in building inter-institutional camaraderie and also enlightened consultation and collaboration on issues of common interest.

In addition to the two conferences, there was a stimulating and forceful address by Dr. Vijay V. Bedekar on 5th September, 2013 at VPM's Annual Convocation where he stressed on the key metrics used globally to measure the performance of teachers viz. modicum academic credentials, additional preferred qualifications, publications in peer reviewed journals, scores on account of impact factors and citation index along with consistent disciplined delivery on the teaching and other related extra academic and administrative fronts. He also stressed the need for

teachers to respond positively to these norms because there is no choice and in the case of institutions which are already rated as the best it is assumed that teachers have only one more place to survive for sustainability and that is Rising Above and Beyond Excellence (RAABE).

The valedictory address of Dr. P. J. Lavakare, an eminent scientist, in October, 2013 (second conference on RAABE), also paved the way for understanding the need for and role of scientific temper and spirit of inquiry in research and also in promoting creativity and innovation. He emphasized the need for a World Class University in the country. In establishing such a university, he warned that Indian ethos should not be lost. Indian society has always respected knowledge and has designed effective ways of teaching and training. Dr. Lavakare reminded the audience to look into this heritage in carving out paths for the future.

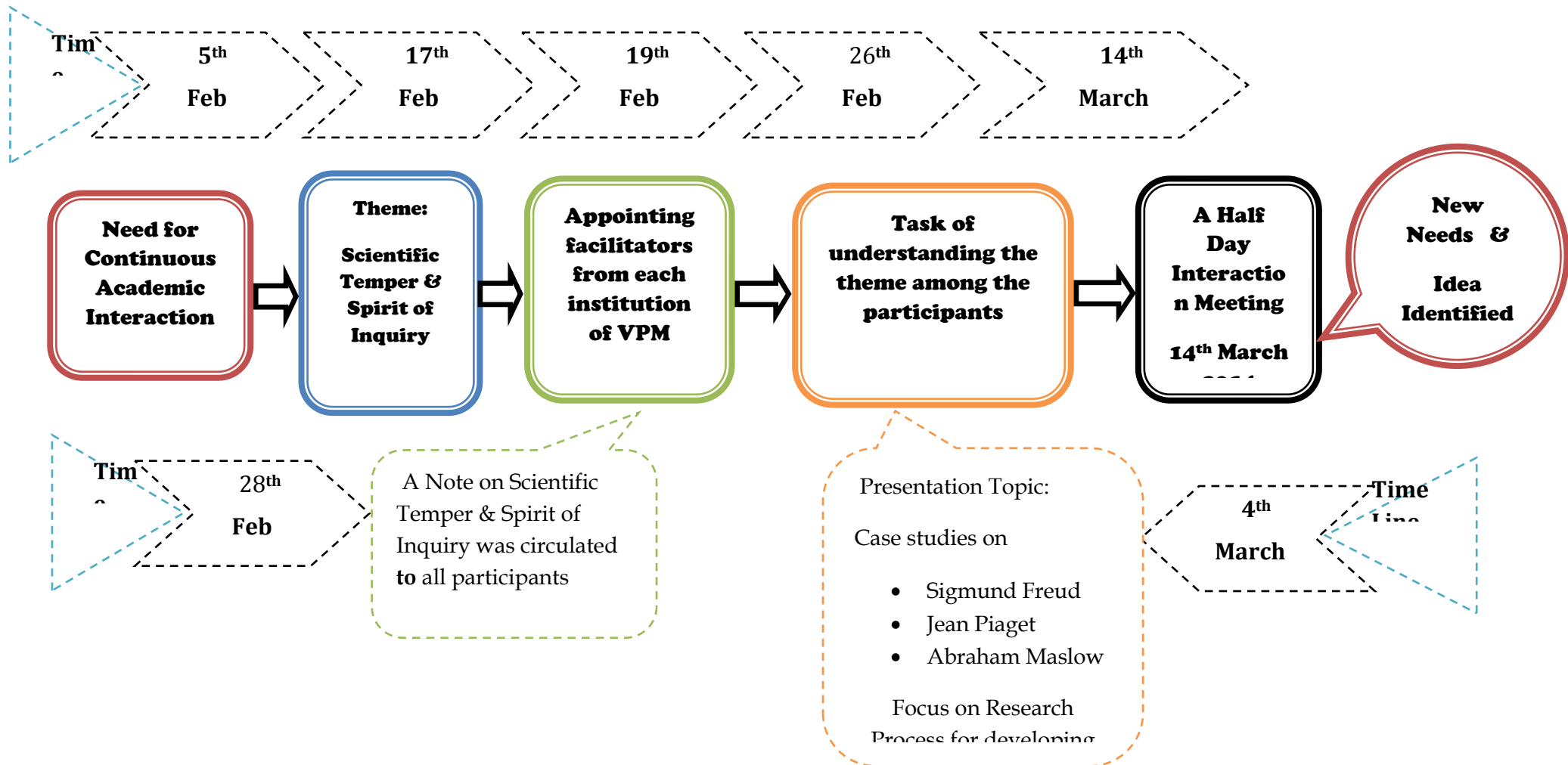
The Heads of VPM's GOI are now initiating ideas for further training and development to keep the momentum on and take their respective institutions to new heights. Thus, a half day interaction session which was organised for VPM's GOI on the theme of Scientific Temper and Spirit of Inquiry was very well received and the proceedings of the said session find a place in this publication.

- Dr. Guruprasad Murthy



The Flow of Activities leading to Half Day Interaction Meeting

“Scientific Temper & Spirit of Inquiry”



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PREAMBLE

Dr. Guruprasad Murthy: Preamble:

The half-day interaction session was initiated by Dr. Guruprasad Murthy through a Preamble articulated through a PowerPoint presentation. He said that the interaction meeting is hopefully an intercept between two conferences on Rising Above and Beyond Excellence held in June & October 2013 and perhaps an impending similar event at the start of the ensuing academic year (2014-15) of VPM's Group of Institutions.

Presentation:

Slide 1:

❖ Scientific Temper

- *Way of Life*
- *Process of Thinking*
- *Method of Acting*
- *Associating with Fellowmen*

Slide 2:

❖ Scientific Temper helps to develop:

- *Spirit of Inquiry*
- *Rational View of the World*
- *Divest Precedence as Key Input for Decision Making*
- *A mindset: To Question and be Questioned*

Slide 3:

Thus:

- *Knowledge is viewed as open ended and ever evolving*
- *Key resource in lieu of superstition, religion, theological and metaphysical beliefs.*

Slide 4:

*“ The Invention admir'd and each,
how hee to be th' inventor miss'd,
so easie it seemed Once found,
which yet unfound most would have thought impossible”*

- MILTON, Paradise Lost



INTRODUCTION

Introduction:

Science has achieved its glories by the application of the method of science which consists of formulating a hypothesis on the basis of the current knowledge and gathering additional data or facts to test its validity. A hypothesis may also be tested by an experiment in a given case and in the process it may be modified or in some cases may be rejected in favour of another.

As Michael Faraday has said, "The world little knows how many of the thoughts and theories which have passed through the mind of the scientific investigator has been crushed in silence and secrecy by his own severe criticism and adverse examination".

It was Jawaharlal Nehru who popularised the term "scientific temper" in India. He dreamt of a nation with a "scientific temper". By this he meant people who would be able to think independently, understand and practice scientific methods in their daily lives, analyse and take informed and calculated decisions rather than taking statements at their face value and avoid simplistic reasoning. Of course, it has been easier said than done to create that atmosphere in a nation where superstition, religion, rumour, myth and innumerable beliefs abound. Thus, we are still struggling to build scientific temper even after sixty years of independence.

The term scientific temper involves many parameters. It is characterized by healthy scepticism, universalism, freedom from prejudice or bias, objectivity, open mindedness and humility, willingness to suspend judgement without sufficient evidence, rationality, perseverance and last but not the least a positive approach to failure. The hallmark of all decision-making by a person with scientific temper is logic, rationality and verifiability. Perseverance, is another important characteristic of scientific attitude. Even the flash of insight, which characterizes many great scientific achievements, usually follows hard toil and reflection on the problem for long periods of time. As Thomas Elva Edison said "science is 99% perspiration and 1% inspiration".

An effective method of fostering scientific temper is to impart knowledge of science through experimentation and demonstration. In this method students get involved directly in activities similar to how scientists operate in discovering new knowledge. This is usually referred to as the discovery approach of teaching. Discovery lessons developed for a variety of sciences, wherein through simple experiments the students discover for themselves different scientific concepts, are useful in this context. It is necessary, in this approach of teaching, that experiments or activities should be open ended with ample opportunities for students to explore and experiment with new ideas.

It must be noted that scientific temper or scientific attitude is not the monopoly of scientists. They are relevant for all and can be used even by a common person. Of course, it is not untrue to say that scientific temper in its true sense had its original interface with natural sciences resulting into the development of basic as well as applied research in that domain. Over the past century, however, scientific temper has played an important role in promoting research and also in solving problems in other areas of knowledge too. Scientific temper has, thus, become the need of the day and every citizen is expected to acquire it for use in day to day life.

A Statement on Scientific Temper was issued on behalf of the Nehru Centre, Mumbai in July 1981. It mentions that Scientific Temper involves the acceptance, amongst others, of the following premise that the:

- A. Method of science provides a viable method of acquiring knowledge,
- B. Human problems can be understood and solved in terms of knowledge gained through the application of the method of science,
- C. Fullest use of the method of science in everyday life and in every aspect of human endeavour from ethics to politics and economics is essential for ensuring human survival and progress and
- D. One knowledge gained through the application of the method of science should be accepted as the closest approximation of truth at that time and question what is incompatible with such knowledge.

Though the importance of scientific temper had been generally recognised, no specific role or place was assigned to it in the Indian Constitution as originally enacted. The Fifth Parliament by the 42nd Amendment to the Constitution inserted one article namely Article 51 (A) ¹. It says that "It shall be the duty of every citizen of India to develop the scientific temper, humanism and the spirit of inquiry". Thus, a good citizen of India is duty bound to develop a scientific temper. Development of scientific temper among the people could, in fact, bring into focus the essence of all religions-the universal laws governing the inner world of human beings and, thus, promote communal harmony in a multilingual, multi-religious and multiracial country like India.

Many thinkers have pointed out that scientific method cannot be directly applied to situations involving abstract attributes like interpersonal relationships, values, ethical and moral norms, as they cannot be measured objectively. Often, this view arises from a restrictive interpretation of scientific method. However, if we take a broader view in tune with its spirit and interpret it as

sincere application of logic, rationality and verifiability, such difficulties could be overcome. By devising proper strategies, like for example, discerning the change in such attributes, rather than measuring their actual magnitudes would prove useful.

-Dr. S.C.Agarkar

¹ Article 51A states, inter alia, as follows:

(h) to develop the scientific temper, humanism and the spirit of inquiry and reform;

(j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;



Dr. VIJAY .V. BEDEKAR

Points Discussed by Dr. Vijay V Bedekar:

The term scientific inquiry as manifested in different educational settings covers a wide range of diverse activities

Many of the important figures of the scientific revolution, however, shared in the Renaissance respect for ancient learning and cited ancient pedigrees for their innovations. Use of Scientific temper started between roughly 1550-1700; beginning with Nicholas Copernicus (1473-1543), who asserted a heliocentric (sun-centered) cosmos and continued with Isaac Newton (1642-1727), who proposed universal laws and a Mechanical Universe. That is From Copernicus' bold but simple claim, so the story goes, a complex series of new developments were necessary to support his view and, at the same time, to replace earlier beliefs. What was needed, at least in retrospect, were new astronomical observations, these now associated with Tycho Brahe (1546-1601); new theoretical modifications concerning planetary orbits and their motions, now associated with Johannes Kepler (1571-1630); and not least, new theories of motion that would accommodate a moving earth, these theories now associated with Galileo Galilei (1564-1642), René Descartes (1596-1650), Christiaan Huygens (1629-1695), and of course, Isaac Newton (1642-1727)

Summaries of contributions of select scientist:

A. Copernicus:

Bequeathed the problem of explaining away Aristotelian physics in moving earth system. The problem, as Galileo later stated it, was to 'move the earth without a thousand inconveniences.'

B. Kepler:

1. Creative but ineffectual stab at explaining planetary system via 'magnetic' physics --notion of local gravity; 'magnetic' force of sun pulling planets around in coaxial orbits.
2. **Three Laws:**
 - a. Ellipses: The planets move on elliptical paths.
 - b. Areas: A radius vector from the sun to a planet sweeps out equal areas in equal times.
 - c. Periods: For any two planets, the times squared are proportion to the cube of the mean distance from the sun.

C. Galileo: Fundamental solution of Copernican problem.

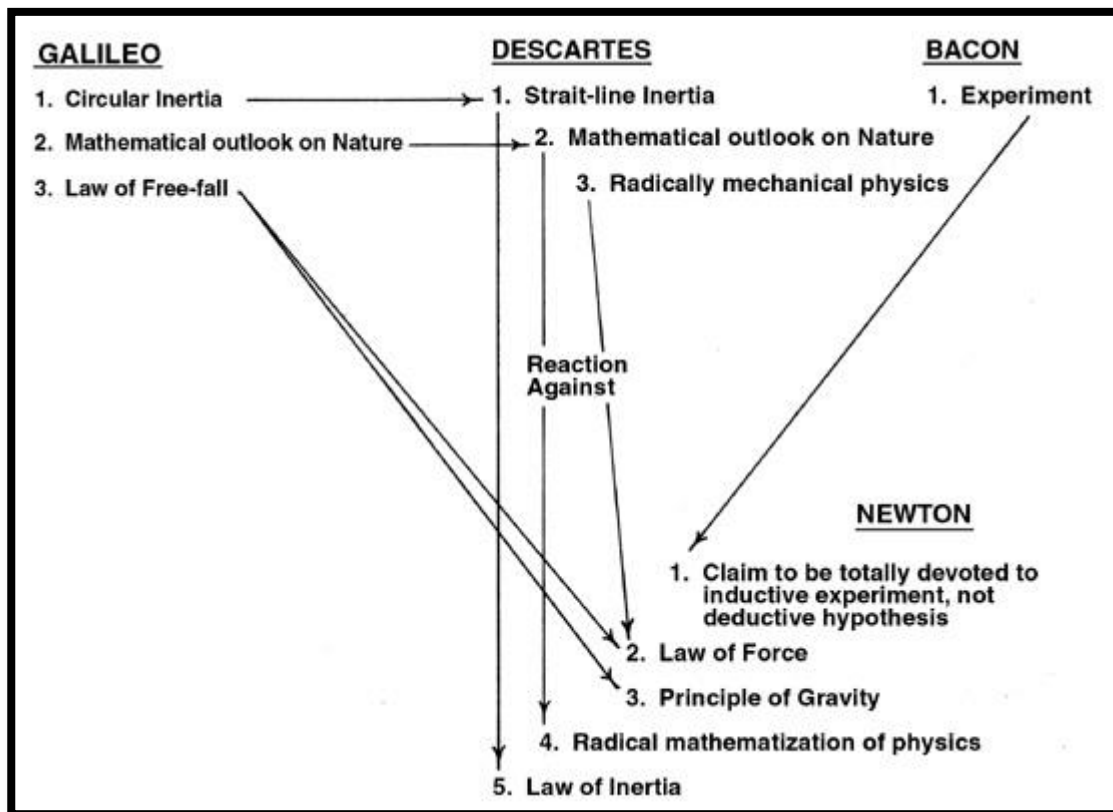
1. Circular Inertia.
2. Free-Fall; uniformly accelerated motion.
3. Nature is fundamentally mathematical.

D. Francis Bacon:

1. Spokesman and symbol for Experimentation (inductive)--probable roots in the Natural Magic tradition.
2. Utilitarianism: Science must be beneficial to society--ideal of progress.
3. Thus Bacon's methodology, though simple, was conceived to be totally new and anti-Aristotelian.

E. Isaac Newton and the Newtonian Synthesis:

1. Elements of the Synthetic, "New" Physics
2. The Problem and the Test Case: Lunar Motion.
3. The Moon's Orbit and the Unification of Terrestrial-Celestial Physics
4. Components of Newtonian Physics: *Matter, Motion, Space & Attraction*.



All traced different ancient and medieval ancestries for the heliocentric system

New approaches to nature: Historians of the scientific revolution traditionally maintain that it's most important changes were in the way in which scientific investigation was conducted, as well as the philosophy underlying scientific developments. Among the main changes are the mechanical philosophy, the chemical philosophy, empiricism, and the increasing role of mathematics.

Research / Scientific Inquiry Questions: 5W1H (Action Research Approach)

- What?
- Why?
- How?
- When?
- Where?
- Who?

Message: Scientific temperament is been noted in constitution, we need to be serious about the same in our day-to-day life we need to develop scientific temper

Example :

Sapling: *iskonamhinahihay* – Is Ko Nam Hi Nahi Hay (no name for this sampling)

Scientific temper is an attitude of logical thinking. If a person uses the scientific method in his/her daily life decision making process knowingly or unknowingly then we can say that he/she has scientific temper. This scientific temper is important in our life because this kind of attitude enable general public for making their decisions rational. Therefore we can conclude that the development of scientific temper among the citizens is essential for the overall development of the nation. It is necessary to develop scientific temper among all the people irrespective of their age, caste, creed, religion etc.

In fact for an overall growth and development of any organization or the country as a whole, we have to foster Scientific Temper in the citizens with absolute capacity for critical evaluation. The lack of Scientific Temper weakens our ability to take rational decisions. This may be the reason why the concept of “Scientific Temper” was built in our constitution.

The spirit of Inquiry is the principal element of scientific temper.



Dr. P. M. KELKAR

Session: Role of Scientific Temper and Spirit of Inquiry in Research and Development

- Dr. P. M. Kelkar

Background: Scientific methods are used for testing validity of a claim through formulation of hypothesis as well as for discovery based research and development. A person with scientific temper is supposed to take decisions based on logic, rationality and verifiability. Presentation made by me during the seminar discusses my own experience in developing and using scientific temper in drugs research and development.

Like excellence, scientific temper and spirit of inquiry comes from repeated use of scientific methods. It comes through experiences gained in small steps such as during learning, education, industry practice and whole life. It gets expressed through one's ability to question status quo, thinking out of box, developing ability to imagine, analyzing and trying alternatives.

Scientific temper also requires personal ambition to become the best in chosen field, tenacity to work hard and long. It requires keen observation power, flair for experimenting, abundant patience and precise documentation of results.

In my own thinking, study of vastly different subjects, development of inquisitive mind through extra reading of books (e.g. Tell Me Why? World Book Encyclopedia, Merck Index), seeing video programs (e.g. Turning Point, How it's Made? ,etc.), personal habits, travel, attending national and international meetings of scientists, special training programs, visiting worldwide manufacturing plants and research centres, working in cross-functional teams, meeting customers, regulators all enable development of scientific temper and spirit of inquiry in oneself. My presentation described number of examples in each one of these areas from personal and industrial life.

Long hours of practical sessions during years of graduation, post-graduation, full time doctoral research and 24×7 industry working helped me to work hard, long, accurate, precise and with purpose. During post-graduate research, I was given nationally important topic of fertility control by illustrious guides who had demonstrated their own expertise in drugs research. My first project titled 'Synthesis of Oral Contraceptives' involved 2-step laboratory synthesis of intermediate starting from Cholesterol, verifying claims, proposing equipment and cost of capital for taking lab synthesis to industrial scale.

My 2nd project guided by experienced Professor with excellent industry contacts involved 'Process Standardization for Lignocaine', a powerful drug of choice for local anesthesia. I had to start chemical synthesis of Lignocaine by isolation of m-xylene from Commercial Xylene (obtained from fractionation of petroleum crude) and converting it in several steps to a commercial size project with manufacturing capacity of 2700 kg/year. This project needed development and standardization of process for m-xylidine an intermediate fully imported at that time. In multi-step processes that were used and optimized using Design of Experiments (DOE) methodology, I was able to obtain pure Lignocaine Hydrochloride and propose a scale up to the desired plant size. List of equipment, plant and piping design for flow of materials and capital required to conduct these processes on a commercial basis were also worked out. This gave me experience of how to convert a research and development idea into reality. Findings of project were shared with leading industries in Mumbai.

Work for my 4-part Doctoral thesis titled 'Synthesis of Potential Anti-fertility Agents and Psychotropic Agents' was carried out at the Central Drug Research Institute, Lucknow under the guidance of highly reputed scientist who had worked with Nobel Laureate and was guiding over 45 Ph. Ds. at that time. Institute provided me with the best chemical synthesis facilities to design and conduct experiments, analytical facilities to validate findings, expert guidance from coworkers and intermediate guide, opportunity to publish research work, write a patent and subject new chemical entities (NCEs) synthesized by me to pharmacological evaluation. 4 Lead compounds for my thesis were identified using research methodology of 'Molecular Modification' and building NCEs around them. After planning and completing synthesis, verification and evaluation of over 100 new chemical entities, publishing 2 papers in international journals in first 2 years, presenting those papers in Chemists Conventions, at the end of 4.5 years of full time research, I was allowed to write and submit Ph.D. Tech. thesis to Mumbai University.

Scientific methods learned during education armed me with tools and techniques to solve any problems after joining the industry. These problems are not necessarily the same solved during masters or doctorate level research. My presentation then described research and development in industry (small r and a big D). I was lucky to be able to work in almost similar area making contraceptive steroids (ingredients of 'Morning After Pill') at laboratory level, pilot plant level and plant level to manufacture these high tech drugs and intermediates in purest form ready for formulation into medicines. Using out of box thinking, I was able develop new processes to

manufacture key antibacterials and tranquilizers (sleep inducing drugs) that were highly appreciated by the Originating Company and implemented in their international plants.

In Medical Device company that I worked, I was able to help production department develop and manufacture sterile medical devices for ready use in an operation theater. My team worked in several areas of development like product research, packaging and packing material research, process research, development of alternate and new suppliers for various raw materials, packaging materials and finished products. Writing, reviewing and approving several documents like RM specifications, Standard Test Methods, Process Specification, Finished Goods Specifications, conducting sterile product and process validations, etc. gave us full confidence of achieving sterility assurance level of 1 in a million allowable failures necessary for use of product in surgery. Entire system of quality assurance based on developing methods to validate consignment on sample test basis assured us a degree of certainty that full consignment meets customer and regulatory specifications and is fit for intended use. This practice was followed up for 7 Originating Companies with a finished product range exceeding exceeding 2 lakhs nos.

I believe the opportunities I got and described above were purely as a result of my ability to develop scientific temper and spirit of inquiry in drugs research and their use by patients.

Dr. P. M. Kelkar Presentation:

Slide
1

Role of Scientific Temper and Spirit of Inquiry in R & D

DR. P. M. KELKAR
14TH MARCH 2014

Slide 2

Scientific temperhow?

- Like excellence, scientific temper and spirit of inquiry comes by repeated use of scientific methods
- It comes in small steps: school, graduation, post graduation, doctoral and industry practice
- Expressed through ability to question status quo, think out of box, analyze and try alternatives, ability to imagine
- How does one learn? Teachers, Experts/ Coaches, Observation, Books, Experience, Travel, Environment, Peers, Family and Friends

Slide
3

Enablers of Scientific Temper

- Ambition to be the best in the chosen field
- Tenacity to work hard, long, precise and accurate
- Flair and liking for conducting experiments, keen observation and abundant patience
- Right attitude, technique and documentation necessary for research and development
- Study of vastly different subjects can help develop ability to use threads of similarity

Slide 4

Enablers

- 'Tell Me Why?' Series of Books; 'World Book Encyclopedia'; Mystery and Adventure Books
- Reading books other than prescribed by SSC Board
- Discovery Channel programs particularly 'How It's Made?'
- 'Turning Point' science programs on TV
- Referring to 'The Merck Index'
- Countries and manufacturing plants across the world
- Research as well as QA Directors' Meetings
- Special Training programs
- Reports, specifications, meeting customers, regulators, meeting people

Slide
5

Drivers

- Experiment based scientific discovery on projects of high social/national importance
- Plans and conducting research on lab scale and process development/ standardization on pilot scale
- Competent Guide, Research Scientists, Well-known Research Institute, Facilities, Well established and rehearsed Research Methodologies (Molecular Modification, Quantitative Structure Activity Relationship-QSAR)
- Job description, company culture, environment and research facilities, corporate communication

Slide 6

Examples

- Experience in College practicals
- Experience as a Summer Trainee in Ciba- Geigy
- Experience as doctorate level student in CDRI
- Experience as company manager in India and Asia
 - Multipurpose equipment and High Tech synthesis in Ciba-Geigy
 - Resolving havoc in Roche plant
 - Managing Recalls in J & J Medical
 - International exposure, Team working and A/P exposure in J & J

Slide
7

Scientific Temper and Spirit of Inquiry in Research and Development

- Build up towards Career in Research & Development
 - Research Report with few lab scale experiments
 - Research Report for process standardization for commercial manufacture
 - Discovery based Research: Methodology, Planning, Executing, Verifying, Reporting, Publications
 - General understanding of how to manage chemical reactions?
- Industry R & D: Small r and Big D, Types of Research, Priority setting, Process improvements through Kilo lab-Pilot plant-Manufacturing Plant, Successful implementation of change
- Department & company wide research
- Documentation and Reproducibility of outcomes

Slide 8

Post Graduate Research

- Topic: Fertility Control to limit childbirth using anti-ovulation steroidal contraceptive pills
- Home Paper Title: Synthesis of Oral Contraceptives
- Guide: who worked with Noble Laureate DHR Barton
- Literature Survey of Existing Knowledge
 - Methods of synthesis of existing steroidal hormones from various chemicals and natural raw materials
 - Inadequacy of existing fertility control practices (mechanical barriers, spermicidal agents and rhythm method)
 - Mechanism of action of Estrogens and Progestins that mimic natural hormones to prevent ovulation during menstruation cycle and during pregnancy

Slide
9

Post Graduate Research

- Work closely on lines of known oral contraceptives (Pill Ortho-Novum), post-coital contraceptives i-Pill, i-Pill 72 and Unwanted 69, morning after pill
- Experimental: 2 Step Laboratory Synthesis of steroidal intermediate starting from Cholesterol
- Learn how to set up and conduct known, complex reactions, handle toxic raw materials, work up reaction mixtures, isolate products and report yields
- Verification of products using M.P., IR etc.
- Plant layout and product costing
- Excellent academic results and tremendous advantage during 1st job

Slide 10

Double Post Graduate Research

- Process Standardization for Lignocaine a powerful local anaesthetic drug (Xylocaine, Lidocaine)
- Best and most potent local anesthetic in market with low toxicity, versatility of formulation, solubility, stability and onset
- Even today it is a drug of choice for local anesthesia by all surgical practitioners, dentists
- Guide with expertise in process industry
- Objective: Import substitution for intermediate m-xylydine and conversion to Lignocaine.HCL

Slide
11

Double Post Graduate Research

- Synthesis Plan: Multistep chemical synthesis starting from commercial xylene obtained by fractionation of petroleum crude
- Literature survey on synthetic methods for anesthetics, selection of synthetic route involving import substitution of m-xylidine
- Experimental work for Step 1 (separation of m-xylene from crude xylene by sulphonyl chloride route, nitration to mixture of 2- and 4-m-nitroxylene and separation of 2-m-nitroxylene, reduction to m-xylidine, reporting yields at each stage)
- Characterization of Intermediate m-xylidine using bromide-bromate titration, confirmation by conversion to acetyl derivative, and M.P. of acetyl derivative, Nitrogen estimation

Slide 12

Double Post Graduate Research

- Failed direct nitration of m-xylene-4,6 disulphonyl chloride
- Experimental (condensation of m-xylidine with chloroacetyl chloride, isolation & characterization of intermediate, condensation with diethyl amine, isolation of Lignocaine base with solvent and conversion to hydrochloride)
- Design of experiments: optimization of reaction conditions at each step to establish process parameters for best yields

Slide
13

Characterization, Plant Layout & Costing

- Intermediates Verification: B.P., Refractive index, GLC and IR spectra
- Lignocaine Hydrochloride: characterization by M.P., IR, Purity and Assay
- Techno-commercial proposal: Prescribe details of Plant layout, material of construction, working days, commercial aspects of manufacture (capital investment, material requirements, manufacturing cost for production of 2700 kgs/year)

Slide 14

Ph.D. Research Methodology Molecular Modification

- Identification of a suitable lead compound around which a group can be built
- Lead can come from
 - biological activity of natural products
 - activity data generated by synthesis
 - screening of novel structures
 - side effects of known drugs and
 - biochemical understanding of disease process
- Design of selected candidate based on pattern recognition in lead molecule and lead optimization
- Literature survey, selecting research scheme, planning and conducting experiments

Slide
15

Molecular Modification

- Intermediates and finished compound (NCE) analysis, verification, validation, process optimization, plant scale up and submission of pure compound for specific biological testing
- Biological testing and evaluation, feed data for further synthesis, large scale clinical trials, evaluation of efficacy and side effects, if any
- Formulation research
- Papers, Patents, Research Communications

Slide 16

Doctoral Research Planning: Steps

- Research Planning
 - Select best institute for drug research in India
 - NIH Maryland scholarship through interview
- Guide: FNA, Head of Medicinal Chemistry Division, colleague of Nobel Prize Winner Lord Todd, Chairman of Indian Pharmacopoeia Committee
- Research Plan: Molecular modification of Quinacrine and Ethidium Bromide and work on 4 major areas of drugs research
- Objective: Conduct lab scale research to synthesize minimum 100 new chemical compounds before writing thesis. Publish at least 2 papers in first 2 years to maintain senior research scholarship

Slide
17

Doctoral Research Projects

- Research Topic: Synthesis of Potential Antifertility Agents and Psychotropic Agents
- Project 1A) Fallopien Tube Occlusion as possible approach to fertility control. Synthesize analogs of Lead molecule Quinacrine e.g. 9-amino acridines and tetrahydro-acridines
- Project 1B): Novel synthesis of 3, 8-disubstituted amino-7-phenyl phenanthridines and its derivatives. Lead molecule Ethidium Bromide
- Project 3: Novel synthesis of 2-aryl-7-methoxy and 7-hydroxyphenanthrenes
- Project 4: Novel synthesis of 2,7-disubstituted and 2,3,7-trisubstituted pyrazolo (4,3-c)-quinolines as potential Psychotropic agents

Slide 18

Doctoral Research Facilities

- Top class facilities, full time working from 9 AM to 7 PM, facility for night reactions, dangerous reactions
- Unlimited supply of materials, infrastructure and instrumental facilities that enable quick determination of reaction products in less than 1 day: C,H,N Estimation, NMR, IR, UV, Mass Spectra for hundreds of intermediates to improve research productivity
- Day to day guidance by senior lab colleagues and experienced intermediate guide
- Change route if step fails or results in poor yields

Slide
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Doctoral Research: Process

- Literature survey to select various synthesis options and selection of 1st best option for multistep synthesis. Completed work on Quinacrine analogs and filed for 1 process patent
- Publication after 2 years and presentation in Chemists Convention organized by Indian Chemical Society
- Addition of 2nd Part of Thesis: Synthesis of Potential Psychotropic Agents to bring variety in exposure to synthetic methods
- Repeat same process as done for the 1st part

Slide 20

Doctoral Research: Process

- Submit purified coded compounds to Pharmacology Dept. for animal testing e.g. LD₅₀, ED₅₀, Type of Activity
- Continue with more publications and patent, if possible
- Weekly Journal Club Meetings and Sunday Coffee meetings
- After 100+ new compounds are synthesized, characterized and given for testing, start writing draft of the thesis. Attach all evidence and data. Draft undergoes several iterations, verification of results by guide
- Research Colloquium in UDCT, Mumbai
- Hand over entire research work to intermediate guide and to the next student in the laboratory
- Complete publications and patent work. Additional papers written after joining industry

Slide
21

Industry Research and Development

- Generally small r and big D
- Hard work, taking lead, cross-functional team working on specific R & D objectives
- Process standardization and research, process validation, process control, New product development with main aim of cost reduction, profit improvement, import substitution
- Packaging research, import substitution, exports obligations, local/International supplier development and qualifications
- Raw/ packaging/ packing material specifications
- Standard Operating Procedures, Standard test methods, Finished products testing and release
- Corrective actions on market feedback and corrective actions

Slide 22

Industry Research & Development (1)

- Taking charge of warehouse, laboratory facilities
- Allotting work for pilot plant employees
- Working in close collaboration with boss every day for 13 hrs, working 2.5 years on bench
- Experienced in manufacturing processes for 87 complex chemical reactions & 29 bulk drugs (female and male hormones, sulphas, Ciba-Geigy Research Centre molecules) and process documentation
- Process optimization in lab, pilot plant and multipurpose chemical plant, QA approvals for bulk drugs
- Trouble shooting at plant level, Conversion of side products to desired drugs for improvement of yield
- Accurate Reporting of Experimental evidence (batch sheets, analysis sheets, TLC and QA reports)

Slide
23

Industry Research & Development (2)

- Allotting work to lab attendants and chemists
- Opportunity to work on production of 50 extremely important bulk drugs and intermediates (Vitamins A and E, Diazepam and Chlordiazepoxide, Sulphamethoxazole) mfd. in 3 dedicated plants
- Transformed way Sulphamethoxazole and Diazepam drugs were isolated, Intermediates amines purified, trouble shooting at plant level, reporting to Originating Company and get approvals for implementation throughout the world
- High quality of research reporting, evidence, QA interface

Slide 24

Industry Research and Development (3)

- Lead and Control Research and QA Dept. activities of chemists, microbiologists, engineers, workmen engaged in the manufacturing of medical devices
- Evaluate and approve processes for medical device manufacturing, testing (STPs, STMs, FGPs) and release to market, trouble shooting of production and QA operations
- R & D, Manufacture and Release of over 300 line extensions and new products
- Managing R & D reporting and Licenses for all 3 sectors of J & J in India and getting DSIR approvals

Slide
25

Industry Research and Development (4)

- Auditing and certifying suppliers for new packaging materials for import substitution
- Installation and commissioning of new medical device plant. FDA approval and licensing for new plant
- Auditing warehouses and qualifying suppliers for Asia-Pacific region
- Handling Licensing, product complaints, market feedback, product returns and recalls for India, annual quality audits by the CQA and OC
- Guide Quality and Regulatory departments of 14 A/P companies
- Understand QA and RA requirements of 7 Originating Companies, Corporate Quality Assurance Dept. and ensure regional compliance to those requirements
- Timely and accurate reporting of issues
- Preservation of confidential documents
- Manage and lead Corporate Safety and TQM Departments



Dr. S. KULKARNI

Session:

ICT as a tool for the use of scientific methods for Business Solutions

- Dr. S. Kulkarni

India has adopted the policy of globalization and liberalization in early nineties. The entire focus has shifted to Banking Operation for providing 99.5 % business process continuity (BPC). Banks' customers started looking for the extended operational hours. Reserve bank of India realized that 90 % of the customers visit bank for cash withdrawal and deposit hence RBI decided to install ATM as an innovative tool for providing 24x7 banking facility across India and very shortly termed as "Anytime & Anywhere banking".

Initially customers were facing the challenges such as proximity of ATM, machine out of order, machine out of cash, required currency denominations were not available & security. Banks have resolved the issue of proximity by providing cross transaction facility & increased the ATM no from 3000 to 103000 within 20 years; Security Guard has been provided at each location to overcome the problem of security. In 2001, Banks were desperately looking for the solution to Cash Management (availability of cash as well as denominations). Operational cost of Cash Management was going up. There was a shortage of qualified Cash Officers and no. of bullet proof vehicles. Banks started looking for third party organizations, engaged in the business of 'Cash in Transit & Security'. BRINKS was the internationally no 1 organization which was headed by me between 2000 & 2008. My team has started working on Automated Cash Optimization solution based on ICT as a tool. Cash-in-transit deliverables are -Vaulting; Sorting; Counterfeit Checking; Wrapping; Packing & Distribution

Bank's biggest challenge was to optimize the supply of Cash to branches & ATMs without increasing the cost and to keep uptime of the machine more than 99.5%. We have collected the data from various ATMs & Branches at different time intervals of the day, at various locations within A, B & C grade metro cities. The location were mainly described as Residential, Commercial, Shopping complexes, Malls, Areas dominated by youngsters, Prime locations of different cities, Railway & Bus stations, Airports, Stadiums, Petrol pumps, Food malls, Multiplex theaters, Hospitals, Wall streets, Areas occupied by IT establishments, Call centers & BPOs. The data was also collected w.r.t. variables such as festival season, wedding season, auspicious days, Weekends, School & colleges opening days, Month end, Salary days, Summer & Diwali Vacations, etc. We have concluded with 126 permutations & Combinations.

This data was analyzed using ICT and remote management tools. Sensors were installed and thereafter cash level at each location was measured from common remote center. Efficiency has gone up without increasing the manpower. This has helped us to optimize the cash supply.

We have completely discontinued the manual cash feeding and monitoring process after 180 days of parallel measures with automated operation. We have reduced branch cash by 45% and ATM cash by 35% within 180 days of automated operation. Cash Management cost has reduced to Rs. 6 per transaction with 99.9% BPC from earlier Rs.15 at 95.6% BPC. The average number of transactions has gone up from 35 to 174 per ATM per day.

Slide 1

Question

How to avail the facility of Cash withdrawal on 24x7 basis across Globe?

.i.e. "Anytime & Anywhere Banking"

-Dr. S. Kulkarni

Slide 2

Background

Challenges faced by Bank

- › Installation of remote machine capable of dispensing cash under 100% secured environment i.e. ATM & Premises.
- › Preparing for regulatory and market changes.
- › Managing risks.
- › Daily Cash Deposit.
- › Managing immediate account reconciliation.

Slide 3

Background

Requirements of Bank Customers?

- › Location of nearest ATM.
- › Security.
- › Availability of sufficient cash inside ATM.
- › Connectivity with bank account.
- › User Friendly operation with minimum access time.
- › Audio & Video help.
- › Cross Withdrawals between two banks.

Slide 4

Hypothesis

- › Implementation of remote management tool for Cash recognition & reconciliation.
- › Improvement on Supply Chain Management for cash delivery.
- › Cost optimization without compromising on service delivery & customer satisfaction.
- › Working effectively with multiple denominations.
- › Moving cash management to electronic platform.

Slide 5

How the Research Methodology was used ?

- › Cash withdrawal data was collected for 180 days of three banks ICICI, HDFC and Axis from their ATMs located in A, B & C Grade Metros. Data was captured at various time intervals of Day and at various locations. This data was defined as Reference Data.
- › Cash withdrawal data at ATMs & Branches of ICICI Bank for last one year used for comparison study.
- › Data collected for the amount spent by ICICI bank for Cash Delivery for one year.
- › Data collected for bottlenecks and failures for one year.

Slide 6

Data Analysis

One year Data analyzed based following variables

- ✓ Location - Residential, Commercial, Industrial
- ✓ Population of Debit Card Holders - Area wise
- ✓ No of transaction based on various time intervals of a Day & Month
- ✓ Average no of transactions per machine/branch
- ✓ Transactions done by other Bank Customers
- ✓ Season wise Data - Festivals, Holidays, Vacations, Special Occasions, School & College Opening time
- ✓ Data captured for weekdays and weekends
- ✓ Data captured for month ends and first 10 days of month
- ✓ Data captured for areas close to IT Parks, BPOs, Call Centers
- ✓ Data Captured for machine and branches located inside Malls, Airports, Five star Hotels, Educational Premises & Hospitals

Slide 7

System Study for Creating Tool

- › One year analyzed data compared with 180 days reference data
- › Analyzed Data and Reference data compared using 126 permutations and combination
- › Tool created on Windows Platform using VB and MS SQL
- › Implementation process was on for 180 days without discontinuing manual process in certain part of A Grade Metro Cities.
- › Tool implemented across India for 180 days without discontinuing manual process.
- › Switched over to 100% automated process for 30 branches and 1000 ATMs across India for 45 days.
- › Thereafter, ICICI went 100 % live across India.

Slide 8

Infrastructure and Resources used

- › 35 Branches of ICICI, HDFC and Axis banks
- › 1006 ATMs across 12 cities.
- › 35 Cash officers
- › 80 Cash Vans
- › 84 B.Com students across 12 cities
- › 32 Bank employees working for Back office Cash Management
- › 7 Cash Vaults
- › 3 Service branches
- › ICICI Bank IT development team
- › Fujitsu Global Cash management Team for analysis of Data
- › ICICI and Brinks Implementation Team
- › Duration - 2 years and 21 days.

Slide 9

My Research is Commercially Accepted

- › Rs 1000 Denomination being used in Fujitsu Cash Dispenser since 2003
- › Manufacturing of Non Cash ATMs accepted by MayBank (largest bank of Malaysia)
- › Cash Optimization Solution used by ICICI, Bank since 2007
- › Cash Sorting, Counting, Verification and bundling done under CCTV Network
- › Multi Denomination Cash Dispenser as per Customer Choice used by May bank
- › Multi Currency cash Dispenser as per customer choice used by May bank
- › Use of Cash Dispenser as unmanned Teller Counter by Citibank

Slide 10





CASE STUDIES

Scientific Method for Creativity and Innovation

A Discussion Document

Over the years scientists have developed a certain method of work to seek answers to fundamental questions in nature. This method, popularly known as scientific method, has been found useful in all fields of knowledge. It has following components: Raise questions, Collect background information, Construct hypothesis, Design experiment, Analyse data and draw conclusion. If hypothesis is found true report your findings. If hypothesis is false or partially true modify it and repeat the procedure. Along with natural scientists the social scientists have also followed the same method in their work.

We are giving below short information about three social scientists highlighting their contributions. You are expected to discuss in groups and bring out the use of scientific method in their research. The summary of your discussion will have to be presented during the seminar on Scientific Temper and Scientific Inquiry for Creativity and Innovation to be held at Dr. V. N. Bedekar Institute of Management Studies on March 14, 2014. For convenience first case may be taken up by participants from Bhandarkar College of Science, the second case by participants from Joshi Bedekar College of Arts and Commerce while the third case may be taken up by participants from VPM Polytechnic. You are free to choose as many sources as possible. The effort should lead to a short write up on the work of each of the following social scientists.

Case 1: Sigmund Freud (1856 - 1939)

Sigmund Freud was a neurologist by training and worked in the hospital in Vienna, Austria. Nazi's occupation of Austria during Second World War forced him to leave the country and take asylum in England. Staying in London he continued his work in psychoanalysis. His book on **The Interpretation of Dreams** (published in 1899) became famous in different parts of the world. Freud believed that there is a specific psychological technique through which dreams can be interpreted, and that, if the technique is successfully accomplished, each dream is revealed as a psychical structure, which has a significant meaning and functioning in the mental activities of the awakened life. Can you pinpoint the scientific method used by Sigmund Freud in developing his theory and comment on its pros and cons?

Case 2: Jean Piaget (1896 – 1980)

Jean Piaget was formally trained in Biology and had a Ph. D. in natural sciences. However, he turned himself to philosophy and later to psychology. He is better known as Developmental Psychologists due to his work on stages of development among children. Inspired by the work of Binet on intelligence testing he undertook studies to understand the development that takes place among children from infancy to adulthood. Based on his work with his own three children and other school children he came out with a theory that suggested four stages of development among children. His work had a great impact on classroom interaction and curriculum development. The work, in fact, forms the basis of constructivistic approach of teaching that is being talked too much in recent days. Can you please identify the method used by Jean Piaget in his research and comment on its pros and cons?

Case 3: Abraham Maslow (1908 – 1970)

Born in New York, Abraham Maslow advocated that our most basic needs are inborn, having evolved over tens of thousands of years. His **Hierarchy of Needs** helps to explain how these needs motivate us all. It states that we must satisfy each need in turn, starting with the first, which deals with the most obvious needs for survival itself. Only when the lower order needs of physical and emotional well-being are satisfied we are concerned with the higher order needs of influence and personal development. Conversely, if the things that satisfy our lower order needs are swept away, we are no longer concerned about the maintenance of our higher order needs. Maslow's original Hierarchy of Needs model was widely published in Motivation and Personality in 1954. At this time the Hierarchy of Needs model comprised five needs: Physiological, safety, love/belonging, esteem and self-actualization. Even now the model is quite relevant. Can you please comment on the scientific method used by Dr. Maslow in his work?

I look forward to a fruitful and mutually rewarding interaction.

Dr. /S C Agarkar

Professor
VN BRIMS



PARTICIPANTS PRESENTATION

PARTICIPANT'S PRESENTATION

GROUP 1: VPM's B.N BANDODKAR COLLEGE OF SCIENCE

SIGMUND FREUD (1856-1939)

In this presentation participant's started with the history of Sigmund Freud who began as a young physician in Vienna in late 1800's. He was appointed as a university lecturer in neuropathology in 1885 and became a professor in 1902. He is one of the most celebrated personalities in the field of mental health and at the same time his views are most controversial. He is the founder of Psychoanalytic theory.

During the course of their presentation they described the scientific method used by Sigmund Freud to explore the unconscious mind - Free association.

"This is the fundamental technical rule of analysis... We instruct the patient to put himself into a state of quiet, unreflecting self-observation, and to report to us whatever internal observations he is able to make"

"Taking care not to exclude any of them, whether on the ground that it is too disagreeable or too indiscreet to say, or that it too unimportant or irrelevant, or that it is nonsensical and need not be said". This method of free association was widely acclaimed and helped many a patients overcome their issues.

The participant's also critically evaluated Sigmund Freud by stating: Freud's techniques sparked a major change in how mental illness were viewed; by suggesting that not all psychological problems have physiological causes; his belief that mental problems could be resolved by actually talking about them helped revolutionize psychotherapy.

The findings are entirely based on the experimental group-no control group was established and could lack scientific rigour. They concluded by presenting how Freud could have been interpreted in Modern Era

Globalization has affected

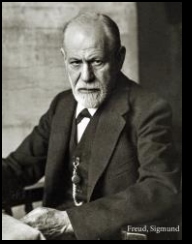
- Cultural ethos
- Technology and Media
- Gender attitudes etc.

These changes settle down deep in the unconscious and impulses generated through them come across in positive as well as negative ways and Free Association in today's times could be Art of living, Vipasna, etc. along with the regular psychotherapy.

Presentation 1

Slide 1

Sigmund Freud
1856-1939



Scientific Method For Creativity and Innovation
Half Day Interaction-Scientific Temper and Spirit of Enquiry
14th March 2014

Slide 2

History

- Started as a young physician in Vienna in late 1800's.
- He was appointed as a university lecturer in neuropathology in 1885 and became a professor in 1902.
- One of the most celebrated personalities in the field of Mental health and the most controversial.

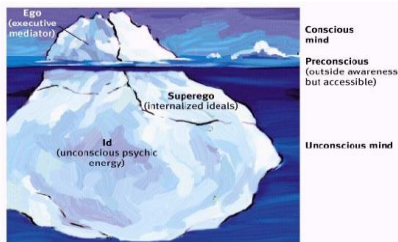
Slide 3

**Theory-
Psychoanalytic theory**

- Popularly known as Psychoanalytic theory
- Basic assumption- man's behavior is determined by innate instincts that are largely unconscious.

Slide 4

Psychoanalytic theory-structure of mind



The diagram shows an iceberg floating in water. The tip above the water is labeled 'Ego (executive mediator)' and 'Conscious mind'. The part below the water is labeled 'Superego (Internalized Ideals)', 'Id (unconscious psychic energy)', and 'Unconscious mind'. A label 'Preconscious (outside awareness but accessible)' is also present between the conscious and unconscious mind.

Slide 5

Dreams

- The unconscious impulses find expression in
 - a. dreams
 - b. slips of speech
 - c. mannerisms
 - d. symptoms of neurotic illnesses
 - e. as well as through socially approved behavior as artistic, literary or **scientific activity**

(Hilgard.E,Atkinson.R,Atkinson.R;1976)

Slide 6

- These Exploratory studies conducted by Freud over a period of 40 years, fill 24 volumes – from **The Interpretation of Dreams** published in 1899 to **Outlines of Psychoanalysis** published in 1940.

Slide 7

The scientific method

- To Explore this unconscious mind Freud used the technique of

Free Association

Slide 8

According to Freud

- Free Association is :
"this fundamental technical rule of analysis... We instruct the patient to put himself into a state of quiet, unreflecting self-observation, and to report to us whatever internal observations he is able to make"
- "Taking care not to exclude any of them, whether on the ground that it is too *disagreeable* or too *indiscreet* to say, or that it is too *unimportant* or *irrelevant*, or that it is *nonsensical* and need not be said"

Slide 9

Free Association

- The method requires the person to talk about everything that comes into the conscious mind no matter how ridiculous or trivial it may seem.

Slide 10

To critically evaluate

- Freud's techniques sparked a major change in how mental illness were viewed; by suggesting that not all psychological problems have physiological causes; his belief that **mental problems** could be resolved by actually **talking** about them helped revolutionize **psychotherapy**.
- The findings are entirely based on the experimental group-no control group was established.(lacks scientific rigor)
- Promotes non judgmental attitude

Slide
11

To critically evaluate

- Promotes Self Analysis & Expression
- Time consuming
- Promotes trial and error
- Use of available technology to rule out the false positives and false negatives
- In an era where in sexuality was a taboo the therapy could establish itself and even cure the patients but in this era where there is ample media exposure this basis for the theory is taken very skeptically.

Slide 12

Freud in modern era

- Globalization has affected:
 - a. Cultural ethos
 - b. Technology and Media
 - c. Gender attitudes etc.
- These changes are settle down deep in the **unconscious** and impulses generated through them come across in positive as well as negative ways
- Positive ways could be such intellectual meets negatives could be the increased crime rates that we see.

Slide
13

Free Association Today:

- Art Of Living
- Love your heart
- Vipassna
- Reiki

Slide 14

Bibliography

- Hilgard.E,Atkinson.R,Atkinson.R;1976
- <http://www.iep.utm.edu/freud/>
- Lahey.B

Slide
15



Thank You!!!

GROUP 2: VPM's K.G. JOSHI COLLEGE OF ARTS AND N.G. BEDEKAR COLLEGE OF COMMERCE

JEAN PIAGET (1896-1980)

The participant's started with the Introduction....Kinds of Development and stated the following points:

- Physical development, deal with the changes in the body;
- Personal development means the changes in an individual's personality;
- Social development refers to changes in the way an individual relates to others;

Explaining the theory given by Piaget then emphasized on the important concepts given by him like:

- **SCHEMAS** (Building blocks of knowledge)Process that enable the transition from one stage to another through :
 1. ASSIMILATION
 2. ACCOMMODATION
 3. EQUILIBRATION

They explained that the methods used by Jean Piaget were as follows:

- Longevity Research
- Naturalistic In-depth Observations
- Clinical Interview
- Original Thinking & Inductive Methods


In their presentation they also explained the pros and cons of Jean Piaget theory.

They concluded by saying:

- Piaget's theory is concerned with children, rather than all learners. It focuses on development, rather than learning of information / specific behaviour.
- It explains the mechanisms and processes by which the infant and then the child, develops into an individual. It has practical use.
- It ignores social- cultural factors in cognition development.

Presentation 2


Slide 1



VPM's Joshi-Bedekar College,
Thane (W)

Jean Piaget (1896 - 1980)
Cognitive Development

Slide 2




The Task:

We have been assigned the task of :

- To identify method used by Jean Piaget in his research and
- comment on pros and cons.


Slide 3



Main Contents

- Introduction.
- Piaget Theory
- Pros and Cons.
- Relevance to today's world.
- Other Scientific methods.
- Conclusion.

Slide 4



Introduction: Development

- The term **DEVELOPMENT** in its most general psychological sense refers to certain changes that occur in human beings between conception and death.
- The term is not applied to all changes, but rather to those that appear in orderly way and remain for a reasonably long period of time.


Slide 5



Introduction... Kinds of Development

- **Physical development**, deal with the changes in the body;
- **Personal development**, means the changes in an individual's personality;
- **Social development** refers to changes in the way an individual relates to others;
- **Cognitive development** refers to changes in thinking


Slide 6



General Principles of Development

- People develop at different rates.
- Development is relatively orderly.
- Development takes place gradually.


Slide 7



Piaget's Theory

- Jean Piaget, born in Switzerland in 1896, is the most influential developmental psychologist.
- Before Piaget common thinking in psychology was that "Children are merely less competent thinkers than adults."
- He became very eager and excited to know when he found that:
- Children gave wrong answers on the questions that required logical thinking.
- He believed that incorrect answers revealed important differences between the thinking of adults and children.


Slide 8



Important concepts

- **SCHEMAS**
(Building blocks of knowledge)
- **Process** that enable the transition from one stage to another through
 - ❖ ASSIMILATION
 - ❖ ACCOMMODATION
 - ❖ EQUILIBRATION


Slide 9



How Cognitive Development Occurs?

- Cognitive Development is gradual, orderly, changes by which mental process become more complex and sophisticated.
- The essential development of cognition is the establishment of new schemas.
- Assimilation and accommodation are both processing of the ways of cognitive development.
- The equilibration is the symbol of a new stage of the cognitive development.

Slide 10



Stages of Cognitive development

Piaget divided the cognitive development of children and adolescents into four stages:

- Sensorimotor (0-2 years)
- Preoperational (2-7years)
- Concrete operational (7-11 years) and
- Formal operational (11 years Above)


Slide 11

Stage 1 sensorimotor(0-2)

- ❑ All children pass through these stages in this order and that no child can skip a stage
- ❑ Different children may pass through the stages at some what different rates
- ❑ Reflexes
- ❑ Object permanence


Slide 12

Object permanence



Slide 13

Object permanence



Slide 14

Stage 2 Pre-operational (2-7)

- ❑ **Growth of Symbolic activities**
- Lack of understanding of the principles of conservation
- Irreversible Thinking
- Ego centric Thinking

Slide 15

Stage 3 Concrete Operational (7-11)

- ❑ Acquire the concept of reversibility.
- ❑ Respond to inferred reality
- ❑ Seriation
- ❑ Classification
- ❑ Objective Thinking

Slide 16

Stage 4 Formal Operational (11 - adulthood)

- ❑ Children's thinking begins to develop into the form that is characteristic of adults
- ❑ Hypothetical conditions
the ability to reason about situations and conditions that have not been experienced.

Slide 17

Methods Used by Jean Piaget

- ❑ Longevity Research
- ❑ Naturalistic Indepth Observations
- ❑ Clinical Interview
- ❑ Original Thinking & Inductive Methods

Slide 18

Pros of Piaget's Theory

- ❑ He changed how people viewed the child's world and their methods of studying children.
- ❑ He was an inspiration who took his ideas.
- ❑ His ideas have generated a huge research which has increase understanding of cognitive development.
- ❑ His ideas have been of practical use in the field of education.

Slide 19

Cons of Piaget's Theory

- ❑ **Problems With Research Methods:** He conducted the observations on small size of sample. Since sample size was small and biased therefore the results of it cannot be generalized to children from other different cultures.
- ❑ **Underestimated the impact of CULTURE:**
- ❑ **Social setting:-** Piaget ignored the effect of the social setting upon the child. The way adults use language and gestures.
- ❑ *Piaget's tasks are culturally biased Schooling and literacy affect on rates of development .*

Slide 20

Cons of Piaget's Theory

- ❑ Most researchers agree that children possess many of the abilities at an earlier age than Piaget suspected
- ❑ Cognitive development across domains is inconsistent (e.g. better at reading than math)
- ❑ Studies have shown that development can to some degree be accelerated

Slide 21

- **Social setting:-** Piaget ignored the effect of the social setting upon the child. The way adults use language and gestures.
- **Underestimated the impact of CULTURE:** Piaget's tasks are culturally biased. Schooling and literacy affect on rates of development.
- Research has disputed Piaget's argument that all children will automatically move to the next stage of development as they mature. Some data suggests that environmental factors may play a role in the development of formal operations.

Slide 22

Relevance to Today's World.

- In developing educational policy and teaching.
- In 1966 UK Govt. education based on Piaget's theory.
- His theory is used widely in school systems throughout the world and in the development of curriculums for children. His theory produced the idea of ages in stages in childhood development.

Slide 23

Relevance to Today's World.

- Educators use this knowledge from Piaget to shape their curriculums and activities in order to produce an environment where children can "learn through experience".
- **Anchored Instruction** (Developed to help children learn through thinking about situations critically)
- **Microwords** (Students use a computer-based environment to learn)
- **Symbol Pads** (Manipulations of symbols and language; word-processors, drawing programs, index cards)

Slide 24

Other Scientific Theories: (1) Vygotsky (Social-cultural theory)

- He proposed that intellectual development can be understood only in terms of the historical and cultural contexts children experience
- In contrast to Piaget, he proposed that cognitive development is strongly linked to input from others.
- He believed that development depends on the sign systems that individuals grow up with.

Slide 25

(2) Erikson's Personal and Social Development

- Life is a series of lessons and challenges which help us to grow. Erikson's wonderful theory helps to tell us why.
- Erikson's hypothesized that people pass eight psychological stage in their lifetime.
- At each stage, there are crises or critical issues to be resolved.

Slide 26

(2) Erikson's Personal and Social Development

- His theory is useful far beyond psychoanalysis - it's useful for any application involving personal awareness and development - of oneself or others.
- Most people resolve each psychosocial crisis satisfactorily and put it behind them to take on new challenges, some people may not completely resolve these crises and must continue to deal with them later in life.

Slide 27

The stages of Personal and Social Development

Stage	approximate ages	Psychological crises
1	birth to 18months	Trust vis. mistrust
2	18m to 3years	Autonomy vs. doubt
3	3 to 6 years	Initiative vs. guilt
4	6 to 12 years	Industry vs. inferiority
5	12 to 18 years	Identity vs. role confusion
6	Young adulthood	Intimacy vs. isolation
7	Middle adulthood	Generativity vs. self-absorption
8	Late adulthood	Integrity vs. despair

Slide 28

Conclusion:

- Piaget's theory is concerned with children, rather than all learners. It focuses on development, rather than learning of information / specific behaviour.
- It explains the mechanisms and processes by which the infant and then the child, develops into an individual. It has practical use.
- It ignores social- cultural factors in cognition development.

Slide 29

Thank You.

GROUP 3: VPM'S POLYTECHNIC

ABRAHAM MASLOW (1908-1970)

Participant's started with the Need for formation of theory, they stated:

Abraham Maslow came into contact with the many European intellectuals that were immigrating to the US, and Brooklyn in particular, at that time -- people like Adler, Fromm, Horney, as well as several Gestalt and Freudian psychologists. He meet Kurt Goldstein, who had originated the idea of self-actualization in his famous book, *The Organism* (1934).

They also stated that Abraham Maslow raised many questions and in order to develop his theory he collected background information. In order to construct hypothesis he:

- Used biographical analysis.
- Interacted with Abraham Lincoln, Thomas Jefferson, Albert Einstein, Eleanor Roosevelt, Jane Adams, William James, Albert Schweitzer, Benedict Spinoza, and Alduous Huxley, plus 12 unnamed people who were alive at the time Maslow did his research.
- He then looked at their biographies, writings, the acts and words of those he knew personally, and so on and developed Maslow's Hierarchy of Needs Theory.

During their presentation participants also stated various limitations of Maslow's theory:

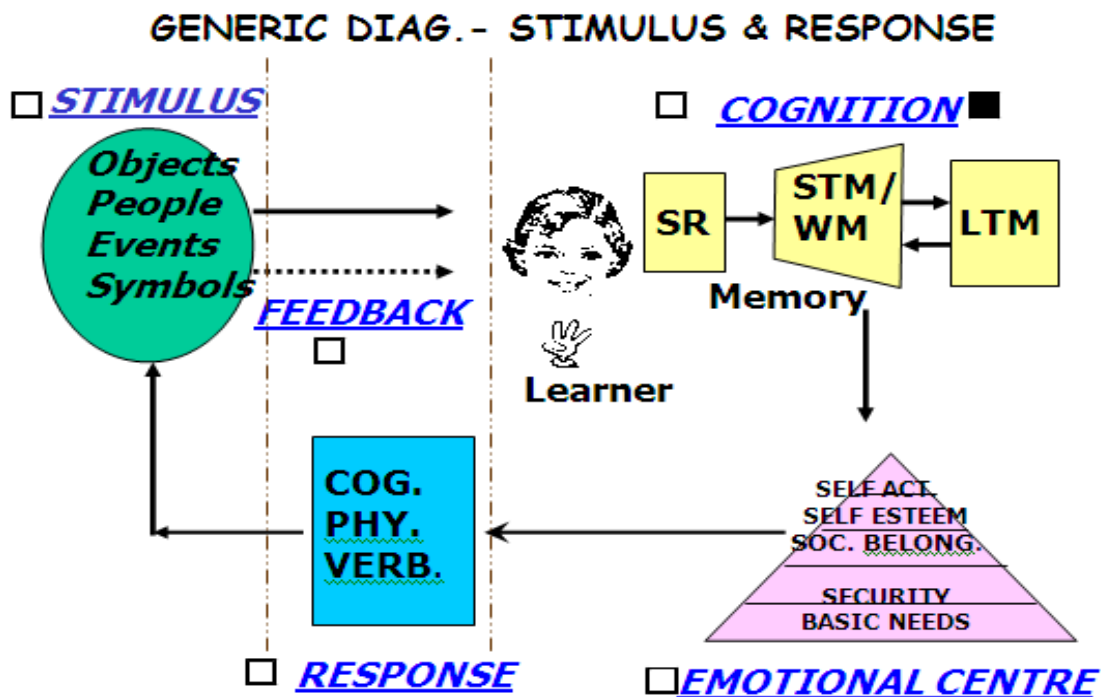
- Maslow's theory is **over simplified and is based on human needs only**. There is **lack of direct cause and effect relationship** between need and behaviour.
- The theory has to refer to other **motivating factors like expectations, experience and perception**.
- **Needs of all employees are not uniform**. Many are satisfied only with physiological needs and security of employment.
- The pattern of hierarchy of needs as suggested by Maslow **may not be applicable uniformly to all categories of employees**.
- Maslow's assumption of 'need hierarchy' does not hold good in the present age as **each person has plenty of needs to be satisfied, which may not necessarily follow Maslow's need hierarchy**.
- Maslow's theory is widely accepted but there is little empirical evidence to support it. It is **largely tentative and untested**. His writings are more philosophical than scientific.

Maslow's modified theory included Cognitive needs, Aesthetic needs, Transcendence.

- Before a student's cognitive needs can be met they must first fulfil their basic physiological needs.
- Students need to feel emotionally and physically safe and accepted within the classroom to progress and reach their full potential.

- Students must be shown that they are valued and respected in the classroom and the teacher should create a supportive environment.
- Students with a low self-esteem will not progress academically at an optimum rate until their self-esteem is strengthened.
-

Cognitive needs as applicable to Diploma Education



The above diagram takes into consideration the process of learning.

In technical education six level of learning are considered, out of which first four are considered in diploma education


1. Remember
2. Understand
3. Apply
4. Analyze
5. Evaluate
6. Create

At the end they concluded that similar hierarchy needs to be practiced for any research activity.

Presentation 3

Slide 1

Scientific Method used by Dr. Maslow



A Presentation by V.P.M's Polytechnic

Slide 2

Need for formation of theory

- Came into contact with the many European intellectuals that were immigrating to the US, and Brooklyn in particular, at that time -- people like Adler, Fromm, Horney, as well as several Gestalt and Freudian psychologists.
- Met Kurt Goldstein, who had originated the idea of self-actualization in his famous book, *The Organism* (1934).

Slide 3

Raise questions and collect background information

- Do they perceive reality efficiently and tolerate uncertainty?
- Do they accept themselves and others for what they are?
- Are they spontaneous in thought and action?
- Are they problem-centered and not self-centered?
- Do they possess unusual sense of humor?

Slide 4

Raise questions and collect background information

- Are they able to look at life objectively?
- Are they highly creative?
- Are they concerned about the welfare of humanity?
- Are they capable of deep appreciation of basic life-experiences?
- Can they establish deep satisfying interpersonal relationships with people?
- Do they possess strong moral/ethical standards?

Slide 5

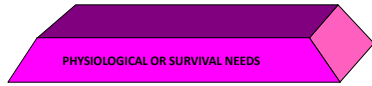
Hypothesis construction

- Used **biographical analysis**.
- Interacted with Abraham Lincoln, Thomas Jefferson, Albert Einstein, Eleanor Roosevelt, Jane Adams, William James, Albert Schweitzer, Benedict Spinoza, and Alduous Huxley, plus 12 unnamed people who were alive at the time Maslow did his research.
- He then looked at their biographies, writings, the acts and words of those he knew personally, and so on.

Slide 6

Maslow's Hierarchy of Needs

MOST NEEDS HAVE TO DO WITH SURVIVAL PHYSICALLY AND PSYCHOLOGICALLY



Slide 7

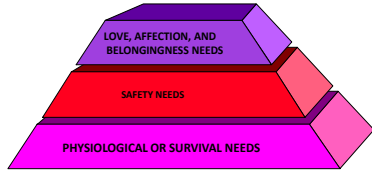
Maslow's Hierarchy of Needs

ON THE WHOLE AN INDIVIDUAL CANNOT SATISFY ANY LEVEL UNLESS NEEDS BELOW ARE SATISFIED



Slide 8

Maslow's Hierarchy of Needs



Slide 9

Maslow's Hierarchy of Needs



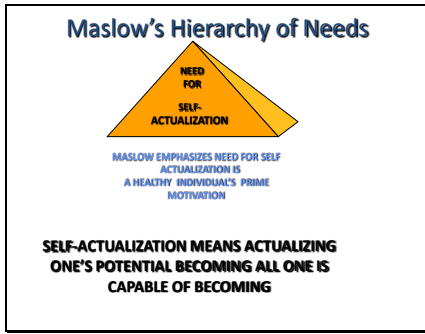
Slide 10

Maslow's Hierarchy of Needs



MASLOW EMPHASIZES NEED FOR SELF ACTUALIZATION IS A HEALTHY INDIVIDUAL'S PRIME MOTIVATION

Slide 11



Slide 12

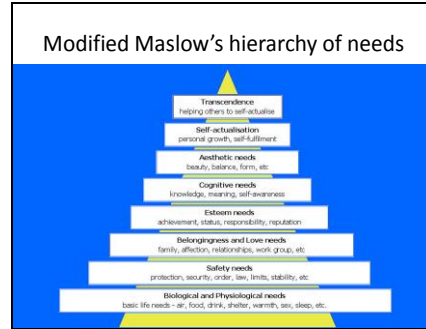


Slide 13

Limitations

- Maslow's theory is **over simplified** and is based on **human needs only**. There is **lack of direct cause and effect** relationship between need and behavior.
- The theory has to refer to other **motivating factors like expectations, experience and perception**.
- Needs of all employees are not uniform**. Many are satisfied only with physiological needs and security of employment.
- The pattern of hierarchy of needs as suggested by Maslow **may not be applicable uniformly to all categories of employees**.
- Maslow's assumption of 'need hierarchy' does not hold good in the present age as **each person has plenty of needs to be satisfied, which may not necessarily follow Maslow's need hierarchy**.
- Maslow's theory is widely accepted but there is little empirical evidence to support it. It is **largely tentative and untested**. His writings are more philosophical than scientific.

Slide 14



Slide 15

Cognitive needs

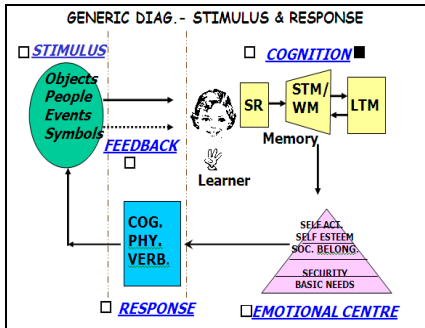
- Natural human need to learn, explore, discover and create to get a better understanding of the world around them.
- This growth need for self-actualization and learning, when not fulfilled leads to **confusion and identity crisis**.

Slide 16

Application to Diploma Education

- Before a student's cognitive needs can be met they must first fulfill their basic physiological needs.
- Students need to feel emotionally and physically safe and accepted within the classroom to progress and reach their full potential.
- Students must be shown that they are valued and respected in the classroom and the teacher should create a supportive environment.
- Students with a low self-esteem will not progress academically at an optimum rate until their self-esteem is strengthened.

Slide 17

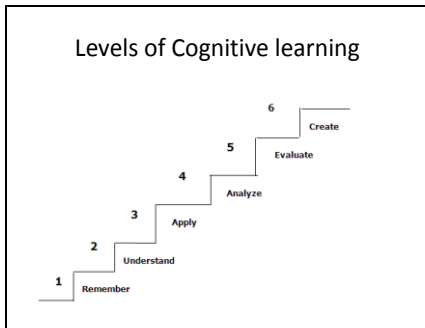


Slide 18

Domains of learning

- Cognitive Domain relates to intellectual skills or abilities
- Affective Domain relates to emotions, feelings, likes, dislikes etc.
- Psychomotor Domain relates to manipulative skills of hands, legs. Eye-hand coordination

Slide 19

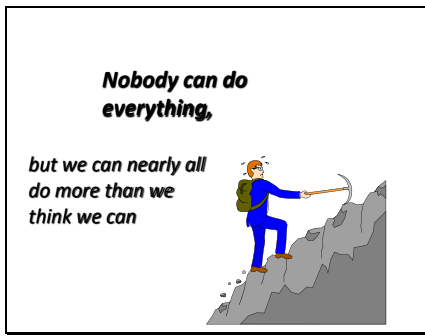


Slide 20

Scientific Methodology

- MSBTE - Our affiliation body has designed a curriculum which is scientific based and includes the objectives that have to be fulfilled for each chapter.
- The six steps indicated earlier are religiously followed for the implementation of the curriculum, tools for assessment and designing of laboratory exercises.
- Similar hierarchy needs to be practiced for any research activity.

Slide
21



Slide
22



Discussions on Presentations

The presentations were followed by healthy interaction regarding 'scientific temper and spirit of enquiry'. Dr. S. C. Agarkar emphasized the importance of additional reading and not to limit ourselves to our own areas of specialization only. He initiated a discussion on 'Inductive and Deductive' thinking. Participants expressed their views on inductive and deductive reasoning.

Deductive reasoning happens when a researcher starts from more general information to a specific issue. Sometimes this is called the “top-down” approach because the researcher starts at the top with a very broad spectrum of information and they work their way down to a specific conclusion. **Inductive reasoning** works the opposite way, moving from specific observations to broader generalizations and theories. This is sometimes called a “bottom up” approach. The researcher begins with specific observations and measures, begins to then detect patterns and regularities, formulate some tentative hypotheses to explore, and finally ends up developing some general conclusions or theories.

By nature, inductive reasoning is more open-ended and exploratory, especially during the early stages. Deductive reasoning is more narrow and is generally used to test or confirm hypotheses. Most social research, however, involves both inductive and deductive reasoning throughout the research process. The scientific norm of logical reasoning provides a two-way bridge between theory and research. In practice, this typically involves alternating between deduction and induction.

There was emphasis on scientific rigour. Dr Kalpita Muley said that human mind is very complicated it is like an abstract painting. There was long discussion on 'Psychology' and the ideal sample size in experiments in psychology. Dr. Shakuntala Singh said that psychology is one of the youngest social sciences and initially it was a part of philosophy. Psychology is the science of mind or science of soul.

Mrs. Luktuke was of the opinion that social science is different from natural sciences. Human mind is difficult to decipher and it changes in fraction of second. Thus there are certain inherent problems in social science. Mr. Deepak Murdehwar added that methodology in medical sciences is different. We need to understand that our students have certain inherent qualities. All children are born with certain inherent qualities and he gave example of Abhimanyu from Mahabharata.

Dr. Usha Raghavan said that in medical science trials are conducted in huge number before the medicine/drug is made available for public consumption. Dr.P.M. Kelkar also emphasized the importance of larger sample size. Dr. Madhuri Pejavar gave a contrarian view stating that at times only one sample is enough depending upon the problem. She gave example of Tata Nano wherein it was enough that one Nano car caught fire to recall the remaining cars and make required changes in the design and functioning of the remaining cars. There may be cases that the second sample may be available after a century or so. Thus certain scientific methods can be associated with small samples also.

Discussions further led to the definition of scientific temper. Dr. Guruprasad Murthy said that Science is nothing but training and organized commonsense.

In fact music and astrology are very closely related to mathematics. The issue in discussion was what decides the authenticity of the theory? It's validity or applicability. Everyone agreed that it is the practical applicability of the theory that matters a lot.

Openness and flexibility are the hallmarks of science. The pursuit has to be knowledge generation. Socrates adopted the method of doubt. Dr. Madhuri Pejavar said that objectivity is of utmost importance. He gave the example of 'Gharanas' in 'Music' wherein one Gharana's approach to music is different from the other. Even in case of a theory the principle of 'survival of the fittest' is applicable. When we talk about objectivity, it means 100% objectivity at that given point of time. Scientific temper is applicable across disciplines.



Dr. S. C. AGARKAR

Creativity Through Scientific Methodn

- Dr.S.C.Agarkar

Natural science is a systematic and rigorous way of acquiring accurate knowledge of the facts, structure, processes and behaviour of any phenomenon. It is a cyclic process involving observation, conceptualisation, generalisation and verification. Science proceeds in steps, with Popperian pessimism. Often Kuhnian revolutions take place in scientific knowledge, destroying old concepts and setting up new ideas. Scientific method has proved useful in the development of natural science. The question that we wish to address "Is it applicable to social science research too?"

The aspects of scientific method that are derived from the positive scientific approaches of natural sciences are considered by many social scientists as not wholly applicable to research in social sciences. It is proposed by these social scientists that human behaviour and organisational phenomena cannot always be objectively analysed as natural science. Nevertheless, both inside perspective of social science and objectivity of natural science are required to successfully research and analyse social problems. In this context three case studies are presented.

1.Sigmund Freud (1856 - 1939)

Sigmund Freud was a neurologist by training and worked in the hospital in Vienna, Austria. During his profession he came across a large number of patients with psychological problems like hysteria. While interacting with the patients he felt that the problems were psychological in nature. He found that the root cause lied in the previous traumatic experiences of the patients. Based on his findings he suggested that the patient can be treated by 'talking cure' where he/she is made to speak out openly. In this context he developed a techniques called Psychoanalysis.

Sigmund Freud himself was a victim of dreams after the death of his father. He tried to remember his dreams and analyse them. He also tried to interpret the meaning of dreams that his patients had. He found that the dreams had some association with the life experiences of the patients. He came out with a theory that dreams are the means of fulfilling desires that remain unfulfilled in real life. He also explained the role of subconscious mind in working out the sequence of dreams. In 1899 he published a book entitled "Interpretation of Dreams" that received good response from different parts of the world.

Steps involved in the work of Sigmund Freud can be summaries as follows:

a. Observation: Freud recorded minute observations of patients' behaviour

- b. Question: Why do patients behave the way they do, why do people dream the way they do?
- c. Hypothesis: The behaviour of patients may be due to the previous experiences, the dream may be to fulfil desires that remain unfulfilled in real life.
- d. Experiment: He conducted studies on patients that came to him. Moreover, he hired some volunteers and collected relevant data
- e. Analysis and Conclusion: Analyses of the data supported his guess. As a result, he could put forth the theory.
- f. Theory: Childhood experiences influence adult behaviour, and dreams are influenced by unconscious mind that records unfulfilled desires.

2. Jean Piaget (1896 - 1980)

Let us now look at the work of Jean Piaget who was a biologist by training. He went to Paris to teach in school run by Alfred Binet, a person famous for intelligence testing. Piaget not only designed intelligence tests but also assessed answer sheets of students. He found that younger students were unable to deal with certain types of questions that demanded logical thinking. He felt that these students might not have achieved that stage and hence they were facing problems. He continued his study and found there are four distinct stages of development among growing children.

He made detailed observations of the behaviour of his three young children who were at different age groups. He also made observations of students from other schools. Based on his observations he came out with a four stage theory of cognitive development: Sensory motor, Pre-operational, Concrete operational and Formal operational. To verify his hypothesis he conducted tests like conservation of mass/volume and found that very young children lacked these concepts. Based on his work he suggested that the curriculum must match with the developmental stage of a child. His work has resulted into the constructivistic approach of teaching that is practised widely these days.

Steps involved in the work of Jean Piaget can be described as follows:

- a. Observation: While going through the answer sheets he made some observations that were striking.
- b. Question: Why should students find these questions difficult?
- c. Hypothesis: He guessed that students had not achieved the level required by the questions.
- d. Experiment: He conducted experiments on his own children and students from schools and collected relevant data.

- e. Analysis and Conclusion: Analysed the data and found that his hypothesis was true.
- f. Theory: Intellectual development occur in stages. Once convinced he made his findings public through publication.

3. Abraham Maslow (1908 - 1970)

Let us now focus our attention on Abraham Maslow, a psychologist by training. He used to interact with people from different walks of life. He himself was a Jew and belonged to an economically poor and illiterate family. He had observed that a large number of children in his area were unable to achieve their potential. He noticed that human beings have a variety of needs like Physiological needs (food, water, oxygen, body temperature, etc.); Safety needs (house, job, retirement plan, etc.); Belonging needs (family, community, groups, friends, etc.); Esteem needs (fame, recognition, glory, dignity, etc.) and Being needs (be all that you can be).

He worked with Thorndike dealing with monkeys. There he observed that some needs take priority over others. For example, if the monkeys are thirsty as well as hungry, they will struggle to get water first. Extending the idea to human beings he came out with the concept of hierarchy of needs with Physiological needs at the bottom and Being needs at the top. The term 'being needs' is also known as 'growth motivation'. However Maslow preferred to use the term Self Actualization coined by Kurt Goldstein in 1934. He gave much more importance to this stage and conducted studies of people who he thought has reached that stage.

Steps involved in the work of Abraham Maslow can be described as follows;

- a. Observation: As a child he saw children who failed in their mission. As an adult he saw people who could not exploit their potential.
- b. Question: Why only a few can achieve their full potential?
- c. Hypothesis: He hypothesized that they cannot reach to that stage as their basic needs are not satisfied.
- d. Experiment: He studied the biographies of successful people, interviewed some of them who were alive and also interacted with 1 percent of successful students in the college.
- e. Data Analysis and conclusion: Analysing the qualitative data he came to the conclusion that there is a hierarchy of needs in the order of: physiological, safety, belonging, self esteem and self-actualization.

From the discussion of three case studies it can be argued that all the three social scientists had used scientific method in their studies. The method has following steps: a. Observation, b. Question, c. Hypothesis, d. experiment, e. analysis and conclusion. If the data obtained through

experiment supports the hypothesis then the result of work is made public. Otherwise, the hypothesis is modified and the entire works starts once again.

Slide 1

Scientific Method for Creativity and Innovation

•S C Agarkar
•DR VN BRIMS
•Thane
Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 2

- Natural science is a systematic and rigorous way of acquiring accurate knowledge of the facts, structure, processes and behaviour of any phenomenon.
- It is a cyclic process involving observation, conceptualisation, generalisation and verification.
- Science proceeds in steps, with Popperian pessimism. Often Kuhnian revolutions take place in scientific knowledge, destroying old concepts and setting up new ideas.
- Scientific method has proved useful in the development of natural science. The question is "Is it applicable to social science research too?"

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 3

- The aspects of scientific method that are derived from the positive scientific approaches of natural sciences are considered by many social scientists as not wholly applicable to research in social sciences.
- It is proposed by these social scientists that human behaviour and organisational phenomena cannot always be objectively analysed as natural science.
- Nevertheless, both inside perspective of social science and objectivity of natural science are required to successfully research and analyse social problems.

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 4

- Sigmund Freud (1856 - 1939)
 - An Austrian born neurologist who worked with patients having hysteria
 - Developed techniques of psychoanalysis to treat psychic patients
 - Conducted studies on dreams
- Jean Piaget (1896 - 1980)
 - A Swiss born biologist got interested in intelligence testing
 - Observing the behaviour of children he formulated stages of development
 - Based on his work he recommended active participation of learners
- Abraham Maslow (1908 - 1970)
 - An American psychologist who worked on primary needs of human beings
 - He came out with hierarchy of needs placing self actualization on the top
 - Based on his work he suggested methods of achieving once potential

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 5

Sigmund Freud (1856 - 1939)

Freud with his famous quote The iceberg model that he suggested

The interpretation of dreams is the royal road to a knowledge of the unconscious activities of the mind.

ICEBERG MODEL

10% seen BEHAVIOUR What is seen and heard

90% not seen MOTIVATION Drives behaviour

SKILLS, COMPETENCY AND KNOWLEDGE

VALUES AND BELIEFS

SELF IMAGE

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 6

- Sigmund Freud was a neurologist by training and worked in the hospital in Vienna, Austria. During his profession he came across a large number of patients with psychological problems like hysteria.
- While interacting with the patients he felt that the problem is psychological and not organic. The root cause lied in the previous traumatic experiences of the patients.
- He suggested that the patient can be treated by 'talking cure' where he/she is made to speak out openly. For that a psychoanalysis technique was found useful.

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 7

- Sigmund himself was a victim of dreams after the death of his father. He tried to remember his dreams and analyse them
- He tried to interpret the meaning of dreams that his patients had. He found that the dreams had some association with the life experiences of the patients
- He came out with a theory that dreams are the means of fulfilling desires that remain unfulfilled in real life
- He also explained the role of subconscious mind in working out the sequence of dreams
- In 1899 he published a book entitled "Interpretation of Dreams" that received good response from different parts of the world.

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 8

- **Observation:** Freud recorded minute observations of patients' behaviour
- **Question:** Why do patients behave the way they do, why do people dream the way they do?
- **Hypothesis:** The behaviour of patients may be due to their previous experiences, the dream may be to fulfil desires that remain unfulfilled.
- **Experiment:** He conducted studies on patients that came to him. Moreover, he hired some volunteers and collected relevant data
- **Analysis and Conclusion:** Analyses of the data supported his guess. As a result, he could put forth the theory.
- **Theory:** Childhood experiences influence adult behaviour, and dreams are influenced by unconscious mind that records unfulfilled desires.

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 9

Jean Piaget (1896 - 1980)

Jean Piaget's Cognitive Theory

- Thinking is qualitatively different depending upon the developmental stage of the learner
- Processes include direct learning, social transmission, and construction.

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 10

- Jean Piaget, a biologist by training, went to Paris to teach in school run by Alfred Binet, a person famous for intelligence testing.
- He not only designed intelligence tests but also assessed answer sheets of students. He found that younger students were unable to deal with certain types of questions that demanded logical thinking.
- He felt that these students might not have achieved the stage of logical thinking. Hence they were facing problems.
- He continued his study and found that there are four distinct stages of development among growing children.

Scientific Method for Creativity
Agarkar VN BRIMS Thane

Slide 11

- He made detailed observations of the behaviour of his three young children. He also made observations of students from other schools.
- Based on his observations he came out with a four stage theory of cognitive development: Sensory motor, Pre-operational, Concrete operational and Formal operational.
- To verify his hypothesis he conducted tests like conservation of mass and volume and found that very young children lacked these concepts.
- Based on his work he suggested that the curriculum must match with the developmental stage of a child. His work has resulted into the constructivistic approach of teaching that is practised widely these days.

Scientific Method for Creativity
Agarwal VN BRIMS Thane S C 11

Slide 12

- **Observation:** While going through the answer sheets he made some observations that were striking.
- **Question:** Why should students find these questions difficult?
- **Hypothesis:** He guessed that students had not achieved the level required by the questions.
- **Experiment:** He conducted experiments on his own children and students from schools and collected relevant data.
- **Analysis and Conclusion:** Analysed the data and found that his hypothesis was true.
- **Theory:** Intellectual development occur in stages. Once convinced he made his findings public through publication.

Scientific Method for Creativity
Agarwal VN BRIMS Thane S C 12

Slide 13

Abraham Maslow (1908 - 1970)

Prof. Abraham Maslow said His famous pyramid model



"A musician must make music, an artist must paint, a poet must write, if he is to be ultimately at peace with himself."
Abraham Maslow

MASLOW'S HIERARCHY

- 1. PHYSIOLOGICAL NEEDS
- 2. SAFETY NEEDS
- 3. BELONGINGNESS NEEDS
- 4. ESTEEM NEEDS
- 5. SELF ACTUALIZATION

Scientific Method for Creativity
Agarwal VN BRIMS Thane S C 13

Slide 14

- Abraham Maslow used to interact with people from different walks of life. He himself was a Jew and belonged to an economically poor and illiterate family. He had observed that a large number of children in his area were unable to achieve their potential.
- He noticed that human beings have a variety of needs like
 - Physiological needs (food, water, oxygen, body temperature, etc);
 - Safety needs (house, job, retirement plan, etc);
 - Belonging needs (family, community, groups, friends, etc);
 - Esteem needs (fame, recognition, glory, dignity, etc);
 - Being needs (be all that you can be).

Scientific Method for Creativity
Agarwal VN BRIMS Thane S C 14

Slide 15

- He worked with Thorndike dealing with monkeys. There he observed that some needs take priority over others. For example, if the monkeys are thirsty as well as hungry, they will struggle to get water first.
- Extending the idea of hierarchy to human beings he came out with the concept of hierarchy of needs with Physiological needs at the bottom and Being needs at the top.
- The term 'being needs' is also known as 'growth motivation'. However Maslow preferred to use the term Self Actualization coined by Kurt Goldstein in 1934. He gave much more importance to this stage and conducted studies of people who he thought has reached that stage.

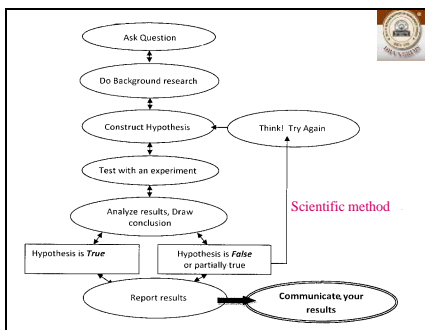
Scientific Method for Creativity
Agarwal VN BRIMS Thane S C 15

Slide 16

- **Observation:** As a child he saw children who failed in their mission. As an adult he saw people who could not exploit their potential.
- **Question:** Why only a few can achieve their full potential?
- **Hypothesis:** People cannot reach to self realization as their basic needs are not satisfied.
- **Experiment:** He studied the biographies of successful people, interviewed some of them who were alive and interacted successful students.
- **Data Analysis and conclusion:** Analysing the qualitative data he came to the conclusion that there is a hierarchy of needs in the order of: physiological, safety, belonging, self esteem and self-actualization.


Scientific Method for Creativity
Agarwal VN BRIMS Thane S C 16

Slide 17



Slide 18

Thank you



Scientific Method for Creativity
Agarwal VN BRIMS Thane S C 18

Scientific Temper and Spirit of Inquiry – Epilogue

By: Guruprasad Murthy

In preamble of the proceedings it was clearly articulated by Dr. Guruprasad Murthy by saying that scientific temper and spirit of inquiry is a mindset and an attitude which facilitates taking a rational view of the world and the fearlessness to question and openness to be questioned. The subsequent session by Dr. Vijay V. Bedekar highlighted many dimensions of the theme. He traced the evolution of thinking by scientists from Nicholas Copernicus (1473 to 1543) to Isaac Newton (1642 to 1727). All the scientists have contributed their thoughts following systematic application of concepts in their own area of interest and presenting their findings by taking a rational view. All these scientists traced different ancient and medieval ancestries from the heliocentric system. This publication traces relevant details regarding the contribution of several philosophers and scientists highlighted in the publication. It was fascinating to note that scientific temper and spirit of inquiry is increasingly dependent on the use of rigorous quantitative models. The main questions to be asked in any scientific inquiry by a researcher is as follows:

- What?
- Why?
- How?
- When?
- Where?
- Who?

The final message given by Dr. Bedekar was that we have to seriously think about the theme under discussion because it's a part and parcel of the constitution¹ of our country.

The session by Dr. Bedekar was followed by a presentation by Dr. P. M. Kelkar who said that scientific methods are used for testing validity of a claim through formulation of hypothesis as well as for discovery based research and

development. He also emphasised that scientific temper and spirit of inquiry is a result of repeated use of scientific methods. He narrated different experiences in his career as a scientist which indicated how scientific temper and spirit of inquiry were the underlying forces which prompted research as he concluded by saying “I believe the opportunities I got , were purely as a result of my ability to develop scientific temper and spirit of inquiry in drugs research and their use by patients”.

The next presentation by Dr. Subodh Kulkarni addressed the audience on the theme ‘ICT as a tool for the use of Scientific methods for Business Solutions’. The specific topic was ‘How to avail the facility of cash withdrawal on 24×7 basis across globe i.e. anytime and anywhere banking’. The process deployed to solve the problem on hand included the observation and identification, question framing, formulation of hypothesis, data collection and analysis, implementation of the procedure planned. The next phase was the presentation by the audience from VPM’s GOI viz. VPM’s. B. N. Bandodkar College of Science, VPM’s K. G. Joshi College of Arts and N. G. Bedekar College of Commerce and VPM’s Polytechnic.

There were three case studies given –

Case 1 – Sigmund Freud, Case 2 – Jean Piaget and Case 3 – Abraham Maslow

All three groups traced the role of scientific temper and spirit of inquiry in the approaches of the respective scientists. They also identified a conceptual frame to present their view point and further noted that if the same problems had to be addressed in today’s world with the prowess of ICT perhaps the approach would be totally different and possibly the results. They presented sound reasoning in defence of their points of view.

The participants presentations’ were followed by discussion on various points raised viz. inductive and deductive reasoning, research methodology and sampling techniques. There was productive and interesting interaction and discussion wherein all participants freely shared their opinions and experiences with reference to research in general and spirit of inquiry in particular. Dr. P. M. Kelkar

and Dr. Shakuntala Singh described the meaning and scope of Deductive and Inductive reasoning with relevant examples. Throughout the discussion, there was significant emphasis on scientific rigour that goes into research. Dr. Shakuntala Singh opined that psychology is one of the youngest social sciences. Dr. Singh further added that psychology was initially part of philosophy.

Dr. S. C. Agarkar who made a presentation on Creativity through Scientific Method said that natural science is a systematic and rigorous process of acquiring accurate knowledge of any phenomena. The same method is applicable to social science too. Dr. Agarkar traced the steps adopted by Sigmund Freud, Jean Piaget and Abraham Maslow. Though the steps varied in detail, the spirit underlying the approach, is comparable. To quote Dr. Agarkar, “From the discussion of three case studies it can be argued that all the three social scientists had used scientific method in their studies. The method has the following steps: observation, question, hypothesis, experiment, analysis and conclusion. If the data obtained through experiment supports the hypothesis then the result of work is made public. Otherwise, the hypothesis is modified and the entire work starts all over once again”.

The thought on Scientific Temper and Spirit of Inquiry had its own impact on the audience. The fruitful, on some occasions lively and rather heated, but healthy debate bore testimony to the success of the meeting of scholars from different disciplines ranging from the hard sciences to the softer ones. The variety of thoughts which emerged showed the keen interest taken by the participants in understanding the spirit of the theme and also frankly articulating their views on various dimensions of the theme both in the course of the presentations as well as the open forum. This meeting has definitely helped in building bridges between different institutions of VPM though they may belong to different faculties – arts, science, commerce, law, polytechnic and management. The specialisation or area of interest of the scholars did not matter. The question was about new knowledge gained, exchanged and the issues to be addressed in order to positively respond to

the theme in day-to-day working so that approach to academic work in particular and life in general is professional, objective, calculated, well-informed and displays the role of science and scientific temper. To that extent the proceedings of the day were very useful and helped to rejuvenate mindsets and fulfilled the purpose of the meet. Further, it was indeed a new experience for teachers from different disciplines from VPM's GOI to come together and exchange ideas on a common platform albeit with different academic backgrounds. There were views, contrarian views and further acceptance or rejections of views based on individual's perception and also the impact which the respective academic disciplines had on their mind with respect to the point under consideration. For example, between hard science and soft science, Dr. Singh said that psychology is a relatively new part of social sciences and hence may not be as respected as pure sciences viz. mathematics and physics. This is because there are certain inherent problems in social sciences which do not find place in natural sciences. Social sciences deal with human beings who are one of the most complicated species on earth. Nevertheless, decision making in life or even in profession is never driven by an either hard or soft science approach. It is invariably an admixture of both including gut feelings

This thought came out very clearly. The fact that earlier researchers like Freud, Piaget, Maslow had a totally different approach, not too much quantification and yet providing some solutions showed how research was driven by a different approach altogether. Researchers of yesteryears were not exclusively driven by hard sciences as such. This was, therefore, a unique experience for the faculty who were given some common inputs, notwithstanding the discipline, to respond to the theme which has universal application. A lively debate on sample size invited the rapt attention of all participants. Dr. Madhuri Pejaver finally commented that sample size would depend upon the nature of the research, total population, availability of respondents, nature of phenomenon under study.

To say the least, the participants enjoyed the proceedings and one teacher commented that “we never expected that Jean Piaget theory holds relevance even in current times”. The same thoughts were expressed with respect to Sigmund Freud – a highly controversial thinker widely criticised yet equally well respected if not fully accepted. Yet the young teachers did mention that if they were to research on the areas attempted by Freud, Piaget and Maslow their approach would be totally different and perhaps the findings too. Thus, given today’s approach of researchers and the prowess of ICT, quantification holds the fort and hard sciences almost rule the waves. Further, with respect to Maslow, the Polytechnic teachers said that the approach was in use in the teaching learning process at the Polytechnic and therefore they related Maslow approach to their teaching pedagogy which was a wonderful experience to know and observe through their presentation. Given the success of the meeting, it is now proposed to take it further to newer heights through further interventions viz. a workshop on research methodology per se and seminars on higher learning in different disciplines really facilitating the process of transcending beyond excellence. It is hoped that Heads of Institutions and teachers will come forward with ideas which can help initiate and launch new methods of institutional development interventions not merely through training and development per se but through a wide variety of innovative pedagogical and andragogical tools and techniques.

Photo Gallery:

Dr. Guruprasad Murthy : Preamble



**Dr. Vijay V. Bedekar, *Chairman, VPM, Thane*
sharing his views on Scientific Temper and Spirit of Inquiry**



**Dr. P. M. Kelkar:
Role of Scientific Temper and Spirit of Inquiry in Research and Development.**



Dr. S. Kulkarni :
ICT as a Tool for Use of Scientific Methods for Business Solutions



Participants Presentations



Dr. S. C. Agarkar : Response to Presentations

