NAAC sponsored National Seminar on

Curriculum Design for Sustainable and Societal Development: A Road Map

12th and 13th August, 2016

PROCEEDINGS

Sriram Devanathan
Prashant R. Nair
Proceedings of

NAAC SPONSORED TWO DAYS NATIONAL LEVEL SEMINAR ON
“CURRICULUM DESIGN AND DEVELOPMENT FOR SUSTAINABLE AND
SOCIAL DEVELOPMENT: A ROAD MAP.

12th & 13th August, 2016

Organized by

Internal Quality Assurance Cell

Amrita Vishwa Vidyapeetham University, Coimbatore
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9. Recommendations/Suggestions/Action Points
Theme of the Seminar: CURRICULUM DESIGN AND DEVELOPMENT FOR SUSTAINABLE AND SOCIETAL DEVELOPMENT: A ROAD MAP

The proposed national seminar on curriculum design and development for sustainable and societal development: a road map discussed, deliberate and showcase various activities, strategy deployments and success stories to empower Higher Educational Institution (HEI) towards designing a curriculum which focuses on the overarching need of the planet, sustainable and societal development. The national seminar will focus on sustainable models that consider the delicate balance between environment, society and economy. An expected outcome of the seminar would be a road-map for wide adoption of a holistic curriculum with focus on sustainable and societal needs.

Sub-themes/sub-areas

1. To explore and identify the strategies and best practices in holistic curriculum design and development for sustainable and societal development
2. To develop models and metrics in designing and developing a curriculum with sustainability issues
3. To showcase best practices and success stories & experience of HEI with initiatives in developing a curriculum with sustainable and societal focus
4. To develop a road map for wide-spread deployment of a curriculum rich in this context
Discussion Themes:

Innovations in Curriculum Development

Sustainable models in curriculum design and development

Sustainable initiatives in curriculum like SD21 EngSD

Reforms and re-orientation in Curriculum Management, policies and practices

Student-Centric initiatives and engagement for societal curriculum

Human capacity building for societal development
PROGRAMME SCHEDULE OF

National Seminar on “Design of Curriculum for Sustainable and Societal Development”
Sponsored by
National Accreditation and Assessment Council (NAAC) and Amrita Vishwa Vidyapeetham
12th and 13th August 2016, at Amrita Vishwa Vidyapeetham, Coimbatore campus

Schedule for 12th August 2016

9.30AM - 9.40AM: Welcome, lighting of the lamp, prayer
9.40AM - 9.50AM: Welcome address by Dr. K. Sankaran, Registrar of Amrita Vishwa Vidyapeetham
9.50AM - 10:00AM: Overview of the conference, by Dr. D. Sriram, Chair of Amrita IQAC
10:00AM - 10:30AM: Address by Chief Guest, Dr. Sheela Ramachandran, Former Vice-Chancellor, Avinashilingam Institute for Home Science and Higher Education for Women

10:30AM - 11:00AM: BREAK - tea and refreshments

11:00AM - 11:45AM: Talk by Dr. K. Nikhil, “What is sustainable development?”
11:45AM - 12.30PM: Talk by Dr. D. Sriram, “Innovations in curriculum design – for holistic development”
12:30PM - 1:15PM: Talk by Prof. Anju Bist, “Amrita SeRVe – a multifarious platform for social action”

1:15PM - 2:15PM: LUNCH

2:15PM - 3.00PM: Talk by Dr. Sanjay Banerji, “Innovative course on environmental management and sustainable development for business school curriculum”
3.15PM - 3.30PM: Contributed paper presentations
3.30PM - 4:00PM: BREAK - tea and refreshments

4:00PM - 4:30PM: Contributed paper presentations

**Schedule for 13th August 2016**

9.30AM – 9.40AM: Welcome, lighting of the lamp, prayer

9.40AM - 10.40AM: Talk by **Prof. Bhavani Rao**, “Reworking curriculum to include 21st century skills: A case study report from a multi-disciplinary implementation in Junior colleges and high schools in Andhra Pradesh”

10:40AM - 11:10AM: BREAK – tea and refreshments

11.10AM - 12:00PM: Talk by **Prof. Kamal Bijlani**, “Education technologies – achieving success in learning outreach and learning outcomes”

12:00AM - 1:15PM: Contributed paper presentations

1:15PM - 2:15PM: LUNCH

2:15PM - 3.45PM: Contributed paper presentations & vote of thanks

3.45PM: Tea and refreshments
ORGANIZING COMMITTEE

Patrons
Brahmachari Abhyamrita Chaitanya, Pro-Chancellor
Dr. Venkat Rangan, Vice-Chancellor

Advisory Committee
Dr. K. Sankaran, Registrar
Prof. C. Parameswaran, Director- Corporate & Industry Relations
Dr. Sasangan Ramanathan, Dean-Engineering

Name/Designation of the Coordinators of the IQAC:
- Dr. Sriram Devanathan
  Professor- Department of Chemical Engineering,
  Amrita Vishwa Vidyapeetham, Coimbatore.

- Prof. Prashant R. Nair
  Associate Professor- Department of Computer Science and Engineering,
  Amrita Vishwa Vidyapeetham, Coimbatore.

Amrita IQAC Campus/ School Coordinators
- Dr. Sanjivi Arul, Amrita School of Engineering, Coimbatore
- Mr. C. Arun Kumar, Amrita School of Engineering, Coimbatore
- Dr. Rajiv Prasad, Amrita School of Business, Coimbatore
- Dr. Dinesh Nair, Amrita Institute of Medical Science, Kochi
- Mr. E. K. M. Namboodiri, Amrita School of Medicine, Kochi
- Dr. Joe Joseph, Amrita School of Dentistry, Kochi
- Dr. Sheela Pavithran, Amrita School of Nursing, Kochi
- Mr. Aneesh T. P, Amrita School of Pharmacy, Kochi
- Dr. Kavya. K. C, Amrita Centre for Nanosciences & Molecular Medicine, Kochi
- Mr. Prasanna Kumar. C. V, Amrita School of Arts & Science, Kochi
- Mrs. Vandana. M, Dept. of Management, Kochi
• Dr. Kanaga Sabapathy, Amrita School of Engineering, Amritapuri
• Dr. Viswanathan. M, Amrita School of Arts & Sciences, Amritapuri
• Dr. Sudarslal S, Amrita School of Biotechnology, Amritapuri
• Mr. Ramdas. P. V, Amrita School of Ayurveda, Amritapuri
• Ms. Soni Vivek, Dept. of Management, Amritapuri
• Dr. T. S. B. Sudarshan, Amrita School of Engineering, Bangalore
• Mr. Maria Sebastin, Amrita School of Engineering, Bangalore
• Dr. Rekha Bhatt, Amrita School of Arts & Sciences, Mysore
• Mr. Jyothish. M, Amrita School of Education, Mysore
• Mrs. Padmavathi, Amrita School of Education, Mysore
• Ms. Archana B. V, Amrita School of Engineering, Coimbatore
A national seminar titled “Curriculum Design and Development for Sustainable and Societal Development: A Road Map” was held at Amrita Vishwa Vidyapeetham (University), Coimbatore campus on 12 and 13 August, 2016. Over 120 higher-education experts from all over India participated in the event that was sponsored by the National Assessment and Accreditation Council (NAAC). They discussed and showcased various strategies and success stories that can enable institutions of higher learning to develop a road map on curriculum focused on sustainable development and needs of the planet.

In her inaugural speech, the Chief Guest, Dr. Sheela Ramachandran, former vice-chancellor of Avinashilingam University for Women, said: “While ancient India promoted learning for life and sustainability, modern education is merely an employment guarantee scheme. The challenge before educators is to face the innovative disruptions and technological infiltration which wean students away from sustainable development needed for a meaningful life. Educational institutes need to develop a curriculum which encourages students to use their head (cognitive), hands (skills) and heart (values).”

Dr. K Sankaran, Registrar of Amrita University, presided over the seminar. He said: “In higher education, it is important to focus on sustainable models that consider the delicate balance between the environment, society and economy. Students need to be educated on technologies that protect the environment. For example, the problem of global warming can be overcome through the use of solar photovoltaic, solar thermal and wind energies. These are sufficient to meet all our energy needs. Planting more trees may be good to consume carbon dioxide, but what happens to the trees after their lifetime? If they are burnt as firewood, the trapped carbon is back into the atmosphere. Even if the wood is buried, microbial action sets in and carbon dioxide is released into the atmosphere. Therefore, new technologies in preserving carbon in the wood are necessary. Also, there are reports of scientists combining carbon dioxide of atmosphere with silicate on the earth's surface to make cement rocks. If this technology is developed, it will be a breakthrough.”

Speaking about the need to include 21st century skills in the curriculum, Prof. Bhavani Rao, Director, AMMACHI Labs, Amrita University, said: “There is much debate on what skills are required for the 21st century where education and development are defined and directed by sustainability. Most educational think-tanks recommend core competencies like critical thinking and problem solving skills with character qualities built over the basic functional literacies across all verticals in education and training. Studies conducted by the world Economic Forum show that skill gaps are especially pronounced in low-income countries and recommend the use of technology to overcome these. Our pilot work of conducting 50 workshops for 1,200 students in Andhra Pradesh addresses these recommendations. The results have been outstanding. Our key takeaways in designing curriculum for 21st century skills are the intelligent and effective use of technology, along with a multi-disciplinary approach in both the content and pedagogical approaches. We now hope to scale our efforts to 40 schools in Andhra Pradesh as well as 60 CBSE schools in Kerala and Tamil Nadu.”
Dr. Sriram Devanathan, Head, Center of Excellence in Advanced Materials and Green Technologies, Amrita School of Engineering, Coimbatore highlighted several successful innovations in sustainable development that have been evolved and implemented at Amrita University. A course on Environmental Studies has been mandatory for all undergraduate students. The University is also putting emphasis on project-based learning, rather than relying solely on classroom lectures. It offers an elective course called “Live-In Labs” in which a team of students develops technological or social solutions to problems in rural areas after spending significant field time in villages. There are also summer village internships where students spend two weeks in a village and help solve priority problems related to income generation, sanitation and hygiene, education, agriculture, and water.

Subsequent sessions involved focused presentations (via invited talks) on broad orientation towards sustainable development by Dr. Nikhil Kothurkar, Former Research Scientist at the Clean Energy Research Center, University of South Florida; Innovations in education technologies for enhanced outreach by Prof. Kamal Bijlani, Chief Architect of A-VIEW; United Nations Sustainable Development Goals by Prof. Anju Bist, Program Coordinator, Amrita Self Reliant Village; a creative course on Environmental Management and Sustainable Development by Dr. Sanjay Banerji, Former National Management Programme Coordinator, MDI Gurgaon as well as numerous contributed papers.

The talks were followed by interactive Q&A sessions, which facilitated development of greater clarity for evolving action items - for design of content, design of pedagogy, alignment with SDGs, incorporation of field work and practical components, sensitization of students and faculty, and holistic perspective to create awareness and knowledge catering to the triple-bottom-line (ecology, economy and equity) - which would then ensure that development addresses all the required dimensions: social, technological, political, cultural, ethical and economic. The seminar was organized under the aegis of the Internal Quality Assurance Cell (IQAC) of Amrita Vishwa Vidyapeetham, by the university's IQAC coordinators, Prof. Sriram Devanathan and Prof. Prashant R. Nair.
Amrita Varsity meet focuses on a curriculum for sustainable development

Coimbatore, Aug 17:
A national seminar titled “Design of Curriculum for Sustainable and Societal Development” was held at Amrita University. Dozens of higher-education experts from all over India participated in the event that was sponsored by the National Assessment and Accreditation Council (NAAC).

They discussed and showcased various strategies and success stories that can enable institutions of higher learning to develop a curriculum focused on sustainable development and needs of the planet. In her inaugural address, Dr. Sheila Ramachandran, Former Vice-Chancellor, Annamalai University for Women, said: “While ancient India promoted learning for life and sustainability, modern education is merely an employment guarantee scheme. The challenge before educators is to face the innovative disruptions and technological infiltration which wean students away from sustainable development needed for a meaningful life. Educational institutes need to develop a curriculum which encourages students to use their head (cognitive), hands (skills) and heart (values).”

Dr. K. Sankaran, Registrar of Amrita University, said: “In higher education, it is important to focus on sustainable models that consider the delicate balance between the environment, society and economy. Most educational think-tanks recommend core competencies like critical thinking and problem solving skills with character qualities built over the basic functional literacies across all verticals in education and training.”
INAUGURAL SESSION

A national seminar titled “Curriculum Design and Development for Sustainable and Societal Development: A Road Map” was held at Amrita Vishwa Vidyapeetham (University), Coimbatore campus on 12 and 13 August, 2016. Over 120 higher-education experts from all over India participated in the event that was sponsored by the National Assessment and Accreditation Council (NAAC). They discussed and showcased various strategies and success stories that can enable institutions of higher learning to develop a road map on curriculum focused on sustainable development and needs of the planet.

Keynote Address:
Delivered by Dr. K Sankaran, Registrar of Amrita University

Synopsis of address:
In higher education, it is important to focus on sustainable models that consider the delicate balance between the environment, society and economy. Students need to be educated on technologies that protect the environment. For example, the problem of global warming can be overcome through the use of solar photovoltaic, solar thermal and wind energies. These are sufficient to meet all our energy needs. Planting more trees may be good to consume carbon dioxide, but what happens to the trees after their lifetime? If they are burnt as firewood, the trapped carbon is back into the atmosphere. Even if the wood is buried, microbial action sets in and carbon dioxide is released into the atmosphere. Therefore, new technologies in preserving carbon in the wood are necessary. Also, there are reports of scientists combining carbon dioxide of atmosphere with silicate on the earth's surface to make cement rocks. If this technology is developed, it will be a breakthrough.

Inaugural Address

Chief Guest: Dr. Sheela Ramachandran, former vice-chancellor of Avinashilingam University for Women
Dr. Sheela Ramachandran is the Former Vice-Chancellor of Avinashilingam Deemed University for Women, Coimbatore since 23.08.2010 to 22.08.2015. She was the Principal of PSG College of Arts & Science, Coimbatore, from 2004 to August 2010 and has returned to her alma mater after 33 years. She completed her postgraduate degree in Foods & Nutrition in 1979 and postgraduate Diploma in Food Science & Preservation in 1977 from Avinashilingam Home Science College for Women, affiliated to Madras University and later obtained her Ph.D from Bharathiar University in 1995.
She has a rich academic knowledge and teaching experience of more than 37 years. Her administrative experience has been for more than 29 years as a HOD, in setting up the Department of Nutrition & Dietetics for development of programmes at UG, PG, M.Phil. & Ph.D. levels. As a Principal of a prestigious college, she has brought in innovations in CBCS, e-learning & video conferencing, learning experiences, evaluation reforms, innovation & entrepreneurship and in the TQM of educational institutions. She has further extrapolated these innovations
in her present position, as the Vice Chancellor of a Centrally-funded Women’s University. The MHRD, UGC & NAAC have recognized these acumen and have sought her expertise in various deliberations & committees. She is the Project Director of the prestigious Obama-Singh Research Project funded by MHRD, GOI, with a tie-up with University of Minnesota, USA, on the topic, “A sustainable Response to Intervention Model’ for successful Inclusion of Children with Disabilities – A India US Partnership” for primary schools. It is one of the 8 India led research projects. She is instrumental behind the first Arts & Science College in the country to have the EDUSAT (Satellite Interactive Terminal) SIT in the country, for video-conferencing. She has served as Peer Team Chairperson, Coordinator & Member for accreditation and re-accreditation of colleges by NAAC. She has 10 international and 25 national research publications to her credit. Her main areas of research in Nutrition are 'Folate in Foods' and 'Role of Foods in Alternative Systems of Medicine'. Her strong interests also are in the field of Higher Education, especially TQM in Higher Education.

She is a recipient of 10 awards. The recent National Award, viz. the Amiya Kumar Bose Award, by the Indian Dietetic Association in November, 2012, during its Golden Jubilee Celebrations is worth mentioning. ICT Academy of Tamil Nadu, a Central and State Govt. sponsored Academy recognized her contributions by bestowing on her the “Academic Leader Award –2015”.

Her forte is in pursuing and strengthening the following:
• TQM in Higher Education
• A highly flexible Choice Based Credit System
• Professionalizing higher education
• Developing academic skills, career skills and life skills in students, teachers and administrators

Synopsis of address:
While ancient India promoted learning for life and sustainability, modern education is merely an employment guarantee scheme. The challenge before educators is to face the innovative disruptions and technological infiltration which wean students away from sustainable development needed for a meaningful life. Educational institutes need to develop a curriculum which encourages students to use their head (cognitive), hands (skills) and heart (values).
RE-ENVISIONING EDUCATION FOR ESSD
Dr. Sheela Ramachandran
Former Vice Chancellor, Avinashilingam University & Former Principal, PSG College of Arts & Science

Is Education for

- Academic skills
- Job skills
- Life skills

Life 100% successful and happy

Education is not like a bucket to fill up

But like a fire to kindle

for

Sustainable & Societal Development
Invited Talks

Prof. Bhavani Rao, Director, AMMACHI Labs, Amrita University

Prof. Rao R. Bhavani is the Director of AMMACHI Labs at Amrita University which focuses on innovating and deploying new applications in learning technologies to benefit the poor with a focus on women from socio-economically underserved communities. AMMACHI Labs does pioneering work on technology-enhanced learning and computerized vocational-education training delivered through multimedia-enriched applications and cost-effective haptic-enhanced simulators for perfecting manual skills. A central focus of Prof. Bhavani's work has been to explore the use of skill-development as the baseline strategy, and women empowerment as the underlying vision. Her current project is a massive sanitation-awareness campaign that empowers women in rural communities to become ambassadors of change, by educating them about sanitation practices and training them to build their own toilets.

Synopsis of Lecture: There is much debate on what skills are required for the 21st century where education and development are defined and directed by sustainability. Most educational think-tanks recommend core competencies like critical thinking and problem solving skills with character qualities built over the basic functional literacies across all verticals in education and training. Studies conducted by the world Economic Forum show that skill gaps are especially pronounced in low-income countries and recommend the use of technology to overcome these. Our pilot work of conducting 50 workshops for 1,200 students in Andhra Pradesh addresses these recommendations. The results have been outstanding. Our key takeaways in designing curriculum for 21st century skills are the intelligent and effective use of technology, along
with a multi-disciplinary approach in both the content and pedagogical approaches. We now hope to scale our efforts to 40 schools in Andhra Pradesh as well as 60 CBSE schools in Kerala and Tamil Nadu.

**REWORKING CURRICULUM TO INCLUDE 21ST CENTURY SKILLS:**
Prof. Bhavani Rao, Director, AMMACHI Labs, Amrita University

Case study report from a multi-disciplinary implementation in Junior colleges and high schools in Andhra Pradesh

*Date: 13 August 2016*

**21st Century Skills for Lifelong Learning**

**Foundational Literacies**
- Literacy
- Numeracy
- Scientific
- ICT
- Financial
- Cultural and Civic
Competencies

- Critical thinking/ problem-solving
- Give constructive feedback
- Creativity
- Offer opportunities to build and innovate
- Provide autonomy to make choices
- Communication
- Create a language-rich environment
- Collaboration
- Foster greater respect and tolerance for others
- Provide opportunity for group work

Character Qualities

- Curiosity
- Initiative
- Persistence
- Adaptability
- Leadership
- Social and Cultural Awareness
Character Qualities

- **Curiosity**
  - Encourage questions/guessing
  - Provide autonomy to make choices
  - Instil sufficient knowledge to ask questions and innovate
  - Evoke contradiction

- **Initiative**
  - Provide long-term, engaging projects
  - Build confidence in the ability to succeed
  - **Provide autonomy to make choices**

- **Persistence**
  - Build in opportunities to learn from failure

- **Adaptability**
  - Foster the ability to process emotions
  - Practise both flexibility and structure

- **Leadership**
  - Foster the ability to negotiate
  - Encourage empathy

- **Social and Cultural Awareness**
  - Foster greater respect and tolerance for others
  - Encourage empathy
  - Foster cultural self-awareness

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Life Skills

- Curiosity,
- Initiative
- Leadership
- Communication
- Collaboration

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Workshop series in partnership with APSSDC

- Life Skills
- Vulnerability Mapping
- Computational Thinking
- Robotics
- Maker

---

Vulnerability Mapping

- Social & Cultural Awareness,
- Adaptability,
- Critical thinking & problem solving
- Collaboration
Computational Thinking
- Persistence,
- Critical thinking & problem solving
- Initiative
- Creativity

Robotics
- Persistence,
- Critical thinking & problem solving,
- Collaboration

Maker
- Critical thinking and problem solving,
- Creativity,
- Communication,
- Collaboration,
- Persistence

- Encourage game-based learning
- Break down learning into smaller, coordinated pieces
Create a safe environment for learning
Develop a growth mindset
Foster nurturing relationships
Allow time to focus
Foster reflective reasoning and analysis
Offer appropriate praise
Guide a student discovery of topics

Help students take advantage of their personality and strengths
Provide appropriate challenges
Offer engaged caregiving
Provide clear learning objectives targeting explicit skills
Use a hands-on approach

Dr. Sriram Devanathan, Head, Center of Excellence in Advanced Materials and Green Technologies, Amrita School of Engineering, Coimbatore

He is the Head of Centre for Excellence in Advanced Materials and Green Technologies and Professor in the department of Chemical Engineering and Material Sciences. He has more than 10 years of industrial experience at the 3M Company in Minnesota, Texas and California and more than 7 years of experience in academic research as a graduate student of Iona State University, USA where he also received his Ph.D. He has a certificate of Six Sigma Black Belt Training from 3M and has successfully led quality improvement/cost reduction projects. His technical interest revolve around applying statistical way of thinking to solving problems in chemical engineering and other areas, with sustainable technologies and approaches. The focus is three-fold: process modeling & optimization, materials development for low-cost socially impactful applications and reclamation of waste materials, design of experiments and process modeling and simulation, data reconciliation and gross error detection, plastics reclamation and conversion, ground water transport.

Synopsis of Lecture: He highlighted several successful innovations in sustainable development that have been evolved and implemented at Amrita University. A course on Environmental Studies has been mandatory for all undergraduate students. The University is also putting emphasis on project-based learning, rather than relying solely on classroom lectures. It offers an elective course called “Live-In Labs” in which a team of students develops technological or social solutions to problems in rural areas after spending significant field time in villages. There are also summer village internships where students spend two weeks in a village and help solve priority problems related to income generation, sanitation and hygiene, education, agriculture, and water.
INNOVATIONS IN CURRICULUM FOR HOLISTIC DEVELOPMENT
CENTER OF EXCELLENCE IN ADVANCED MATERIALS & GREEN TECHNOLOGIES

Presented at National Seminar on “Design of Curriculum for Sustainable and Societal Development”
At Amrita Vishwa Vidyapeetham 12th August 2016

Holistic Education

Youngsters need to understand the purpose of life. They need courage and wisdom to face the challenges of life. With that understanding they become the light of the world. If we care for them responsibly, molding their whole character with love, then the future of the world will be safe. – Amma

Holistic Education

I HAVE NEVER LET MY SCHOOLING INTERFERE WITH MY EDUCATION.

mark twain
Constructive Alignment

Learning outcomes

Learning activities

Assessment methods

Sheffield Graduate

By the time they graduate, the University aims to enable all graduates to demonstrate that they are:

• knowledgeable in their subject
• a skilled and ethical researcher
• a critical, analytical and creative thinker
• an entrepreneurial problem solver
• information literate
• skilled in the use of IT
• an efficient planner and time manager
• a flexible team worker
• an accomplished communicator
• an independent learner
• an active citizen who respects diversity
• culturally agile and able to work in multinational settings
• professional and adaptable
• well rounded, reflective, self aware and self motivated
• competent in applying their skills and knowledge

Holistic Design of Curriculum

Relevance

Progression

Depth and Breadth

Coherence

Practicality

Personalization & Choice

The disparity

What society wants

What student needs

What is designed / imparted
Vision

- Sensitization
- Problem Assessment
- Problem Resolution

Innovations in Amrita

- Environmental Studies
- Project based learning
- Live-in Labs
- Village internships
- Curricular project based on development
- Soft skills development
- Self-awareness and personal growth
- Cultural education

Environmental Studies

- Initiated as mandatory course by order of Supreme Court of India
- Complete student engagement and ownership
- Comprehensive topics of study
- Technological, ethical, political, social, ecological and economical considerations
- Project based – theory and hands-on

Project based learning

- Core subjects
- Supervised learning
- Learn and apply model
- Independent study and work (3 credits – akin to normal course)
- Overcomes limitations of conventional examination system
Biomass / Plastic Waste to Engine-grade Fuels

Strengths
- Surplus crop residue - 164 million tons in India
- Potentially carbon neutral

Disadvantages
- Surplus crop residue - 164 million tons
- Potentially carbon neutral

Two-stage Biomass gasifier for excellent product control

Biomass Gasification

Fischer-Tropsch Synthesis

Microchannel Reactor

Sustainability & Livelihood in Tribal Community

Naturally grown "Lemon Grass" in 25 acres

Valaramkunnu, Wayanad, Kerala

- 300 tribal people
- 8 km walk down the hill for daily wages
- Only 40% of the people work

Existing lemon grass oil process
- Batch distillation
- Poor product quality
- Low Oil Yield (0.1%)

Amrita Semi-continuous Distillation – using Solar Energy

- Excellent product quality
- Higher Oil Yield (2.2%)

Income – Rs. 1.4 lakhs per year

Amrita Team
- Dr. Udaya Bhaskar Reddy Raquilla
- Dr. Sairam Dewanathan
- Mr. Challa Mahesh Reddy - Pre-final year student
- Ms. Prathvi - Pre-final year student
- TNI Delta Interns
- Mr. Mick Richards
- Mr. Dieter Muller
- Mr. Ruben Irom
Low-cost biodegradable sanitary pads with banana stem fibers

Banana Fiber Absorbent - Value Proposition
- Sustainable
- Opportunity for income generation
- Low investment
- Suitable for SHG/Cooperative Society

Village internships
- Conducted by Amrita SeRVe
- Summer vacation – 2 weeks
- Students (5-10) + Faculty members (2)
- 7 focus areas
- Short projects
- Technical or social solutions
- Building rapport with community

Curricular projects based on development
- Low-cost detection of adulteration of diesel
- Pyrolytic gasification of plastic and bio-waste
- Biodegradable super-absorbent polymer
- Coconut-tree climbing robot
- Bioethanol / biodiesel production
- Natural soaps and detergents
- Gesture based wheel-chair control
Subsequent sessions involved focused presentations (via invited talks)

- On broad orientation towards sustainable development by Dr. Nikhil Kothurkar, Former Research Scientist at the Clean Energy Research Center, University of South Florida.

He received a B. E. in Polymer Engineering from Maharashtra Institute of Technology, University of Pune. In 1999, he moved to Gainesville, Florida, USA, to pursue graduate studies in the University of Florida's Materials Science and Engineering Department where he worked as a graduate research assistant under the guidance of Dr. Anthony B. Brennan developing inorganic-organic particulate nanocomposites for ultrafast infrared optical sensor protection from destructive laser attacks. He graduated with a Ph. D. in 2004, after defending his dissertation entitled, "Solid State Cadmium Sulfide-Polymer Nanocomposites."

After graduation, he accepted a position as a Postdoctoral Research Associate in the Solar Energy and Energy Conversion Laboratory, University of Florida, for two years. There he developed rugged and crack-free sol-gel photocatalyst coatings on metal and ceramic substrates. He also worked on a project to develop lower cost hydrocarbon polymer electrolyte membranes for fuel cells. He then worked for a year as a Research Scientist at the Clean Energy Research Center, University of South Florida in the fields of
photocatalysis and its applications in biomedical devices, and hydrogen production by biomass gasification. Dr. Kothukar's fields of interest are nanomaterials, photocatalysis, biomedical materials and devices, low cost water treatment and alternative energies.

Synopsis of Lecture: By the problems of unsustainability, the root cause of every issue, at environmental, social and individual level, he deciphered realistic solution to overcome them. Thereby in a rhythmic manner he explained the veracious definition of sustainable development. Unsustainability are existing due to the open loop system which can only be rectified by making closed loop system into practice, where Industrial Symbiosis can be accepted as a model for work. Fundamental resolution for the root cause – degradation of ethical values, is only holistic education which could successively bring out sustainable development.

**WHAT IS SUSTAINABLE DEVELOPMENT?**

*Dr. Nikhil K. Kothurkar*

**Outline**
- Interrelations in Nature
- Present Unsustainability
- Sustainable Development
- Inadequacy of a Fragmented Approach
- Design for Sustainability
  - Integrated Resource Management
- Requirements for Sustainability
- Consumption, Sustainability and Well Being
- Fundamental Necessity of Education for Sustainability

*Earth-threatening environmental problems like Global Warming, Ozone depletion, Deforestation, Desertification, Loss of biodiversity, natural habitats and species, Pollution of food, water, air, land, radioactive pollution.*

**Problem of Unsustainability**
- The marvellous progress in technology and many fields has come at a staggering cost.
- The scene of modern development is that of simultaneous crises on many fronts.
  - Environmental crisis:
Problem of Unsustainability
Concurrently, with the environmental crisis, we also have:

- **Social crisis**:
  - War, oppression, terrorism, corruption: motivated by control over resources
  - Growing slums, degrading morality, broken families,
  - Basic needs: food, clothing and shelter—the very motivation for development—have not been satisfied.
  - Poverty and hunger

- **Individual crisis**
  - Serious health problems: Cancers, heart disease, AIDS, infectious diseases, birth defects, anxiety, stress…

- **Sustainable Development (SD)**
  - SD is the economic development to meet human needs while preserving the environment.
  - Meet needs into the indefinite future.
  - Present economic growth is unsustainable since it leads to social inequities and environmental damage.
  - Economy, Society, Environment: 3 interdependent and mutually reinforcing pillars of SD.
Understanding Sustainability: Analogy of an Orchestra
- Several artists with different instruments
- What is not an orchestra:
  - Merely pretending to play the instrument (is like greenwash)
  - Merely playing the prescribed notes (is like mere compliance with regulations)
  - Creating as much noise as possible (is like increasing GDP).
  - Each musician independently playing his/her best (is like trying to solve one problem independently of others)
- What is necessary for a successful orchestra:
  - Agreement to play one common composition
  - A commonly agreed-upon plan that includes the role and timing of each musician
  - Each musician following the plan with mutual coordination

Consensus and Understanding about SD
- Do countries and corporations agree upon the urgent need for sustainable development?
- Do we understand enough?
- Will the rest follow those who understand?
- Convergence of efforts is required:
  - As our understanding evolves…
  - As methodologies and approaches evolve…
  - Policies must follow suit.
  - Industries and consumers must rapidly adopt the new developments.

Sustainability Must Be Designed
- Sustainability is possible only after deliberate design both at the system level and the component or process level.
- Sustainability cannot be the product of disconnected or fragmented solutions in an environment that is skewed by technology, markets and policies.

Need for Systems Thinking
- Systems thinking is necessary for solving interconnected problems.
- The WHOLE is more than just the sum of the individual PARTS.
  - E.g. Putting together all the parts of a car in any random order does not make a functional car.
  - Each part is related to other parts in a specific way and contributes to the functioning of the whole.
  - Design is necessary both at the component level and the system level. (e.g. each part must be properly designed and the entire car must also be properly designed.)
  - Diagnosing and correcting malfunctions in complex and interrelated problems requires systems thinking.
Multiple Simultaneous Interventions for Sustainability

- Simultaneous interventions from technology, business, policy and governance are necessary.
  - Sustainability cannot be the outcome of an intervention based on any one of the following areas namely technology, business, policy or governance.
  - For instance, merely developing new technologies cannot ensure sustainability if the commercial and policy frameworks are unfavorable.
  - Sustainability requires coordination between these areas...like an orchestra.

Requirements for Sustainability

For achieving sustainability in the short-term, the following must be pursued simultaneously in a coordinated manner:

- Sustainability-based governance and policies: economic development favoring social justice and environmental protection.
- Sustainable business: profitable, ethical and socially beneficial.
- Sustainable technologies: Closed-loop (zero waste) resource-use systems, using renewable energy.
- Strict regulation: Swift, fair and objective law and order system including the pollution control boards etc.

A New Paradigm

- Intentional communities founded on sustainable principles:
  - Sustainable Living Communities
  - Small-scale communities with minimal ecological
impact
- Ecovillages
- Good peer networking—Eco municipalities
- Members are united by shared ecological, social or spiritual values.

**Consumption, Sustainability and Wellbeing**
- Resource consumption does not necessarily assure well-being.
- Well-being is also influenced by many factors other than consumption:
  - **External**: family, friends, education, position in society
  - **Internal**: identification and fulfillment of one’s purpose in life, realization of spiritual/philosophical truths.
- Although overconsumption does not improve well-being greatly, it damages the environment and reduces the well-being of others and of the future generations.

Thus, overconsumption inevitably becomes unethical.

**Need for More Holistic Indicators of Development**
- ‘Development’ in a broader sense, is much more than mere economic development.
- The gross domestic product (GDP) that is used to measure economic development, does not account for the social and environmental impacts of the economic growth.

**But the economic policies of countries are geared towards increasing the GDP.**
- No wonder many countries and the world in general is facing social and environmental problems!

- More holistic and balanced indicators of development are needed
  - Countries should focus on increasing these numbers rather than only GDP.

**Holistic Indicators of Development**
- **Quality of life**
  - **ecology, economics, politics, culture**
- **Human Development Index** [ref.]:
  - life expectancy, education, and income indices.
- **Happy Planet Index**
  - Attained well-being (not necessarily material goods) per unit of extraction of or imposition upon nature.
- **Satisfaction with Life Index**
  - Strong correlation with health, wealth, basic education
  - Based on asking people how happy they are and social and economic development.

**Multiple Symptoms Caused by a Single Common Disease**

**Two approaches must be pursued simultaneously:**
● Controlling the external symptoms (temporary solution)
● Diagnosis and treatment of the disease (permanent solution)

Common Root Cause for Social and Environmental Problems

Root Cause of Unsustainability & Its Resolution

● Root Cause--degradation of ethical values:
  ○ While this investigation is essential and exciting, it is out of the scope of the present discussion.
  ○ Suffice it to say that the erosion of values is implicated in all the all these environmental and social problems

● Fundamental resolution—holistic education:
  ○ So, restoring ethical values becomes essential.
  ○ This is done through value-based education.

● Education is Fundamentally Essential for Sustainability
  ○ A systematic integration of environmental education and ethics with the regular curricula at all levels of school and college is essential.
  ○ Fundamentally, unsustainability is caused by the present flawed value system that overemphasizes consumption.
  ○ Value systems strongly interact with decision-making to shape human behavior patterns.
  ○ Sustainability is impossible if this erroneous value system is not replaced with a ‘sustainable’ value system.
  ○ Awareness campaigns, workshops, or starting advanced degree programs in sustainability are necessary, but are not sufficient.
  ○ It is important to integrate environmental education and ethics into the curricula at all levels starting from the beginning of a child’s schooling.
  ○ Education for sustainability ensures that the implementation of the above principles is constantly refined and propagated across generations.
Innovations in education technologies for enhanced outreach by Prof. Kamal Bijlani, Chief Architect of A-VIEW; United Nations

Prof. Kamal Bijlani is the Chief Architect of A-VIEW. With the support of President Dr. Abdul Kalam and partnering with several major Indian universities, Prof. Bijlani and his colleagues moved the broadcast platform to the Internet. The initiative matured under the administration and financial support of the National Mission of Education, an initiative of the Ministry of Education in India. The government, particularly the Ministry of Education, was motivated to promote A-VIEW as one of the country’s major e-learning venues, and to keep access to the software free of cost to all participating institutions. He has prior experience as head of the Lab. Prof. Bijlani served as program co-chair for the 2012 International Conference on Technology-Enhanced Education. He is a member of the IEEE (Institute of Electrics and Electronic Engineers) and has published with the organization. His work has been honored with a number of awards, including the Computerworld Honors Program Award for Educational Excellence in the field of Education Technology in 2012. He believes that the scale of development for E-learning is limited primarily by the availability and quality of an Internet connection. The Internet boom in the country has led to a major surge in this public sector. This area has immense scope; however, growth depends on overall development of infrastructure and bandwidth.

Synopsis of Lecture: He gave highly informative session about A-VIEW (Amrita Virtual Interactive e-Learning World) developed by Amrita with IIT-Bombay, IIT-Madras and IIT-Kharagpur as partners. A-VIEW is an award winning indigenously built multi-modal, multimedia e-learning platform that provides an immersive e-learning experience that is almost as good as a real classroom experience developed by Amrita e-Learning Research Lab. It is part of Talk to a Teacher program coordinated by IIT Bombay and we are funded by the Ministry of Human Resource Development (MHRD) under the Indian Government’s National Mission for Education using Information and Communication Technology (NME-ICT) along with various other projects in Virtual Labs, Haptics and Natural Language Processing. It is recognized as Global Internet Innovation by Cisco.

EDUCATION TECHNOLOGIES – ACHIEVING SUCCESS IN LEARNING OUTREACH AND LEARNING OUTCOMES

Prof. Kamal Bijlani

Learning Outreach

• Blended Learning
  ▪ MOOC
  ▪ MySangham
  ▪ A-VIEW interactions
• Mobile learning
• Serious games

Learning Outcome: Anatomy of a Course

• Pedagogy Project By IIT Kharagpur
  ▪ Examples
• Outcome based education: Inpods
• Concept-based Assessment
• Industry based Pedagogy
Amrita Blended Learning Platform

- **Blending of:**
  - Traditional Classrooms
  - Online Learning Materials
    - MySangham
  - Online Virtual Classrooms
    - A-VIEW
  - Flexible Blending chosen by Teacher

- **Integrated Online Collaboration**
  - Discussion Forum
  - Online Chat Rooms

- **Integrate Assessments and Quality**
  - Self-Assessments, Bridge Programs
  - Value Added Modules
High Level Features

- Multimedia Learning Environment (LMS)
- Course Builder (CMS)
- Training Center Management (TCM)
- Village Information System: Technology & Action for Rural Advancement

Supporting Features

- Multilingual
- Audio Playback
- Tablet/Mobile Support
- Interactivity (Pedagogical Approach to Learning)
- Learning Assessments
- Analytics

MySangham Learning Environment

- Video Lectures – Theory and Procedural
- Interactive Games and Activities
- Quizzes
- 3D Glossary
- User-friendly Navigation

MySangham Awards & Recognitions

- Won 2015 Facebook India Innovation Challenge Award
- Skilling the under served people through innovation in technology
- Operating at grassroots level (presence in 21 states as part of ASeRVe project)
- Proven training model with UNDEF (The United Nations Democracy Fund)
- Trained: more than 4500 low literate women
- Training – LEE (Life Enrichment Education) and Skill Development
- Deployed in Amrita Vidyalayam schools
Global Recognition by CISCO
Amrita University’s A-VIEW
Recognised as Global Internet Innovation by CISCO

A-VIEW Overview
A-VIEW can be used as a Versatile E-Learning Platform for setting up online
- Classrooms
- Meetings
- Training & Workshops
- Conferences

A-VIEW offers,
- Real-time audio-video and synchronized content sharing
- Live assessment and feedback
A-VIEW works on
- Multi-platforms & Multi-devices

Free to Use & Open Source

A-VIEW Features
Live Interaction
Live Audio/Video Interaction
Hand Raise to Ask Question
Quiz
Polling
Question & Chat

Content Collaboration
Desktop Sharing
Document Sharing
Whiteboard

Video Sharing
2D/3D Viewer
• Sustainable Development Goals by Prof. Anju Bist, Program Coordinator, Amrita Self Reliant Village

Ms. Anju Bist is program coordinator for Amrita self-reliant Village (Serve). As a key member of the University’s Green Campuses Initiative, she is involved in many student and administrative projects to help usher in sustainability in all aspects of the University’s operations. The initiative seeks to share ideas and learning with similarly-minded people from other colleges over an e-learning network. Ms. Bist was in charge of web communications of all constituent schools and campuses of Amrita Viswa Vidyapeetham. She also leads meditation classes for Amrita Students. Prior to joining Amrita nearly ten years ago, Ms. Bist worked for Pricewaterhouse Coopers in the United States, with diverse clients such as Compaq, JC Penney, US Department of Defense and North Carolina School District, designing, developing and implementing large-scale IT systems. She obtained an MS in Information Systems and an MBA from the University of Maryland at College Park and was a gold medalist in Mechanical Engineering from Osmania University in India. Her earlier studies were supported by the prestigious National Talent Search Scholarship in India. Her research interests include Environmental Management and Sustainable Development.

Synopsis of Lecture: 193 UN members met at New York and signed Sustainable Development Goals on September 25th, 2015 to ensure the same in global level with focus on poverty eradication, primary education, promotion of gender equality, reduction of child mortality, betterment of maternal health, environmental sustainability, global partnership for development etc. Among them the grievous challenges are education system that disregards values, lifestyles that disregards health. As faculty members one should try to revolutionary changes to rectify the same. Focus was also given on usage of chemicals and pesticides at alarming amount which result in both environmental degradation and health hazards.

SUSTAINABLE DEVELOPMENT GOALS - 2016 – 2030
On September 25, 2015 193 member nations of the UN come together in NY to sign 17 Sustainable Development Goals. These goals succeeded the MDGs Millennium Development Goals (2000-2015). There were eight MDGs with 21 targets. The 17 SDGs address developmental issues of people and the planet

End poverty in all its forms everywhere
End hunger, achieve food security, improved nutrition and promote sustainable agriculture
End hunger, achieve food security, improved nutrition and promote sustainable agriculture
169 Targets, 230 Indicators

**Four central challenges that we face today: They need to be engaged on a war-footing** –
- Transforming a system of education that disregards values
- Removing an obsession with sophistication that disregards culture
- Changing a lifestyle that disregards health
- Discarding a model of development that disregards nature

**As Faculty members what can be done?**
- transforming a system of education that disregards values

- removing an obsession with sophistication that disregards culture
- changing a lifestyle that disregards health
- discarding a model of development that disregards nature

“Earth, the preservation of nature, and the disappearing harmony between humanity and nature”
- *Amma*

“All the recent natural disasters and the alarming changes in the global climate are challenging the further survival of this beautiful earth we live in.”
- *Amma*

**Extraction**
- Fancy word for Natural Resource Exploitation
- Fancy word for Trashing the Planet

In the past three decades alone, one-third of the planet’s natural resource base has been consumed. We are cutting and mining and hauling and trashing the place so fast that we are undermining the planet’s very ability for people to live here

- 75% of global fisheries now are fished at or beyond capacity
- 80% of the planet’s original forests are gone
- In the Amazon alone, we are losing 2000 trees a minute i.e. 7 football fields a minute

- Transforming a system of education that disregards values
- Removing an obsession with sophistication that disregards culture
- Changing a lifestyle that disregards health
- Discarding a model of development that disregards nature

The Slow Poisoning of India
- Indian farmers use about 30 million tons of urea each year.
- India is the largest importer for urea in the whole world.
- Urea accounts for about half of India’s total fertilizer consumption.
- A chemical fertilizer that adds nitrogen to the soil, urea is heavily subsidized by the Indian government.
- Farmers pay Rs. 5360 per ton, while the government subsidy amounts to over Rs. 10,000 per ton.

An average meal may have half mg of pesticides in it
- Transforming a system of education that disregards values
- Removing an obsession with sophistication that disregards culture
- Changing a lifestyle that disregards health
- Discarding a model of development that disregards nature

The Age of Stupid
We could have saved ourselves
- But we didn’t.
What state of mind were we in to face extinction and simply shrug it off?

The whole world is coming together to address these issues
Renowned scientists of the past viewed the universe and its subtleties with awe and wonderment.
Their research had the inquisitiveness and faith of an innocent child.
In fact, many past and present eminent scientists acknowledged spirituality towards the end of their lives.
But, by then it was too late.
Amma prays that the scientific community leading the world today does not make this same mistake. Recently, we have witnessed so many natural calamities and alarming changes in the global climate, including rapidly increasing global warming.

We need to ponder deeply on whether human effort alone will be enough to put a halt to the imminent worldwide catastrophe.
- Amma
• A creative course on Environmental Management and Sustainable Development by Dr. Sanjay Banerji, Former National Management Programme Coordinator, MDI Gurgaon.

Dr. Sanjay Banerji is the Founder Director/Dean of Amrita School of Business. He worked in Hindustan Steel Ltd/SAIL and Management Development Institute (MDI), Gurgaon. He is the Founder of the Gurgaon Quality Forum. He presented and published papers in India and abroad. He authored study materials on Project Management for IGNOU, and Case Studies for class room teaching and developed a computer model for Project Appraisal using Simulation methodology. Dr. Banerji is an external examiner for Ph. D. at IIT Kanpur, Sagar University and for Master Programs of School of Planning and Architecture, New Delhi, Indira Gandhi National Open University, New Delhi. He worked as a visiting faculty at IIM Lucknow, IIM Kozhikode and IMI New Delhi. He guides Ph. D. scholars for Bharathiyar University and guided more than 50 Projects of PGDM/M. B.A. Designed and conducted numerous MDPs for companies like BEL, NTPC, TCL and ONGC. He had been invited to chair many forums in India. He is also a member of Board of Studies of Universities and Autonomous Management Institutes, Member of Coimbatore Management Association, Senior Member of American Society for Quality (ASQ), Certified Quality Engineer of ASQ during 1993-96 and received Lead Assessor certification from Victoria Group, U.K. He was trained by SAP Labs in BPI-1. He had authored many scholarly papers on academics.

Synopsis of Lecture: Biggest source of planetary boundary stress today is excessive resource consumption by roughly the wealthiest 10% of the world’s population and the production pattern of the companies producing the goods and services that they buy. It is being explained in the Doughnut Economics Model. Human greed is at the root of the present crisis. Education plays a very significant role and sustainability education must begin from the kindergarten and continue life-long. Hence solutions must be found by going deeper, by listening to the clarion call by global thought leaders, and the Chancellor of the university recommends the fusion of Science and Spirituality of Sustainable development.

CURRICULUM DEVELOPMENT OF ENVIRONMENTAL MANAGEMENT AND SUSTAINABLE DEVELOPMENT FOR MBA

Prof. Johan Rockstrom and team Stockholm Resilience Center

• 2009 Postulated the science of 9 Planetary Boundaries and revised it in 2015. This must be included in all curricula, and all of humanity need to understand what are the essential limitations to development.
• Introduced the concept of ‘Anthropocene’ – an age dominated by the human beings
• We must realize that we are in the driver’s seat, deciding upon the destiny of our own children and grandchildren.
• We do have an opportunity to arrest the decay, but it is quite evident that the window of opportunity is fast shrinking, and we may soon reach a point of no return.
A SAFE AND JUST SPACE FOR HUMANITY

- Central to pursuing sustainable development is the imperative of eradicating poverty, so that all people lead lives free of deprivation.
- This depends in good part on ensuring that humanity’s collective use of natural resources remains within sustainable limits.
- Figure 1 (below) provides a simple visual representation of this double objective.
Dynamics in the Doughnut

- The biggest source of planetary-boundary stress today is excessive resource consumption by roughly the wealthiest 10 per cent of the world’s population, and the production patterns of the companies producing the goods and services that they buy:
  - Carbon: Around 50 per cent of global carbon emissions are generated by just 11 per cent of people;
  - Income: 57 per cent of global income is in the hands of just 10 per cent of people;
  - Nitrogen: 33 per cent of the world’s sustainable nitrogen budget is used to produce meat for people in the EU – just 7 per cent of the world’s population.

IN SEARCH OF A 21ST CENTURY COMPASS

- As the 2009 Stiglitz-Sen-Fitoussi Commission on the Measurement of Economic Performance and Social Progress concluded, “Those attempting to guide the economy and our societies are like a pilot trying to steer without a reliable compass... We are almost blind when the metrics on which action is based are ill-designed or when they are not well understood.
- Any vision of sustainable development fit for the 21st century must recognize that eradicating poverty and achieving social justice is inextricably linked to ensuring ecological stability and renewal.
COURSE INTRODUCTION

• I had the opportunity of going through two MOOC courses: ‘The Age of Sustainable Development’ from Coursera and ‘Planetary Boundaries and Human Opportunities’ from Edcast. Based upon these two courses, and especially the latter, I had recast the course outline.

Curriculum

• I plan to incorporate the following updates:
  • Focus on SDGs, with September 2015 Paris Convention inputs
  • Incorporating ‘Sustainability Literacy Tests’
  • Incorporating Amrita University – UNAI Seminar proceedings

• Keeping current on Sustainability issues
• Taking advantage of ongoing PB & HO course from Edcast, especially the ‘Hangouts’
• Draw from the latest Millennium Ecosystem Assessment

Course Plan

• Focus on the ‘Nine Planetary Boundaries’
• The Anthropocene,
• Doughnut Economics,
• Resilience and Tipping Points
• Anthropocene, is the Age of The Human Being. For the first time in the history of our planet earth, we humans are in the driving seat, steering the course our planet.
• As future managers, through your choices and your decisions, you have the unique opportunity of making a significant contribution towards creation of a
  • ‘Safe and just space for mankind and nature’

Objective

• KASH
  • K stands for knowledge. This course would be pretty heavy in terms of the knowledge bank to be shared, with additional references provided for those who want to know more.
  • Attitudinally, we would hope that you like the concept of becoming ‘Budding Planetary Stewards’ in the age of the Anthropocene.
  • Armed with the new knowledge, each one feels eager to contribute towards retaining our mother Earth in the Holocene like state that we have known so well for the past 10,000 years.
  • Our failure to do so, might take our planet out of this state irreversibly making it impossible for the future generations
to live.
• In terms of Skills, we would encourage you to get familiar with the array of global databases available, so that you could use them to find objective data based answers to questions on sustainability.
• Finally, we wish that you form a Habit of living responsibly in this challenging era, and spread the message of Ecology, Equity and Economy. As future business managers, you have a huge potential to leave behind a very positive footprint.

Session Plan
• Session -1 - Introduction: A general introduction to Sustainable Development
• Session 3: Economics, Equity and Ecology: selected concepts of ecology, ecological services, industrial ecology, Earth as a Super organism. (Reading: A safe and just space for humanity: CAN WE LIVE WITHIN THE DOUGHNUT? Oxfam Discussion Papers, Kate Raworth)
• Session 5: Planetary Boundaries, Resilience Thinking and Tipping Points. (Reading: Planetary Boundaries: Exploring the Safe Operating Space for Humanity; Johan Rockström et al. 2009)
• Session 6: Climate Change (Reading : Climate change in a nutshell, Owen Gaffney
• Session 7: Biodiversity loss or Biosphere Integrity (Reading : Approaches to defining a planetary boundary for biodiversity, Georgina M. Mace, 2014).
• Session 8: Nitrogen and Phosphorous loading (See Global Nitrogen Pictures and data).
• Session 9: Ozone depletion (Reading : Twenty Questions and Answers, About the Ozone Layer: 2010 Update Coordinating Lead Authors: David W. Fahey and Michaela I. Hegelin)
• Session 10: Land use (Reading : A Meta-Analysis of Global Urban Land Expansion
• Karen C. Seto et al ; Reprint of “Can Earth system interactions be governed? Governance functions for linking climate change mitigation with land use, freshwater and biodiversity protection” ; Måns Nilsson, Åsa Persson). 
• Session 12: Novel Substances (Reading : 5 - 5 Novel Entities)
• Session 13: Aerosol Loading (Reading 5 - 4 Aerosol Loading)
• Session 14 : A Framework of Global Response to Sustainable Development
• Session 15 : Millennium Development Goals
• Session 16 : Sustainable Development Goals (Reading Sustainable Development Goals UN).
• Session 17 : Role to play in environmental management and sustainable development as a person, citizen and manager
Session Plan: Student Faculty

- Sessions 18 : The Paris Convention on Sustainable Development Goals
- Session 19 : Sustainability Literacy Test
- Session 20 : Amrita University – UNAI Seminar
- Session 21 : Current Sustainability issues in Indian Context
- Session 22 : PB & HO course, and Hangouts
- Session 23 : Latest Millennium Ecosystem Assessments
- Session 24 : Review

Evaluation Scheme

- Quizzes / Readings summary: 3 X 5 + 5 = 20
- Sustainability Literacy Test: 10
- Student Session and Term Paper: 10
- Mid-Term Examination: 20
- End Term Examination: 30

- Total Marks: 100

Summary

- Education plays a very significant role, and sustainability education must begin from the kindergarten and continue life-long
- Since the field is full of controversies, the foundation must be laid with scientific facts as Rockstrom says. (Stay clear of controversies)
- Think holistically – like the Doughnut Economics model
- Finally, try to understand that human greed (not want) is at the root of the present crisis.
- Hence solutions must be found by going deeper, by listening to the clarion call by global thought leaders, and we have our Chancellor recommending the fusion of Science and Spirituality for Sustainable Development.

The talks were followed by interactive Q&A sessions, which facilitated development of greater clarity for evolving action items - for design of content, design of pedagogy, alignment with SDGs, incorporation of field work and practical components, sensitization of students and faculty, and holistic perspective to create awareness and knowledge catering to the triple-bottom-line (ecology, economy and equity) - which would then ensure that development addresses all the required dimensions: social, technological, political, cultural, ethical and economic. The seminar was organized under the aegis of the Internal Quality Assurance Cell (IQAC) of Amrita Vishwa Vidyapeetham, by the university's IQAC coordinators, Prof. Sriram Devanathan and Prof. Prashant R. Nair.
PAPER PRESENTATIONS:

INTRODUCTION OF NATIONAL LEVEL COMPETANCY / LICENSING EXIT EXAMS FOR PROFESSIONAL GRADUATES

Sivaram Hariharan, Syamala G, Prudence R, and Ramanathan M

PSG College of Pharmacy, Peelamedu, Coimbatore TN 641004. Email: muthiah.in@gmail.com

Abstract

In recent times, India has transformed itself as a global higher educational hub, thanks to the clairvoyant policies adopted by our founding fathers post independence. A big revolution has swept over the field of Indian higher education and this has resulted in a plethora of institutions (mostly private colleges and deemed universities) which are catering to the increasing demands for seats in various professional disciplines. Moreover, the concept of STEM education as the mantra for the future has also given impetus to more higher education institutions being set up in the fields of Engineering, Health Sciences, Biotechnology, and other STEM disciplines. While this has been a welcome development for the nation, this has also brought along a big problem with potential harmful repercussions: the problem of dilution and falling standards across the board. While India has still elite institutions that offer very high quality higher education, today the nation is also plagued by sizeable numbers of professional degree colleges that abysmally fail in delivering quality education. Many fly by night institutions also prey on the vulnerability of students and cash in unethically on their desire to get a professional degree. In this light, the country risks severe damage to its image, especially regarding the quality of its professional graduates passing out of its various professional institutions. There is absolutely no guarantee regarding the competency of these graduates other than those that come out of the elite established institutions. Therefore, there is an URGENT NEED to implement a MANDATORY national level exit competency / licensing exam to ensure that the professional graduates, regardless of the institutions that they graduate from. This will ensure the minimum standards required for that particular profession and go long ways in improving the educational standards of the country. These exams could also be used as an output measure for the various institutions and become a viable scale in evaluating them. These exams could be online and the graduates could take them any time at their convenience, but within a reasonable time frame as deemed fit for that particular profession. If need be, there could also be a practical / oral evaluation. The test could feature real world problem solving with emphasis on SUSTAINABILITY and also on ETHICS. The sooner this is implemented, the better will be the educational prospects for our future generations as these exams will in one stroke ensure uniformity and more importantly, the much needed quality.

Introduction:
When the founding fathers of this nation laid the first stones of elite higher educational institutions like the IITs post independence with the best of ideals and intentions, little would they have envisioned the behemoth that it has become today [1]. Higher education has become a mighty money churning industry today with private institutions and deemed universities (with notable exceptions) running like smooth and well oiled corporate machines with only emphasis on the bottom line of profits and more profits for their owners and stake holders. Little concern is given for education for the sake of education itself. Of course, increasing costs could be justified to some extent because of ever increasing costs of infrastructure and personnel. But what cannot be justified ever in higher education is falling standards and a lack of ideals in graduates. And certainly, universities cannot become agencies for jobs. Unfortunately, this is what they are becoming when the emphasis is not placed on the merit during admissions but money. Naturally, the customer who pays big money looks for something more in return and creates enormous pressure on the management to dilute standards and allow them to coast through their degrees. This has also lead to the pernicious situation called as degree inflation in almost all fields of higher education [2].

In this rapidly changing world with the triple threats of global warming, climate change, and terrorism, we need a big systems reboot concerning higher education. We need highly skilled graduates who are ethical and more importantly focussed on bringing ecologically sustainable goals for the problems besetting the world today. The triple threats facing the world are not going to go away any soon and require efforts on a war footing to bring them under control, leave alone neutralizing them completely. This is because of the almost unstoppable momentum these triple threats have garnered over decades of apathy.

And what we as humans cannot afford in this context are graduates who have literally purchased their degrees from dubious institutions. Tackling the triple threats mentioned above need high integrity over and above high skills. Therefore, we urgently need a national system which ensures the professional viability of graduates in all professional disciplines. And this system could be in the form of mandatory competency exams. These exams must be rigorous and test the graduates holistically. There could a common paper across all disciplines, followed by an area specific paper. These examinations could be held online and the graduate should be given a time frame of possibly of a maximum of 2 years after graduation. This, in turn, will ensure uniformity of standards and will be an objective measure independent of which institution the candidate has graduated from. Already such exit exams have been envisioned and proposed for the medical and the pharmacy professional degrees [3,4].

**Salient features of this proposed exit test**

- Should be online and be of high standards matching the best international institutions.
- Skill (real world problem solving, ethics, and sustainability based
- Question papers to be formatted both from academia and industry
• 2 papers: one common across all disciplines and other individual area based
• Should be taken within a maximum period of 2 years from completion of undergraduate degree
• Should also act as a foreign equivalency exam
• Should regulate the number of graduates per year as per real world demand. Therefore the passing benchmark for these tests would be correspondingly adjusted just like it is done with the Chartered Accountancy exams.

Advantages of these exit tests:

• Ensures uniformity of standards of exiting graduates just like the CA exams.
• An objective skill based test regardless of the institution the graduate hails from.
• Ensures viable employability
• Mandatory for professional practice as well as becoming eligible for post-graduate studies.
• Raises the standards and respect of the Indian UG professional degree uniformly all over the nation.
• Will act as good outcome measure of any UG professional degree institution and can become an excellent NAAC tool for evaluation of an institution. Could become a gold standard.
• Exam rules and content can be changed as per changing norms and demands of the real world.
• Great platform for Industry / Academia interaction.
• Could be a good regulatory tool on the number of graduates coming out per year for a given professional degree based on real world demand and supply.
• Educational institutions will be encouraged to crank up their standards and genuinely work towards raising the standards of their students.
• Will also be encouraged to espouse the value of ethics and integrity to their students and in turn will become more than fee collecting agencies.
• Will act as a great tool in weeding out dubious institutions that are out there to just make money at the expense of hapless students.
• Those institutions who do not consistently meet set criteria of passing percentage of their graduates in these tests will be put on probation and inspection.
• Will really work against the insidious degree inflation.
Conclusion:

National level competency exams / exit tests for all professional degrees is the need of the hour in the current context. The sooner this system is implemented or at least tabled for discussion the better it will be for the future healthy trajectory of our educational institutions.

References:

COMMUNITY PARTICIPATION IN EDUCATION FOR SUSTAINABLE DEVELOPMENT

O.P.Uma Maheswari, N.R.Neelavathi

Asst.Prof. in Computer Science(Asst. IQAC coordinator), P.K.R. Arts College for Women, Gobichettipalayam, Asst.Prof. in Mathematics(Asst. IQAC coordinator), P.K.R. Arts College for Women, Gobichettipalayam.

“We want that Education by which character is formed, strength of mind is increased, the intellect is expanded, and by which one can stand on one’s feet”

- Swami Vivekananda

Introduction

This paper demonstrates how effective community participation is playing a vital role in the sustainable development in education.

Community participation is fundamental to achieving sustainable development. The community participation and sustainable development are mentioned in legislation, public policy and other strategic documentation.

Community participation and sustainable development are in discussion. Community participation yet has little thought to its contribution to the objectives of sustainable development. The contribution is not well understood, and there is no direct link between or evidence of community participation in achieving sustainable development.

Community based environmental education for sustainable development

A healthy natural environment is the fundamental human development and human survival. The majority of the world population lives below the poverty line and off the natural resource base, which is why the natural resource bases are under serious threat. Due to this reason, Environmental Education (EE) is vital essential. Environmental Awareness must be created through both...
non-formal and formal education methods all over the nation. In general, rural people are articulate and possess a great depth of perception. As an outcome, the rural people have their traditional knowledge and also feel for environmental issues, particularly as these affect their daily lives. But very little formal information about the importance of education reaches the rural population.

Community participation

The terms community involvement, consultation and participation are used. Community involvement or engagement is the over-arching concept of involving the community. The degree of involvement offered various activities range from consultation to participation.

The community is restricted in establishing ownership of problems and gaining opportunities for greater participation and implementation of solutions.

The other one is community participation, where, through the range of activities and methods employed, the community is more directly involved in the decision-making process. This enables a feeling of empowerment and ownership for the community.

Sustainability

Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

In 1990 the Commonwealth Government suggested the following definition for Ecologically Sustainable Development (ESD) in Australia: using, conserving and enhancing the community’s resources so that ecological processes on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.
Trends in community participation that develops sustainability

In Australia and New Zealand, community consultation, has become a common practice in the drafting of legislation. This process is the principle that the public have given chance to voice their opinion on policies and practices that are likely to affect them.

Community consultation is a statutory requirement in many areas of local and state government.

Sustainability outcomes for community participation

The principles of co-operation, building local capacity for change, equal rights and empowerment involves:

- Managing and enhancing the local authority’s own sustainability performance;
- Integrating sustainable development aims into local and central government’ policy and activities;
- Creating awareness raising and education;
- Consulting and involving the public and
- Measuring, monitoring, planning and reporting on progress towards sustainability.

Some potential measures of sustainability are listed below:

- Level of involvement, consultation or participation;
- Planning and education in the area of sustainability;
- How equity gets succeeded in reaching the diversity in the community;
- Nature of the decision making process;
- Integrated approach to decision making;
- Legacy of the project  i.e. is the community left to deal with the outcomes;
• Able to positive influence of the process;
• Project monitoring through independent surveys; and
• As many as mechanisms for community involvement in order to reach as broad an audience as possible.

**Community participation helps to enhance the sustainable development in education**

The Community participation helps to enhance the sustainable development in education by using the following issues:

• Providing detailed information about the project so the community could make valuable decisions;
• Permitting the community to express their own views;
• Involving the community in the choice of a preferred opinion;
• Establishing a Community Reference Group (CRG) for decision making; and
• Employing a wide range of consultation techniques.

The following helps to improve the consultation process:

• Community Reference Group (CRG);
• Community surveys;
• Web site upgradation;
• Getting community input to the Committee;
• Politicians’ opinion;
• Mass media relations.
Conclusions

Trends in community participation and sustainability in education over the past ten years have improved. It can be seen from a small amount of research that the rate and degree to which this improvement has occurred. A lack of potential measures of community participation in sustainability performance was also identified. This provides opportunity for government to develop new criteria for the evaluation of the effectiveness of community participation in achieving sustainability outcomes.

**Let's strive for excellence**

******************************************************************************
UPLIFTMENT OF ENGINEERING EDUCATION ON PAR INDUSTRIAL STANDARDS – TOWARDS SUSTAINABLE LEARNING

S.S.Aravinth, S.Kiruhika, Mrs.T.Dhivya,

AP/CSE, Knowledge Institute of Technology, Salem, ssacse@kiot.ac.in

ABSTRACT:

To enrich the institutional development a number of innovative strategies have adopted. The consultative curriculum should be developed with help of industry experts, which will result in the industry ready students. Industry based curriculum provides the competitive support to the students and hands on training should be given by industry experts. Accreditation is the process of giving higher standards to the institutes which focuses the competency, quality auditing and growth level of the institute in the region. So the objectives and outcome of the syllabus is to meet industry expectations. More over industry internship projects and industries case studies in a periodically manner are to be carried out to shape all the learners.

Institutes care about their enriching workforces in terms of having good potential staffs, so the faculty members supposed to be encouraged by their institutes to do the collaborative works with the industries. That makes the institutes adoptable to different working environments. The staff exchange program will long term development plans and activities to achieve the higher standards. The internship projects will give the entry level for all the students. Hence more number of industrial internships has to be guided. Centre of Excellence with leading industries are highly promoted. As a result of industry collaboration, the academic projects are implemented. Industry training to the students and faculties are highly appreciated by every institute. Through this, the real time projects are carried out. In this paper the strategies for sustainable industry and institute partnerships plans are described. This paper helps to researchers in the area of sustainable industry institute partnerships and development
KEYWORDS:

CURRICULUM AND SYLLABUS DEVELOPMENT, STUDENTS TRAINING, INTERNSHIPS, CENTRE OF EXCELLENCE, STAFF EXCHANGE AND INDUSTRIAL PROJECTS

I. INNOVATIONS IN CURRICULAM DEVELOPMENT:-

INDUSTRY BASED CURRICULUM DEVELOPMENTS

The biggest gap between the education and the industry is not being aware of the current technologies, frequent industrial visit; syllabus has not been framed with the industry expectation. The main change we can do is, Industries Experts and academic experts should join themselves, they should decide the syllabus which should have both the content that each of them are expecting. Then we should find the students with preferred domain for that giving lectures from the corresponding resource persons is necessary.

Once this is done, students can identify their skills, thus what the industry needs. An individual group will be formed for each domain, in which the students will be having their corresponding team members. Special placement team will be formed, identify their strengths and weakness, then fine tune the strengths and try to cut down the weakness(Communication, stage fear, body language)

Then we can give training from any completed or fake projects, where they will be exposed to real time industry environment, by these students will complete minimum 3 to 5 projects before they getting employed. All these projects will be updated in their resume and we can demand the companies that we have number of employee in each specified domain. The lab training should be done in webinar.
## CURRICULUM BASED ON INDUSTRY VERTICALS

<table>
<thead>
<tr>
<th>S.No</th>
<th>Value Added Course</th>
<th>Activities</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Oracle 11g SQL Fundamentals</strong></td>
<td>Certification from Oracle University through Oracle WDP.</td>
<td>Students gain in-depth knowledge in Oracle and they used Oracle as backend in various projects</td>
</tr>
<tr>
<td></td>
<td>• Cloud Infrastructure and Services</td>
<td>EMC CIS Certification from EMC² through ICTACT.</td>
<td>It covers the virtualization concept-physical data centre to classical data centre</td>
</tr>
<tr>
<td></td>
<td>• CISCO CCNA Module I and II(Networking – Routing and Switching)</td>
<td>CISCO Certification</td>
<td>Students understand networking fundamentals with routing devices such as routers, switches and hubs</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Java Programming</strong></td>
<td>Oracle Certified Java Professional in Association with Launch Pad Coimbatore</td>
<td>Provides knowledge and skills in Java which is needed for on-the-job expertise</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Mobile Application Development</strong></td>
<td>To develop mobile Apps in Association with</td>
<td>Makes students to develop mobile app on their own and they upload in internet</td>
</tr>
<tr>
<td>4.</td>
<td><strong>C &amp; C++</strong></td>
<td>Value added courses were conducted to students at regular intervals</td>
<td>Gain knowledge in programming and students do mini projects in C and C++</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Big Data Analytics and Hadoop</strong></td>
<td>Registered for Data Science and Big Data Course will be powered by EMC²</td>
<td>This course makes an impact on students and they developed various final year projects under the topic Big Data.</td>
</tr>
</tbody>
</table>
II. INDUSTRY TRAINING

We can conduct weekly three Sessions and different kind of three applications. Each session will have three hours. The training will be handled by the respected professional of the domain, as we already discussed in curriculum each and every domain students will be monitored by the academic professionals. Every day students work will be (training) recorded in the database, if he or she not utilizing the training properly. Students have to attend the online examination based on the training at the end of each month.
The students will be informed before about the training (topic) where experts will learn them. Two groups will be divided in each domain, one group have to prepare questions for the other group. Every member will be actively participating in the training. By implementing the above strategies we can make more or less an effective employee to the industry.

**STUDENTS TRAINING:**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Types of the Training</th>
<th>Industry Name</th>
<th>No of Students</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Live Project Training</td>
<td>Learn Flow Technologies</td>
<td>60 Students of 15</td>
<td>Developed and Implemented a Full Fledged ERP System for an Organization Nagpur batches</td>
</tr>
<tr>
<td>2.</td>
<td>Course Cum Certification</td>
<td>EMC Corporation</td>
<td>50</td>
<td>Cloud Infrastructure and Services Academic Associate Certification</td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Hands on Training</td>
<td>Wipro</td>
<td>10</td>
<td>Mission10x Technology Learning Centre through UTLP Kit</td>
</tr>
<tr>
<td>4.</td>
<td>Course Cum Certification</td>
<td>Oracle University</td>
<td>21</td>
<td>SQL and RDBMS Training</td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Course Cum Placement</td>
<td>CMC</td>
<td>44</td>
<td>Java Course with Projects</td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Lego Robotics Training</td>
<td>MINDSTROMS</td>
<td>36</td>
<td>To know about the robotics technology and sensor based programming</td>
</tr>
<tr>
<td>7.</td>
<td>IOT Centre of Excellence</td>
<td>Intel FICE Pvt.Ltd,</td>
<td>25</td>
<td>To give the connectivity to the objects through sensor devices</td>
</tr>
<tr>
<td>8.</td>
<td>E Box Training</td>
<td>Amphisoft Pvt.Ltd</td>
<td>100</td>
<td>To enhance the programming skills</td>
</tr>
<tr>
<td>9.</td>
<td>Maximo Training</td>
<td>IBM</td>
<td>02</td>
<td>To train the students through Maximo intelligent suite</td>
</tr>
</tbody>
</table>

Proceedings of NAAC sponsored National Seminar – ISBN# 978-81-924422-8-0
10. Mobile App Development  Learn Flow Edu Guru Pvt.Ltd  52  To develop the mobile applications

11. Big Data Advanced Analytics  Ethna Attributes Soft Solutions Pvt.Ltd  12  To apply analytics skills on large data set

<table>
<thead>
<tr>
<th>S.No</th>
<th>No of Faculty</th>
<th>Nature of the Event</th>
<th>Topic</th>
<th>Venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>3 Faculty Members</td>
<td>Mission10x Training Program</td>
<td>Leadership Skills</td>
<td>Wipro Technologies Pvt.Ltd Bangalore</td>
</tr>
<tr>
<td>2.</td>
<td>5 Faculties of CSE</td>
<td>Advanced Mission10x Program</td>
<td>Interpersonal Skills Trained by Wipro Technologies</td>
<td>Knowledge Institute of Technology</td>
</tr>
<tr>
<td>3.</td>
<td>30 Faculties of CSE</td>
<td>Mission10x Program</td>
<td>Activity Based Learning Methodologies</td>
<td>1. Vellore Institute of Technology 2. KIOT</td>
</tr>
<tr>
<td>4.</td>
<td>1 Faculty</td>
<td>Software Development Training</td>
<td>Maximo Software</td>
<td>IBM</td>
</tr>
<tr>
<td>5.</td>
<td>5 Faculties of CSE</td>
<td>Training on Soft Skills</td>
<td>Presentation Skills</td>
<td>Zeal Technologies</td>
</tr>
<tr>
<td>6.</td>
<td>7 Faculties of CSE</td>
<td>Training Cum Certification</td>
<td>Cloud Infrastructure and Services</td>
<td>EMC Corporation</td>
</tr>
<tr>
<td>7.</td>
<td>3 Faculty of CSE</td>
<td>Training on Networking</td>
<td>CISCO Certified Network Administrator</td>
<td>Amirtha University</td>
</tr>
<tr>
<td>8.</td>
<td>3 Faculty of CSE</td>
<td>IOT Training through COE - IOT</td>
<td>Fundaments of IOT</td>
<td>Knowledge Institute of Technology</td>
</tr>
</tbody>
</table>
III. STAFF EXCHANGE PROGRAM

   Staff Exchange is process of swapping faculties into different locations like industry sector, Research field and Education field. By this, that particular staff can get the insight in their respective domain and so on. It is a great way to develop our career.

   Consider a person is working in a Research field; he/she has to think more to develop a new idea in the world for that they have to communicate with all the people. By that they may get much contact. And their lifestyle may change according to the research field. He/she will see all things in the way of how they get developed, by this they may have an own experience of their concept.

   By working in the different sectors they may have improved a lot in their academic and in their personal life. He/she gets any trouble; they stay cool and solve that particular problem. They will be very good in problem solving. And they become an optimistic person. They can lead everyone to success.
Overall advantages of Staff Exchange

- A great way to develop your career
- The status of the person will be improved.
- The knowledge will be improved.
- The college will provided the very good platform to teach
- Confident level of the staff will be improved.
- He/she Establish a good network of new international and national contacts
- He/she can set a strong basement of teaching
- He/she can manage work stress.
- Their job will be a secured one.
- Salary will be incremented
- They will become a good leader

STAFF EXCHANGE PROGRAM

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of The Faculty</th>
<th>Nature of the Event</th>
<th>Topic</th>
<th>Venue</th>
</tr>
</thead>
</table>
| 1.   | Prof.K.Ravikumar  
Asso.Prof / CSE  
KIOT | Industry Training –  
Training to Trainer  
Approach | Mission10x Technology  
Learning Centre UTLP Kit  
Training | Wipro Technologies  
Bengaluru |
| 2.   | Mr.Karthick Ragupathy  
CEO – Learn flow Technology | Project Guidance | ERP Packages | KIOT |
| 3.   | Prof.J.Gowrishankar  
AP / CSE | FICE Training | An Interactive Session on  
IOT product | FICE Education Career Private  
Limited, Bangalore |
4. Dr. V. Kumar  
   Prof-Head/CSE  
   Round Table Conference  
   One Day Round Table Conference on Intel Higher Education Program  
   Hotel Leela Palace, New Delhi

5. Prof. M. Ramkumar  
   AP / CSE  
   Prof. M. Babu  
   AP/CSE  
   OFS Training  
   Basics on Java  
   Object Frontier Solutions

6. Prof. I. Rajesh  
   AP / CSE  
   Prof. M. Babu  
   AP/CSE  
   Prof. J. Gokulraj  
   AP/CSE  
   Learn From Campus  
   Programming Languages  
   Tech Mahindra Ascendas tech park

IV. STUDENTS INTERNSHIPS

Industry based job oriented training based on the customer requirements is called internship. Various students have been offered internship training by different companies. That list is enclosed here.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Company Name</th>
<th>Company Sector</th>
<th>Date From</th>
<th>Date To</th>
<th>No. of Students</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Inautix</td>
<td>IT</td>
<td>5/1/2015</td>
<td>5/4/2015</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>MaxIT</td>
<td>IT</td>
<td>23-02-2015</td>
<td>23-04-2015</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>MGaze</td>
<td>IT</td>
<td>23-02-2015</td>
<td>23-04-2015</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Citrusus</td>
<td>IT</td>
<td>2/3/2015</td>
<td>2/6/2015</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Snowman Branding and</td>
<td>IT</td>
<td>2/11/2014</td>
<td>1/6/2015</td>
<td>1</td>
</tr>
</tbody>
</table>
V. CENTRE OF EXCELLENCE

a. BIG DATA

Initially BDBI club has been inaugurated followed by Hadoop cluster establishment training were given to the students. Various Hadoop ecosystems have been deployed and seven projects have been completed so far through this facility.

<table>
<thead>
<tr>
<th>Services</th>
<th>Services</th>
<th>IT</th>
<th>Start Date</th>
<th>End Date</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Msposay</td>
<td>Simbus</td>
<td>IT</td>
<td>8/9/2014</td>
<td>8/3/2015</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IT</td>
<td>9/2/2015</td>
<td>9/5/2015</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>E Attributes</td>
<td>IT</td>
<td>22-12-2014</td>
<td>8/4/2015</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Glenwood Systems</td>
<td>IT</td>
<td>7/3/2016</td>
<td>16-03-2016</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Hakuna matata Solutions Pvt.lTd</td>
<td>IT</td>
<td>10/3/2016</td>
<td>2/4/2016</td>
<td>2</td>
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<tr>
<td></td>
<td>TCS</td>
<td>IT</td>
<td>22-06-2015</td>
<td>14-08-2015</td>
<td>6</td>
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<td>OFS</td>
<td>IT</td>
<td>07/3/2016</td>
<td>1/6/2016</td>
<td>5</td>
</tr>
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<td></td>
<td>TM</td>
<td>IT</td>
<td>26-04-2016</td>
<td>28-04-2016</td>
<td>23</td>
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<tr>
<td></td>
<td>Wipro Technologies MTLC</td>
<td>IT</td>
<td>07/01/2015</td>
<td>09/01/2015</td>
<td>10</td>
</tr>
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<td></td>
<td>Intel Pvt.Ltd</td>
<td>IT</td>
<td>25-01-2016</td>
<td>30-01-2016</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Tech Mahindra</td>
<td>IT</td>
<td>29/4/2016</td>
<td>2/6/2016</td>
<td>23</td>
</tr>
<tr>
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<td>22/4/2016</td>
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</tbody>
</table>
## Proceedings of NAAC sponsored National Seminar

### S.NO | NAME OF THE ACTIVITY | RESOURCE PERSON | INDUSTRY
---|---|---|---
1. | Inaugural of BDBI Club | Dr.N.Vijayarangan, Senior Scientist | TCS, Chennai
2. | Hadoop Cluster Creation | Mr.M.Srinivasan, Vice President | Ethna Attributes soft solutions pvt ltd, Chennai
3. | Hadoop Ecosystem and Projects Implementation | Mr.M.Ilamparithi, Senior Software Engineer | YuMe Technologies Pvt Ltd, Chennai

### b. INTERNET OF THINGS

Initially IOT Forum has been inaugurated and interactive session related to product development was given in association with FICE INTEL, Bangalore. Various projects are being implemented in IOT lab in association with INTEL

### S.NO | NAME OF THE ACTIVITY | RESOURCE PERSON | INDUSTRY
---|---|---|---
1. | Inaugural of INTEL | Mr.RAGHAV, National Technical Manager Mr.ABDUL AHMED, Technical Manager | FICE Carrier Education Pvt Ltd, Bangalore.
2. | INTEL Training Program | Mr.Prateek Guptha Mr.Syed Md.Asadur Rahman | INNOVIANS Technologies, Noida.
3. | RASPERRY–Pi Workshop | Mr.Chandan Kumar Verma, Manager. | Roxent Technologies, Nagpur

### VI. COLLABORATIVE ACADEMIC INDUSTRIAL PROJECTS

Today’s generation, Industrial training plays an important role in professional education. For the student, it is the platform to understand and apply practical application what they learnt in class. It gives the students, how their work environment will be when
they join the company. It plays an important role for the student who are preparing for professional career. Internship programs in organization allow students to develop various skills, exposure to the company and innovative ideas into the work environment. The organization provides hands-on training to the students. So, the Engineering colleges can make mandatory in curriculum about industrial training and students can get more benefit. It provides various benefits such as

1. It helps students to gain various functionality involved in industry.
2. To understand both pros and cons of industry.
3. To enhance their interpersonal skills, leadership, attitude, communication and presentation skill.
4. It helps them to gain real time experience.
5. They can predict the future trends.
6. It helps the students to enhance current technology.
7. Industrial exposure helps students on the advanced tools used in the industry.

<table>
<thead>
<tr>
<th>S.NO</th>
<th>NAME OF THE CLUB</th>
<th>INDUSTRY</th>
<th>NAME OF THE PROJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Association Appz Developers Club</td>
<td>Delflip Edusense Pvt. Ltd Haryana</td>
<td>Mobile Application Development</td>
</tr>
</tbody>
</table>
| 2    | Association Appz Developers Club     | Learn Flow Eduguru Technologies Pvt.Ltd Nagpur,Maharastra | Web Application Development  
1. Exam Hall Seating Arrangement using PHP  
2. KIOT Alumni Web portal  
3. KIOT Project Management portal |
| 3    | Big Data Big Insight Club           | Ethna Attributes Soft solutions Pvt.Ltd Chennai | 1. Polling Analysis System using Map Reduce Frameworks in Hadoop Environment  
2. Hadoop Intranet Setup using WIFI technology |
| 4    | Big Data Big Insight Club           | Snowman Branding and Services      | Recommendation System Creation for Tourism Management                             |
| 5    | Big Data Big Insight Club           | YuMe Technologies Pvt.Ltd, Chennai  | 1. Twitter Sentiment Analysis  
2. Data Processing environment setup for unstructured data using HBASE |
CONCLUSION:

It will be very good if the travel between industry and institute partnerships will go a long. Industry institute partnership will give the focused deeper insight of technology advancements. In this paper we are addressed the academic enriching process through the above mentioned topics such as curriculum, industrial projects, accreditation, training, staff exchange and rankings. The institution development and growth are based on the industry partnerships and industrial trainings. The industrial projects can deliver more exposure for students and teachers. Industry based live trainings; live projects and incubator centres play a major contribution on institutions growth. Industry based Hands on trainings will give more insight of industries projects to the students. So here with, we conclude this paper by simply saying that industry institute partnership will give more boons to the institute and industry.

REFERENCES:-

INSTIGATING THE POTENTIAL OF COMPUTATION THROUGH VEDIC ALGORITHMS - APPLICATION OF ‘EKANYUNENA PURVENA’ SUTRA

Dr. Smitha S.
Assistant Professor, Sree Narayana Training College, Nedunganda, Varkala, Thiruvananthapuram, Kerala

Abstract

The present day’s education, though has undergone a radical change, with the development of modern science and technology, especially the computers, much needs to be done on the holistic approach to education, which can evolve personality. Today, in majority of the cases, mathematics is considered to be a dry subject and still notion exists that it is only for the intelligent. Many dread mathematics, because the teachers themselves teach in an unimpressive way and the joy of making learning of mathematics a pleasurable experience is almost lacking. This is found right from the school to the college level. In this regard, Vedic/Ancient Indian Mathematics with its wonderful concepts, methods and techniques, which have stood the test of time, comes in handy for imparting a holistic, creative education in mathematics. The present study tries to popularize the specialty of the Vedic approach which provides wonderful opportunities for the development of the innovative and research faculty of the young students. The findings of the study emphasize the immediate inclusion of Vedic Mathematics applications in the present curriculum for grooming our students in order to achieve success in their future life by completely reducing their mathematics anxiety which is the basement of their skill in computation and decision making. The present paper tries to create awareness about the vast potential of the Vedic/Ancient Indian Mathematics ‘Ekanyunena Purvena’ in multiplication with 9’s.

Key Words: ‘Ekanyunena Purvena’, computation

Introduction

The purpose of education has been to develop well moulded, well informed and well equipped citizens of the society with a view to contribute to physically and technically embodied human capital. A certain amount of mathematical ability is considered as a prerequisite to develop the essential skills in this respect. Any person can get on very well without being formally educated or learned. However, it is difficult for one to pull on without having the basic capabilities in Mathematics such as knowing how to count or calculate. Education can create knowledgeable, productive, value-oriented individuals capable of contributing their skills and knowledge for their own happiness and for the well being of the society. The individuality of the child does not grow in a vacuum; he must draw the strength and sustenance from the interaction with everything in the world around. Just as proper education aims at developing capabilities for making children self reliant in life,
Mathematics education should aim at developing capabilities for making them self reliant in Mathematical problem solving. Mathematics is an interesting subject if student participation is ensured in its learning.

Many of our students consider Mathematics a very difficult subject. The condensed forms of mathematical theories are not palatable to a large section of the student body. The established methods of mathematical calculations have been moulded over centuries. Learning mathematics becomes a herculean task when the student is not familiar with the basics and without training in the proper method for the formation of ideas. The repetitive nature of exercises in order to gain proficiency in mathematical calculations makes the learning of Mathematics uninteresting”. Learning Mathematics is an unpleasant experience to some students mainly because it involves mental exercise.

**Vedic Mathematics**

Vedic Mathematics is a perfectly adaptable practice for enhancing speedy computational skills and mental calculation. The property of numbers is very extensively exploited in the Vedic Mathematics particularly in the field of computations. The system reflects the rich treasure of Mathematics cultural heritage of India. The present study tries to popularize the speciality of the approach which provides wonderful opportunities for the development of the innovative and research faculty of the young students. The findings of the study emphasize the immediate inclusion of Vedic Mathematics applications in the present curriculum for grooming our students in order to achieve success in their future life by completely reducing their mathematics anxiety which is the basement of their skill in computation and decision making.

**Vedic Sutra of ‘Ekanyunena Purvena’**

‘Ekanyunena Purvena’ sutra is used for some types of multiplications. The numbers closer to the base 10, 100, 1000 etc are easily worked out in one line. Sutra deals with a special case of multiplication with 9’s. The sutra provides for multiplications wherein the multiplier digits consist entirely of nines and it also explains the procedures when the number of digits in the multipliers differs.

This we can use for problems which use identities in application for their arithmetical operations. Here we consider different identity applications. Viz.

**Example -1: 68 × 99**

**Step 1**

<table>
<thead>
<tr>
<th>68</th>
<th>×</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td></td>
</tr>
</tbody>
</table>

Here the Purva (Previous) is 68.

One less than Purva is the left part of answer.
Here 68 – 1 = 67

Step 2

Write the complement (Nikhilam) of Purva as right part of answer

Complement of 68 is 32.

67 /32 Hence answer is 6732

Need and significance of the study

“It is a matter of great concern and serious consequences that the result of Mathematics in the AISSE Exam at the end of class X and AISSCE exam at the end of class XII conducted by CBSE is falling at an alarming rate every year” (NCERT, 2010). “For the engineering entrance examination, the grade point of Mathematics is to be reduced to 45%” (Hindu Daily, November, 2013). It leads to an observation that our present Mathematics understanding fails to achieve the major objective of Mathematics education, namely, attainment of self-reliance in Mathematics. Lack of understanding of the subject would create backwardness and phobia in the students. The result is that the students are not only scared but would also develop disgust for the subject. Even at the school stage where the objective of mathematics teaching is to develop computational ability of the students, it is doubtful whether the aim is being transferred as expected. Surely, it is not because of the fault of anyone who deals with the subject, but the system which we follow even today is perfectly “Conceptual Based” rather than “Computational Based”. The incorporation of Vedic Mathematics and the present Issue based approach make the system both conceptual and computational based which is the need of the hour. The present study focuses on enhancing computational ability of secondary school students through conceptual cum computational approach by incorporating Vedic Mathematics ‘Ekanyunena Purvena’ Sutra in the prevailing issue based strategic approach.

Purpose and Method of study

The present study aims to test the effectiveness of a Learning Package of Vedic Mathematics prepared with the application of ‘Ekanyunena Purvena’ Sutra for enhancing Computational Ability among Secondary School students in the area of ‘Multiplication of Numbers with 9s’. The investigator selected the Non-equivalent Pre test-Post test Control Group Design (Gay, 1987) which is one of the strongest of the Quasi Experimental Designs.

Population and Profile of the sample

The sample for the study was selected on the basis of ‘cluster sampling technique’, consisted of Secondary Students (Class VIII) of select schools of Thiruvananthapuram and Kollam districts (N=240).
Methodology and Instrumentation

The tools used for the study were

1. Learning Package prepared on Vedic mathematics ‘Ekanyunena Purvena’ Sutra for easy multiplication.
2. Computational Speed Test developed and standardized by the investigator.

The Computational Speed Test was initially administered to the groups as Pre-test and the scores were used for comparing. Experimental group was exposed to treatment of Vedic mathematics and the control group was given with the existing system of computation. At the end, Post-Test was administered and the scores were collected. There were 20 items in the Speed Test. Time taken for the first item by each student was carefully noted by the respective invigilators. The procedure continued until the 20th item was finished. The total time taken by each student to complete the whole test was calculated using individual time score. After an interval of 1 month, a retention test was given without any notice. The same tool was used for administering the retention test. The scores obtained by both experimental and control groups were collected. The effectiveness of the package was tested by comparing the pre test-post test scores of the test using appropriate statistical technique like ANCOVA, Repeated ANOVA, LSD test of post hoc comparison and interpreted accordingly.

Data Analysis

Effectiveness of the Learning Package of Vedic ‘Ekanyunena Purvena’ in enhancing Computational Speed of the students of Secondary Schools (Using ANCOVA)

The Scores on Computational Speed Test were taken separately and analyzed statistically using ANCOVA to determine the effectiveness of the prepared Learning Package of Vedic Mathematics in enhancing computational speed of the students of secondary schools. Mean and Standard Deviations of both post test scores and retention test scores were found out to compare the computational speed of the experimental and control groups. The details are given in Table 1

Table 1.

Mean and Standard Deviations of Computational Speed scores in Post and Retention Tests of Secondary School students in experimental and control groups

<table>
<thead>
<tr>
<th>Test</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Test</td>
<td>Experimental</td>
<td>120</td>
<td>8.10</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>120</td>
<td>14.17</td>
<td>3.69</td>
</tr>
<tr>
<td>Retention Test</td>
<td>Experimental</td>
<td>120</td>
<td>10.00</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>120</td>
<td>15.81</td>
<td>3.93</td>
</tr>
</tbody>
</table>
Table 1 conveys the fact that the mean of experimental group in the post test (8.10) is lower than that of the control group (14.17). Again in the retention test, the mean of experimental group (10.00) was lower than that of the control group (15.81).

The Table 1 reveals that the mean scores of experimental group in both the post and retention tests were lower than those of the control group while considering the computational speed of students. In order to find out whether the difference in the test scores is significant, the adjusted mean scores obtained by these groups in both the tests were compared using the technique of Analysis of Covariance (ANCOVA) and the obtained F-value was tested for significance using the covariate as the pre-test. The results of the analysis are given below in Table 2.

<table>
<thead>
<tr>
<th>Test</th>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Squares</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post test</td>
<td>Pre Speed</td>
<td>254.90</td>
<td>1</td>
<td>254.90</td>
<td>41.53**</td>
</tr>
<tr>
<td></td>
<td>Between Groups</td>
<td>2437.44</td>
<td>1</td>
<td>2437.44</td>
<td>397.14**</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>1454.57</td>
<td>237</td>
<td>6.14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corrected Total</td>
<td>3917.73</td>
<td>239</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retention Test</td>
<td>Rt Rt Speed</td>
<td>129.22</td>
<td>1</td>
<td>129.22</td>
<td>17.83**</td>
</tr>
<tr>
<td></td>
<td>Between Groups</td>
<td>1474.75</td>
<td>1</td>
<td>1474.75</td>
<td>203.53**</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>1717.29</td>
<td>237</td>
<td>7.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corrected Total</td>
<td>3200.25</td>
<td>239</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**significant at 0.01 level

In the post test, the obtained F-ratio for the Between Groups is 397.14 (F(1,237) = 397.14, p < 0.01). This indicates that the mean difference between experimental and control group is statistically significant. In the retention test, the obtained F-ratio for the between groups is 203.53 (F(1,237) = 203.53, p < 0.01) which again reveals that the mean difference between experimental and control group is statistically significant even in the retention tests. It can therefore be concluded that the prepared Learning Package of Vedic Mathematics on Multiplication using ‘Ekanyunena Purvena’ is effective in enhancing computational speed of students at secondary level.
Table 3
Mean values and Standard Deviations of computational speed scores in pre, post and retention tests of secondary students in experimental and control groups

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Experimental</td>
<td>120</td>
<td>17.71</td>
<td>3.48</td>
</tr>
<tr>
<td>Post Experimental</td>
<td>120</td>
<td>8.10</td>
<td>0.88</td>
</tr>
<tr>
<td>Retention Experimental</td>
<td>120</td>
<td>10.00</td>
<td>0.18</td>
</tr>
<tr>
<td>Pre Control</td>
<td>120</td>
<td>16.13</td>
<td>3.46</td>
</tr>
<tr>
<td>Post Control</td>
<td>120</td>
<td>14.17</td>
<td>3.69</td>
</tr>
<tr>
<td>Retention Control</td>
<td>120</td>
<td>15.81</td>
<td>3.93</td>
</tr>
</tbody>
</table>

Table 3 shows that the mean of retention test scores of the experimental group (10.00) was lower than that of the pre test (17.71) of the group. But when compared to the control group retention score (15.81), the mean of retention test scores of the experimental group (10.00) was much lower.

Table 4
Summary of Repeated ANOVA of Computational Speed scores in pre, post and retention tests of secondary school students in experimental and control groups

**Significant F-ratios of both groups (F(2,238) = 716.95, p < 0.01; F(2,238) = 15.14, p < 0.01) indicate that there is significant difference among the three sets of speed tests in both groups.t at 0.01 level**

Table 5
Results of LSD Test for significance between pairs of Computational Speed Test of

**Test for significance mean scores of Speed Test of**
secondary school students of the experimental group

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Pairs</th>
<th>Mean values</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-Experimental</td>
<td>17.71</td>
<td>9.61**</td>
</tr>
<tr>
<td></td>
<td>Post-Experimental</td>
<td>8.10</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Pre-Experimental</td>
<td>17.71</td>
<td>7.71**</td>
</tr>
<tr>
<td></td>
<td>Retention Experimental</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Post-Experimental</td>
<td>8.10</td>
<td>1.90**</td>
</tr>
<tr>
<td></td>
<td>Retention Experimental</td>
<td>10.00</td>
<td></td>
</tr>
</tbody>
</table>

** Significant at 0.01 level

Discussion

When the results of Analysis of Covariance of post-test scores on Computational Speed Test of participants in the experimental and control groups were taken, the difference between the means was found to be statistically significant (\(F_{(1,237)} = 397.14; p < 0.01\)). The Analysis of Covariance of Retention test scores in Computational Speed Test of experimental and control groups showed significant difference between the means (\(F_{(1,237)} = 203.53; p < 0.01\)). Research on the effects of Vedic Mathematics on improving Computational Speed includes the works by Nicholas, Williams & Pickles (1984), Hope (1987), Muchlman (1994), and Haridas (2004) who concluded that “Vedic Mathematics provides very easy, one line, mental and superfast methods”.

Findings

1. The Vedic Method of ‘Ekanyunena Purvena’ Sutra for Multiplication is effective in improving Computational speed of secondary students

2. The application of ‘Ekanyunena Purvena’ Sutra is more effective than the existing system of Mathematics instructional procedure in improving computational speed in Multiplication of numbers.

3. The Vedic ‘Ekanyunena Purvena’ Sutra for Multiplication is effective for the Secondary School Students in retaining their Computational Speed.

Conclusion

This study clearly supports the skilful application of Vedic Mathematics in our secondary Mathematics classes. During the study, it has been seen that, a majority of students tended to work large portions, or an entire problem,
mentally. This is a shift away from the concrete procedures and representations towards more abstract mental procedures and representations. Also, with this shift toward more self-referral computation, results indicated that mental processing of mathematical information, affective enjoyment of calculating, and the percentage of problems worked correctly, all improved. That is speed, and ease of computation improved and the number of perceived steps became less. This indicates a holistic improvement in computation.

References

***********************************************************************************************************************************************
ROLE OF TEACHER EDUCATORS IN PROMOTING INNOVATIONS IN CURRICULUM – AN ANALYSIS
Dr. M. Savitha Pande
Principal, Amrita School of Education, Mysuru, Amrita Vishwa Vidyapeetham University, savithapande@yahoo.co.in, 09731739996

ABSTRACT

This is a thematic paper, which attempts to analyse the Curriculum suggested by NCTE for Two Year B.Ed Programme. For the development of Nation’s economy, Curriculum development plays an vital role. Wherein it creates lot of employment opportunities for our students in the global market. It also attracts foreign students to seek admissions in our Universities, which in turn will facilitate to improve both the status of University in specific and Nations’ economy in general. Ground work has already been laid for sustainability across the Nation. Various approaches to sustainable development through education encouraged people to understand the complexities and assess their own values and those of the society in which they live in the context of sustainability. The guidelines suggested by NCTE to formulate curriculum mainly focuses on elevating our education system to the global standard. Considering the complexity and significance of teaching as a professional practice, it felt that it is imperative to raise the entire enterprise of teacher education to University level and also to bring greater convergence between professional preparation and continuing professional development of teachers. The Education Commission (1964-66) has emphasized on this point almost six decades in advance with the all time acceptable statement “the destiny of India is now being shaped in her class-rooms”. Who are all inside the class-room and what they are discussing reflects on our Nation’s progress. Hence this paper mainly focuses on Teacher Educator’s role in developing Curriculum and also to introduce innovative practices during the formulation of curriculum and also during its transaction. The Sample group is mainly the Teacher Educators who have shouldered the responsibility of preparing humane teachers.
ROLE OF TEACHER EDUCATORS IN PROMOTING INNOVATIONS IN CURRICULUM – AN ANALYSIS

“Educationists should build the capacities of the spirit of inquiry, creativity, entrepreneurial and moral leadership among students and become their role model”. A. P. J. Abdul Kalam

Introduction

Education is considered as an essential tool for achieving sustainable development. Curriculum development plays a vital role in improving the economy of a country and also for sustainable development. Country’s economy can improve the people’s way of life through curriculum development. Education for Sustainable Development (ESD), Education for Sustainability (ES) and Sustainability Education (SE) are all interchangeable terms describing the practice of teaching for sustainability. Practice of teaching mainly focuses on Societal demands, formulation of need based Curriculum, teachers who gives life to curriculum and finally the learners who are considered as Nation builders. Ground work has already been laid for sustainability across the world. Various approaches to sustainable development through education encouraged people to understand the complexities and assess their own values and those of the society in which they live in the context of sustainability.

National Policy on Education 1986 emphasized that, “The Status of the teacher reflects the socio-cultural ethos of the society; it is said that no people can rise above the level of its teachers.”

The Education Commission (1964-66) report emphasized that “the destiny of India is now being shaped in her class-rooms” These statements holds good even today in the present scenario of Education system. Both the reports have clearly focused on the role to be played by the teachers: i) as inspirers in inculcating human values in the children who are considered as future citizens of our Nation.

   ii) as transmitters of knowledge

   iii) promoters of Secular Nation’s Culture and Tradition.

Teacher is considered as a ‘Maker of Man’, torch bearer of the future of mankind and Nation builder. Teacher is the most important element in the educational process. Teacher awakens the mind fully, allows one to manifest, stimulates the spirit within,
awakens consciousness and radiates into thought and action of the individuals. In the eyes of the student the teacher is a role model in all respects. The teachers have been called up to equip themselves to meet the challenges and aspirations. Since education is a dynamic process it is inevitable for the teacher to be dynamic himself through self development.

Education as an essential tool for achieving sustainable development does not mean that we need to merely impart knowledge to the learners in certain subjects. We also should develop in them good habits and attitudes with which they may successfully face the future and at the same time preserve the traditional values which will safeguard their future further. Who should take the responsibility of instilling this knowledge in them should be decided by the concerned authority. When we speak of knowledge even a lay man could say that it is the responsibility of both school and teacher to impart knowledge to children. Knowledge can be acquired both through formal and informal ways and means. But when we speak of Curriculum, a systematized way of imparting knowledge should be planned through formal system of education. The next question is who has to formulate the curriculum? Who are those experts who can be involved in formulation of the curriculum? This paper is going to focus on Teacher Educators, Curriculum and Innovations.

**Need and Importance of the study**

The main concern of this paper is to study the curriculum innovations that can be planned by teacher educators to facilitate sustainable education and to investigate the ways by which teachers transform these innovations while putting them into practice. These innovations in turn will lead to the construction of appropriate teacher training materials that can be used in order to impart quality education and also to create motivation and interest among learners.

Two significant developments particularly the National Curriculum Framework 2005 (NCF 2005) and the National Curriculum framework for Teacher Education (NCFTE 2009) have discussed in elaboration the concerns necessary for qualitative improvements to be brought in the entire education system which includes Teacher Education as well. These two frameworks have touched upon all stages of education. The NCFTE 2009 has elaborately discussed upon the new concerns of school curriculum which includes the issues related to inclusive education, perspective for equitable and sustainable development, gender discrimination, role of interaction with the community and its impact on education, usage of ICT both during pre-service and in-service stages and also at schools.
these issues have been considered as prime important. Apart from all this, the main focus of (NCFTE-2009) is to prepare a humane teacher and make possible the teacher to build a sustainable society by imparting quality education. Considering all these major concerns and issues a new approach to teacher education curriculum has been highlighted by National Council for Teacher Education (NCTE).

**NCTE and its Role in Teacher Education Programmes:**

In pursuance of the National Council for Teacher Education Act, 1993 (No. 73 of 1993) on the 17th August, 1995 the National Council for Teacher Education as a statutory body came into existence. The main objective of the NCTE:

- is to achieve planned and coordinated development of the teacher education system throughout the country.
- to prescribe Norms and standards for the teacher education programme.
- lays down guidelines for intake of students, eligibility, admission procedure and fees, programme implementation, staff qualification, infrastructure etc.,
- the mandate given to the NCTE is very broad and covers the whole gamut of teacher education programmes including research and training of persons for equipping them to teach at pre-primary, primary, secondary and senior secondary stages in schools, and non-formal education, part-time education, adult education and distance (correspondence) education courses.

As we all are very much aware that until 2014 the B.Ed programme duration across the Nation was One Year. Lot of speculation were in progress for past so many years under various committees formed by experts to change the entire Curriculum of Teacher Education programme along with the duration.

Finally, NCTE by following the recommendations of the Justice Verma Commission (JVC) appointed by the Government at the instance of the Hon’ble Supreme Court of India notified the revised Regulations 2014, along with Norms and Standards for 15 programmes on November 28, 2014 under Government of India Gazette Notification No.346 (F.No. 51-1/2014/NCTE/N&S) The JVC had suggested wide range reforms in Teacher Education which the new Regulations 2014 have addressed. The new Regulations are an outcome of wider consultations with stakeholders undertaken by NCTE. For important highlights of Regulations 2014.

Based on Justice Verma’s report NCTE has come out with an Modern Curriculum Framework for Two-Year B.Ed Programme. It has recommended/insisted all the recognized and existing teacher education Institutions across the Nation to follow the suggested common curriculum prescribed by NCTE.
Two Year B.Ed programme prescribed by NCTE

The course structure offers a comprehensive coverage of themes and rigorous field engagement with the child, school and community. The programme is comprised of three broad inter-related curricular areas-I) Perspectives in Education II) Curriculum and Pedagogic Studies and III) Engagement with the field. Engagement with the field is the curricular component that is meant to holistically link all the courses across the programme, while it also includes special courses for enhancing professional competencies (EPC) of the student teachers. Transaction of the courses is to be done using a variety of approaches, such as, case studies, group presentations, projects, discussions on reflective journals, observations of children, and interactions with the community in multiple socio cultural environments.

Constructivism

Constructivism is a strategy of learning which mainly focusses on students existing knowledge, beliefs, and skills. With this approach, learners synthesize new understanding from his prior learning and new information. In this process the teacher sets up problems and monitors learners exploration, guides their inquiry and promotes new patterns of thinking. Finally learners begin to think of learning as accumulated, evolving knowledge. Constructivist approaches work well with learners of all ages, including adults.

NCF 2005 wants the teacher to be a facilitator for child’s learning. Wikipedia defines ‘facilitator’ as someone who helps a group of people understand their common objectives and assists them to plan to achieve them without taking a particular position in the discussion. The teacher, who is a variable in the classroom context, is charged with the function of acting as an intermediary between the variables outside the classroom and the students and to assist the students in their learning (Tyler 1992) Hence teachers tend to play an active role throughout the learning process of any student. Teacher should facilitate the child to scaffold the existing knowledge. The teacher should help the children to construct knowledge and meaning on their own. Five- E model of learning has been suggested by NCF 2005. Engage, Explore, Explain, Elaborate and Evaluate.
Innovations in Curriculum

How to make it possible in the Curriculum?
How to connect the societal needs with the child’s education?
What are the different ways of introducing innovative practices?

Curriculum is the totality of experiences the learner use to gain both from planned formal curricular/academic and co-curricular activities during his stay in the school. Innovations in Curriculum can be defined as deliberate actions to improve or influence positively a learning environment by adapting a method of presenting material to learners which involves human interaction, hands-on activities and learner feedback. Changes in curriculum may involve innovation, adapting a new educational method and it is not necessary all the time to adapt a method with human interaction. When curriculum innovation or change is made in the classroom, it can enhance the social skills of students and focus on unique methods for teaching historical, technological, organizational or political lessons. An innovative lesson may encourage students to use online tools, multimedia software applications or hands-on lab experiments and outdoor archeology adventures.

Teacher Educators Role in Curriculum Innovations

According to the social constructivist approach, instructors have to adapt to the role of facilitators and not teachers (Bauersfeld, 1995). Where a teacher gives a didactic lecture that covers the subject matter, a facilitator helps the learner to get to his or her own understanding of the content. Teachers need to understand their personal theories as they influence the way they proceed with their teaching (Tylee 1992). Curricular programs that are innovative and in demand in the local or global markets, will attract many students not only locally but even from foreign countries. How the teacher educator can plan for innovation during the formulation of curriculum and also during the transaction has been suggested as follows: Teacher Educator should plan for innovative curriculum which gives more scope for the learners to make discoveries with presence of their teachers to serve as a mentor or guide instead of taking the role of the expert who controls the learning.
Valuing diversity: They must accept all students as learners who already know a great deal and who have experiences, concepts, and language that can be built upon and expanded to help them to learn more.

Assign Individual/Group Projects that may include individual self-study. Assignments or group activities that can produce a final product, such as a newsletter, video recording or presentation in the form of reflective journals.

Collaboration between home and school: when teachers know their students well, they can select materials accordingly of their interest and relevance. They can also clarify new concepts by using examples or analogies drawn from the youngsters’ everyday lives. Serve as role models: Teacher educators are in a good position to serve as role models and by this they can instill and develop in them the leadership skills.

Respecting different cultures: Encourage learners to explore and share their own cultural identities. Encourage them to share how it has helped to shape their own lives. Studying the history and literature of the different cultural groups represented by learners in the classes they teach will also yield important insights.

Updating/strengthening Subject matter knowledge. If we want our learners to attain high levels of achievement, teacher educators need not only to well-develop their pedagogical skills but also a deep grounding in subject matter knowledge is required. Without such grounding, teachers’ ability to make content conceptually accessible to students is severely limited.

Curriculum innovation should encourage the learners to resist the norm and think outside of the box to reach all types of learning with individualized styles instead of focusing on lessons that are effective for just a few average students, to gain some better marks without intuitive thinking in a classroom.

Develop coordination between theory and practice: Encourage field visits to give first-hand experience. The main concern of the teacher educator should be to enable learners to make sense of life and develop their potential. Tagore says, we achieve our greatest happiness when we realize ourselves through others. Our teacher educators should make it possible.
The professional colleges should equip the teachers to achieve these objectives during the training period. To do so, teacher educators should be very passionate about their profession, committed, and sincere in inducing all these qualities in the trainees to make learners a good human being.

**Innovative Instructional Practices: Trainees** learn best through active participation in learning tasks; they also make a point of actively engaging participants in their own learning. Through guided reflection on their personal learning, class members gain valuable insight into effective teaching.

Innovative practices that can be adapted to make learning more interesting are as follows:

- Cooperative learning
- Group projects
- Value oriented activities
- Creating interest in spirituality for self management
- Practicing Yoga and Meditation
- Community Activities, participation and services
- Village visits, conducting health awareness programme
- Application of theories learned in courses through field visits.
- Analysis of situations discussed during classroom interaction.
- Analysis of their own classroom teaching.
- Emphasis on learning by discovery rather than by verbal instruction
- Service learning in community settings
- Enhancing ICT skills

**Conclusion**

For achieving sustainable development through education, teacher educator plays an prominent role. The role of the teacher educator is diverse and has several orientations. Teacher educator should promote values that foster peace, humaneness and tolerance in a multicultural society. One such important aspect is to prepare the child to face the challenges of life, make him mentally and emotionally strong along with his physical strength. The suggested Curriculum for Two Year B.Ed Programme by NCTE may
facilitate to achieve these objectives when the Teacher Educators are well oriented about this and discharge their competem

towards their profession.

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**HUMAN CAPACITY BUILDING FOR SOCIETAL CURRICULUM**

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**Introduction**

After 1947, India has become a democratic country. In order to make democracy successful in India, education should make the citizen prepared in all aspect especially mentally. The prime aim of democratic education is to promote in social development of children only through democratic curriculum. The democratic curriculum helps not only in societal development even also in development of democratic citizenship, leadership, personality, vocational efficiency, thinking power, democratic values, internationalism and social outlook. These are very essential for the children successful achieving, only through democratic curriculum that leads to societal development for future citizen of the nation.

**Concept**

**Curriculum** – The term democracy has been derived from two Greek words, namely Demos – the people and cratic- power. The literal meaning of the word democracy is ‘power of the people’ or power of the public.

**USA Association for Supervision Curriculum Development**

“Curriculum programme should be concerned with living and learning conditions in the school and in the community. Planning should be based on the needs of the society and the interests of the pupils.”

**Democratic curriculum** – includes the totality of experience that a child acquires in the four walls as well as outside the four walls on the basis of the democratic principles and values.

**Societal development** –

Social development is about putting people at the centre of development. This means a commitment that development processes need to benefit people, particularly but not only the poor, but also a recognition that people, and the way they interact in
groups and society, and the norms that facilitates such interaction, shape development processes and Progress toward an inclusive society.

Democratic curriculum has been constructed on the basis of the following democratic principles and values:

**Democratic Principles**

**Freedom:** It includes freedom of thoughts, expressions, belief, faith and movement. It helps in every individual to develop his/her personality.

**Equality:** Education should be given to all children equal to their inborn capacities, irrespective of their caste, creed, gender, location, linguism, politicalism and economic status.

**Equity:** The term equity refers to the principle of fairness. While it is often used interchangeably with the related principle of equality.

**Fraternity:** Democratic philosophy of life develops feeling of brotherhood and group living and each individual receives proper respect in the society.

**Justice:** It emphasizes that all are equal before the eyes of law and the rules of the state.

**Democratic Values**

**Faith in change:** It always changes in social, Political and economic aspects. A democratic has a scientific attitude towards life and believes in change for developing a better society.

**Social service:** Through individual’s active participation in civic life and the community can give maximum service to each individual member.

**Individual and social progress:** The individual is for the society and the society in turn promotes the good of the individual and to achieve development and maximum welfare.

**Respect the dignity of individual:** Each individual is an integral part of the society. He/she should be respected by others for his/her capacities and powers and allowed to flourish without any hindrance from other individuals.
Faith in peaceful: Democracy rejects violence and discrimination and it establishes a peace-loving society.

Democratic curriculum has been constructed on the basis of the following principles:

1. General curriculum: General education up to a certain level is essential so that every citizen in the society can acquire some fundamental tit-bits of knowledge. In India, a general curriculum is adopted up to 10th standard. Every student has to study every subject.

2. Diversified Curriculum: Interests, abilities, aptitudes and needs of children are different. Therefore Diversified curriculum should be followed to suit the needs of all children.

3. Flexibility: Democratic curriculum should be varied and flexible to satisfy the interest and needs of the individual and the society, because the society changes with change of time.

4. Broad based curriculum: It includes manifold activities in order to achieve democratic aims. It provides every pupil the totality of experiences through studying various subjects and participating in manifold activities.

5. Equal weightage to all subjects: It is given to humanities, social science, natural science and formal science to develop social, political and economic awareness.

6. Activity centred: Democratic curriculum stresses on the principle of learning by doing. This enabled the children to search for truth through their own experiments and experiences and prepare children for the future life.

7. Secular curriculum: It is not favour of any religion and treats all religions equally.

8. Need and environment based: Democratic curriculum should be constructed on the basis of local needs and availability of resource according to changing needs of the environment and aspirations of the people which differs from time to time and place to place.

9. Ensure total development of personality: Democratic curriculum brings about physical, mental, psychological, social, emotional, spiritual, economic, political and aesthetic development in the individual personality.
Conclusion

Democratic curriculum for Democracy should become creative and practical and it must strive to inspire students with a burning passion for social justice, to break down the barriers of caste, colour and sex to deepen cultural understanding and sympathy and broaden their intellectual outlook which helps in societal development.

Hence Democratic curriculum is a powerful weapon for societal development.

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HUMAN CAPACITY BUILDING FOR SOCIETAL CURRICULUM

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Introduction: The various studies, organized activities related with curricular and co-curricular and the entire school life and social life and the atmosphere all find their place in the curriculum. Each one is designated to make their contribution towards the attainment of goals of education.

Meaning of Curriculum: The word curriculum derived from the Latin word ‘currere’ means – to run or to proceed.

Definition of curriculum: According to an old concept the meaning of curriculum is ‘A list of reading material’. Reading material is nothing but study subject.

“Curriculum does not mean only academic subject traditionally taught in school, but it includes the totality of experiences that pupil receives through the manifold activities that go on in the school, in the classroom. Library, workshop, playground and in numerous informal contacts between teachers and pupils. In the sense the whole life of the school becomes the curriculum which can touch the life of the students at all points and help in the evaluation of a balanced personality” - Secondary Education commission.

As per the principles of construction of curriculum propounded by the secondary education commission says the curriculum should be related with the community life. So that it may explain its main and important things to the child and it may bring him in contact with its important activities.

According to the recent educational thinking we should consider the following things as base of curriculum. Capability of the child, interest and need etc. Today in India the huge problem faced is national integration. At the time of constructing curriculum we should bear in mind both child and society. During the time of determining the curriculum it is also essential to keep in mind how we can achieve national goals through it. So all three things should be considered, the first one is the child or individual, the second, society and the most important one is Nation.

According to Anderson and Gruhn Organization of curriculum should be based on problems. That emerge in the society that student may get help in development of required attitudes and skills along with they may be able in understanding democratic society.

According to the school of Idealism the curriculum is determined in different forms. Idealism provides a principal place to Fine Art, Music, History, Literature, Language, etc.
According to the school of Pragmatism subjects like Art, Language, Mathematics, Woodcraft, Spinning and weaving, social activities, Vocations etc. must be included in the curriculum.

According to the School of Realism the curriculum should include activities through which knowledge can be obtained in real situations of life.

Sociological base:- According to this, subjects and activities are included in the curriculum which provide assistance in developing appreciation of sociability. From this point of view place is given to Language, History, Literature, Sociology, Geography, Ethics etc. in curriculum.

**Purpose of Curriculum**

**Character Formation:** To lay the foundation for a rich, useful and moral life Later they may do work for the sake of social welfare.

**To preserve National heritage:** We make children capable of understanding their national heritage and having faith in it.

**Healthy Living:** To build healthy habits among children and to develop appropriate mental and emotional points of view and habits.

**Clear thinking and observation:** To develop conscious power based on appropriate hypotheses. The children will differentiate right and wrong or truth and untruth

**Knowledge and skill:** To develop Knowledge and acquire various skills in children according to their ability or caliber.

**Aesthetic feeling and expression:** To develop aesthetic appreciation and creative expression in child for the use of beauty

**Economic and social relations:** To develop appropriate economic and social relations. So that they may lead life in family, School and Society with appropriate manners

**Citizen ship:** To create faith among children for the Indian Republic and a feeling of pride. In addition to this to make them aware of citizens’ rights and duties or responsibilities.

**To develop a reformed curriculum a systematic programme could be evolved.**

It should be containg the following steps

1. Stake holder input at design stages.
2. Work with partners in curriculum development and train them
3. Develop modules with Partners
4. Integrate teaching and research

5. Network with Government and NGO’s

6. Faculty research and collaborative Research

**Conclusion**

Curriculum development is a complex ongoing process, which must constantly change to reflect changes in broader society and to take into account evolving knowledge about learning and developmental processes. Effective curriculum development for adequately meeting learner needs should involve constant reflection, debate and decision-making about what is to be learned and why, how it is to be learned, the roles of teacher and learner in the educational process, the roles of other stakeholders, and the relationship between the school and the community. Regular curriculum renewal is considered increasingly necessary in education systems around the world due to the rapid changes taking place in contemporary society. This world is characterized, among other things, by evermore-rapid technological and scientific development; a growing dependence on information and knowledge as the most important resources for economic advancement; an increasingly globalized economy leading to growing inequality between rich and poor countries; a never greater intermingling of peoples and cultures; severe ethnic, cultural and political conflicts in many countries; and an erosion of traditional value systems in nearly all societies.

Great challenges are posed to the process of curriculum development and reform in today’s society. The rapid pace of change, and the central role played by information and knowledge in development, have led to an ongoing debate about the nature and purpose of learning in school and in society, with the meaning of education being re-examined and redefined. Traditional education has proved to be inadequate for the needs of the ‘post-modern’ society.

Acquiring the four pillars of knowledge learning to know, learning to do, learning to be, and learning to live together is advocated as the desired objective of the educational process, equipping individuals with the knowledge and skills needed to learn throughout life, to be productive and active citizens, enabling continued personal growth, enhanced economic and social development, and fostering social cohesion.

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Abstract

This paper shares the experience to develop a curriculum model for Education for Sustainable Development (ESD) that meets the dual-purpose of (1) satisfying industry requirements with the necessary technical knowledge and soft skills, so that the students are competent in the workplace; and (2) encouraging them to serve the broader needs of society, especially those at the bottom-of-the-pyramid. This represents our response to the initiative of delivering holistic education to our students so that they are “competent, versatile, creative and innovative, imbued with sound values and excel in work and life so as to achieve our Vision of being “Work-ready, Lifeready and World-ready.” We firstly outline key literature on ESD and explore the challenges faced by higher education in meeting the needs of ESD. The need to integrate the use of design thinking and appropriate technology – the former to complement the “Conceive” and “Design” stages, and the latter to support the “Implement” and “Operate” stages of engineering. We explain how we also “mapped” the three elements of design thinking to the three pillars of sustainable development. The paper also shares some of the challenges we faced, namely in scaling-up the learning experience for all students, logistical difficulties, and lack of multi-disciplinarily in student involvement. Finally, we discuss possible future developments to further strengthen our effort in this important curriculum area.

1.0 Introduction

The United Nations had designated 2005-2014 as the Decade of Education for Sustainable Development, giving due recognition that education is “the most effective means that society possesses for confronting the challenges of the future” (UNESCO, 1997). According to UNESCO, Education for Sustainable Development (ESD) aims to help people to develop the attitudes, skills, perspectives and knowledge to make informed decisions and act upon them for the benefit of themselves and others, now and in the future. ESD helps the citizens of the world to learn their way to a more sustainable future. Over the years, although many higher education institutions around the world had responded to the challenge by including sustainable development in their curriculum, the progress had generally been slow. A recent UNESCO report noted that “much of current education falls far short of what is required”; and calls for a “new vision” and “a deeper, more ambitious way of thinking about education” (UNESCO, 2002). Sibbel (2009) attributed the non-attainment of ESD goals to the misplaced efforts in the past, on trying to change consumption behaviour, as well as limitations to relying on consumer action due to various barriers ranging from the very concept of sustainability to limits of human information processing capabilities. There are now renewed calls for reinventing higher education (UNESCO, 2008; AASHE, 2010) using a whole systems approach (Waas et al., 2012) to address the issues of ESD. Shephard (2008) in particular, argued for the need to
include affective domain in ESD, suggesting that “graduates should know about sustainability issues, they should have the skills to act sustainably if they wish to and they should have the personal and emotional attributes that require them to behave sustainably”.

However, there is no universal model of ESD; and nuanced differences according to local contexts, priorities and approaches exist even when there was overall agreement on the concept (De Rebello, 2003). Sterling (2004) identified a range of educational responses to sustainability as shown in Table 1, and advocated the third approach, which he termed “sustainable education.” This constitutes an order of learning higher than that of ESD. He explained the concept as one that is not just a simple add-on of sustainability concepts to the curriculum, but a cultural shift in the way we see education and learning, based on a more ecological or relational view of the world. Rather than a piecemeal, “bolt-on” response which leaves the mainstream otherwise untouched, it implies systemic change in thinking and practice, informed by what can be called more ecological thinking and values – essentially a new paradigm emerging around the poles of holism, systemic thinking, sustainability, and complexity.

Table 1: Three Levels of Education in relation to Sustainability

<table>
<thead>
<tr>
<th>Education about sustainability</th>
<th>First-order learning</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Emphasis is on content/knowledge-based learning within the dominant paradigm</td>
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<tr>
<td></td>
<td>Assumes that meaning of sustainability can be clearly identified and taught as a separate subject Essentially ‘learning as maintenance’ of current paradigm</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Education for sustainability</th>
<th>Second-order learning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emphasis is on ‘learning for change’ that includes content, but goes further to include values and capability bias</td>
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<tr>
<td></td>
<td>Deeper learning: involves critical and reflective thinking about sustainability</td>
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<tr>
<td></td>
<td>Assumed that we know clearly what values, knowledge and skills ‘are needed’ for change and while challenging the existing paradigm leaves it mainly intact</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Education as sustainability (Sustainable Education)</th>
<th>Third-order, transformative learning</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Emphasis is on process and quality of learning, which is seen as an essentially creative, reflective and participative process</td>
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<tr>
<td></td>
<td>Knowing is seen as approximate, relational and provisional, and learning is continual exploration through</td>
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Shift is towards ‘learning as change’ which engages the whole person and learning institution

Process of sustainable development or sustainable living is essentially one of learning, while context of learning is essentially that of sustainability

Sterling (2004) further contended that the role of higher education “…should not be predicated only on “the integration of sustainability” into higher education, because this invites a limited, adaptive, response …we need to see the relationship the other way around – that is, the necessary transformation of higher education towards the integrative and more whole state implied by a systemic view of sustainability in education and society.” Vare and Scott (2007) further made the point that, “sustainable development, if it is going to happen, is going to be a learning process – it certainly won’t be about ‘rolling out’ a set of predetermined behaviours”. Our goal is to steer our education in chemical engineering towards the last type: third-order transformative learning where our students work closely with communities at the bottom of the pyramid to jointly formulate a workable solution for the people who needed help the most. In the process, we also hope to transform our students’ value and belief systems by directly engaging them in the process.

2.0 Sustainable Development skills

The skills and values included in the purposes of any curriculum are in part addressed within SDE as part of three SDE competencies.

2.1 Systems thinking – The ability to understand the links and relationships between issues is vital for understanding the interdependent nature of our world and for addressing the complex problems that increasingly dominate our lives. However despite the fact that systems thinking is easily taught and learned it is not generally taught in schools. Including systems thinking in the revised curriculum will enable pupils and teachers to address problems in a ‘joined-up’ way, linking and applying learning to new situations and to make better sense of the world around them.

This skill is closely related to the Purpose of the Curriculum statements, in particular:

- Make informed choices and decisions
- Evaluate environmental, scientific and technological issues
- Develop informed, ethical views of complex issues
- Apply critical thinking in new contexts

2.2 Reflective evaluation – Changing our behavior is an integral part of moving towards sustainable development. It is therefore vital that pupils are able to assess their own behavior in conjunction with their teachers and peers. Teaching pupils to use reflective evaluation techniques enables them to honestly assess what they have done well, what could have been done better and how they
would do things differently next time, in a way that builds their confidence and ensures that they do not feel they are being criticized. In addition to supporting SDE, including reflective evaluation in A Curriculum for Excellence will also support the development of confident individuals.

This skill is closely related to the Purpose of the Curriculum statements, in particular:

- Develop and communicate their own beliefs
- Assess risk and take informed decisions
- Solve problems
- Make reasoned evaluations

2.3 Participative decision making – The ability to work within a group with wide-ranging opinions and views is a vital component of SDE. Engaging pupils in participative decision making and building their skills in using it ensures that pupils learn to appreciate views that are different from their own. It will encourage the ability to listen to others opinions, to have the confidence both to put forward their own ideas and to change their mind when persuaded by the arguments of others. There is evidence from case studies that shows participative decision making is also extremely effective at buildings pupils’ confidence and motivation for learning. Despite this teachers are not routinely taught these simple and easily used techniques.

This skill is closely related to the Purpose of the Curriculum statements, in particular:

- Work in partnership and in teams
- Take the initiative and lead
- Learn independently and as part of a group
- Relate to others and manage themselves

Learning and Skills for the 21st Century

“Our vision is that by 2010, the UK will be seen as a world leader in developing and deploying management and leadership capability for the 21st century. In all sectors and at all levels, individuals will have the understanding, knowledge and skills they need to enable them to grasp the right opportunities and innovations for the UK in a rapidly changing and interconnected world of market-places, communications, and social and environmental challenges.”

3.0 The Principles of Curriculum Design 3

Sustainable development education has a significant role to play in ensuring curricular balance while in it demonstrating its close compliance with emerging curriculum design priorities.

3.1 Challenge and enjoyment

Sustainable development education –

- Addresses real world issues of local, national and international importance,
- Provides opportunities for positive action by individuals and groups, Involves innovative teaching approaches,
- Encourages use of out-of-classroom learning and firsthand experience, bringing motivational benefits,
- Includes active learning and action research as characteristic learning modes.

3.2 Breadth

Sustainable development education –

- Integrates elements from a wide range of subjects,
- Is an exemplar of the cross-curricular approach to teaching and learning,
- Involves a range of teaching and learning modes.

3.3 Depth

Sustainable development education –

- Provides opportunities for individual and group exploration of ideas and issues,
- Provides opportunities for meaningful personal research,
- Provides opportunities for individual or group research or action in detail.

3.4 Personalization and Choice

Sustainable development education –
• Promotes exploration of choice at a variety of levels, personal, group, school and national,
• Has responsibility, choice and participation as core aspects,
• Provides opportunities for meaningful pupil decision making.

3.5 Coherence

Sustainable development education –

• Is an integrating element, taking learning from a wide range of modes and subject disciplines,
• Provides powerful glue in citizenship, curriculum and the school as a whole.

3.6 Relevance

Sustainable development education –

• Is relevant to all individuals now and in the future,
• Promotes the knowledge, skills and dispositions which are needed by all citizens of the 21st century,
• Is concerned with current national and international issues in the news,
• Can be linked to events in and concerns of the community

3.7 Progression

Sustainable development education –

• Is concerned with a wide range of issues, from the very simple to some of the most complex issues facing society,
• Illustrates a clear progression from local to national to global,
• Requires building on and integrating a wide range of previous experiences.

4.0 Challenges

We also identified other issues and challenges related to engineering and design and these are briefly explained below:

Scaling-up: Hermann (2007) noted that the adoption of a more holistic approach to education for sustainability is also likely to demand that consideration be given to the environment in which students engage in the learning process. We certainly want to introduce our students to more out-of-classroom learning, which will make the learning process more authentic; an approach that had
been proven to be more engaging and resulted in enhanced learning. Currently our approach involved only several groups of students in their Final Year Projects, numbering around 6-9. We need to extend the experience to the rest of the cohort of students. This presents challenges in not just getting enough sustainability-themed projects for them to work on, but also sufficient number of local communities to accommodate them all.

Various researchers had suggested that sustainable development can best be mobilized by higher education in the context of regions by developing strategic partnerships between institutions. We already have some projects overseas, and this approach can “alleviate” the problem we faced above – to a certain extent. Going regional also offers the advantages of opening our students’ eyes to the needs of the regions. Being a relatively affluent society, our students had grown up in relative comfort and henceforth failed to appreciate the need for sustainability. While plausible, going regional can still be prohibitive cost-wise, and thenumber of such student groups are still relatively small. Concern from parents over the “hardships” on their children is another factor we need to contend with. To overcome this, we will consider organizing a parents’ seminar where students who went on such overseas trips can share the benefits with the parents to generate greater buy-in.

**Logistics:** Related to the above, to engage a large number of students in out-of-classroom learning pose logistic challenges in terms of transport, outdoor classrooms, and other amenities. Timetabling for such activities is another challenge that may not be easy to overcome; especially when faced with lesson cancellation due to public holidays. The logistical burden will also be heavier for projects based on overseas locations. As such, all our current trips are planned for during the vacation, which posed a different set of problems in terms of getting enough staff to sacrifice their holidays to accompany students on such trips. We are currently looking into ways to compensate our staff in this area.

**Skills coverage:** At the moment, certain skills such as systems thinking and lifelong learning are not sufficiently covered in the 3-year curriculum. Others, such as ethics, while adequately covered, are not directly linked to sustainable development. There is a need to explicitly make this connection. Ethics is also related to an individual’s value system, cultural beliefs and norms, etc. Value education and teaching of cultural sensitivities undoubtedly will pose challenges as well.

**Multi-disciplinary approach:** Our endeavor thus far involved only our own students. Involving them working together with students from other disciplines will certainly enhance the learning process. O’Rafferty (2011) for example, had argued that inter-disciplinarity is a necessary requirement for addressing sustainability issues. Likewise, Czippop et al (2010) made the case that for ESD in an institution to be sustainable over time, the efforts should be reflected in the very culture and mission of the institution, which requires the various disciplines to work closely together. Given the scale-up and logistics issues mentioned above, this may become the most significant challenge yet, as it will not be easy for various diplomas to make changes in their respective course structures to accommodate such a learning arrangement. We are currently embarking on a institution-wide initiative to restructure our diploma program to free up more curriculum hours. We hope that this will enable students from different discipline to come together to work on projects.
**Assessment**: Last but not least, is the issue of assessment. Shephard (2008) had noted that “…it is quite possible for learners to learn about their subject and be able to describe, comprehend, apply, analyze, synthesize and evaluate to the extent that they can pass their exams, without actually changing their attitudes as indicated by the way they respond or behave afterwards.” At this point, we do not have in place an assessment format to validly and sufficiently assess the affective domain of ESD beyond some anecdotal evidence articulated by students during informal conversations. This is certainly an area that we will address in the near future.

More importantly, from the learning point of view, we are not compromising on students gaining real-world technical know-how needed for their future employment. The main emphasis of our curriculum is still to equip students with real-world attributes desired by employers. The initiative of ESD is to complement the cognitive domain with affective domain; both of which are increasingly important in today’s complex world.

Discussions by researchers at national forums have recently identified five characteristics listed here, that differentiate a good school from an excellent school. These have a high degree of concurrence with the principles and practice of SDE set out in this paper.

Table 2: Characteristics of good and excellent school

<table>
<thead>
<tr>
<th>GOOD SCHOOL</th>
<th>EXCELLENT SCHOOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has clear and wide-ranging statements of vision and values</td>
<td>Lives its vision and values which were created and shared with its own community</td>
</tr>
<tr>
<td>Vision and values take account of the local context of the school</td>
<td>Engenders a ‘can do’ attitude whatever the local challenges being faced</td>
</tr>
<tr>
<td>Uses opportunities to gather views of partners and wider community</td>
<td>Actively and systematically seeks the views of partners and community and acts upon these views</td>
</tr>
<tr>
<td>Regularly consults with staff, pupils and parents</td>
<td>Has a wide-ranging participation in decision making across all partners</td>
</tr>
<tr>
<td>Engages with new developments as they arise in local and national initiatives</td>
<td>Is open to and seeks out new ideas and innovation, selecting and implementing those in tune with its vision and values.</td>
</tr>
</tbody>
</table>
5.0 Conclusion

Sustainable development in education is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Educationally sustainable economic growth refers to economic development that meets the needs of all without leaving future generations with fewer resources than those we enjoy today. The essence of this form of development is a stable relationship between human activities and the natural world, which does not diminish the prospects for future generations to enjoy a quality of life at least as good as our own. The aim of sustainable development is to balance our economic, environmental and social needs, allowing prosperity for now and future generations. Everybody has the right to a good standard of living, with better job opportunities. Economic prosperity is required if our country is to prosper and our businesses must therefore offer a high standard of products that consumers throughout the world want, at the prices they are prepared to pay. For this, we need a workforce equipped with suitable skills and education within a framework to support them.

References


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HUMAN CAPACITY BUILDING FOR SOCIETAL CURRICULUM
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Abstract :
In one of the reports on Education, UNESCO has mentioned the four pillars of Education:
They are:

Learning to live together,
Learning to Know,
Learning to do
Learning to be

This suggests that the education system should be such that it leads to the development of the capacity to absorb new knowledge, to gainful employment, to the building of a unique all-round personality and perform the important function of social integration. Education is a social meaning of full activity. This links between individual self-fulfillment and social commitment, that is made out clearly in our constitution, wherein the promise in the preamble – “liberty of thought, expression.” is reconciled with reciprocal rights (rights to education”) and duties (“duty of the parents to send their children to school “). The new millennium has brought with it a heightened sense of urgency for a regional cooperation in virtual spheres of human activities. This leads to globalization. Education is one area of activity that has been among the earliest to recognize the value of and need of regional co-operation. Education demands pedagogical shift towards child –centered, activity based methodology.

Key words: Learning, pedagogical, Education, Globalization

Introduction:
Capacity for building curriculum should result in the below poem where the writer Rabrinath Tagore in Gitanjali prays to God to lead his country where the mind is without fear and the head is held high.

“Where the mind is without fear and the head is held high;
Where knowledge is free;
Where the world has not be broken up in to fragments by narrow domestic walls;
Where words come out from the depth of truth;
Where tireless strining stretches its arms towards perfection;
Where the clear stream of reason has not lost its way in to the dreary desert sand of dead habit;
Where the mind is led forward by thee in to ever-widening though and action ---
In to that heaven of freedom, my Father, let my Country awake”.

RabindraNath Tagore, in Gitanjali

Tagore is talking on the harmonious society as their heavens. Social harmony is broadly defined as existence of harmony in social relations, which is the result of long process adjustment and accommodation between different social groups. Here social groups may be formed by caste, religion, region, language, ethnicity, etc.

To enable education to carry heavy burden of bringing about social harmony, the following are to be carried out in curriculum design:

1) **Value Education**: is to be given to sensitize young minds towards basic human values. Right bases approach ought to be incorporated in educational process. Need of the hour is to teach history specific chapters emphasizing on Indian culture, and that which can remove communal biases from the minds of people by telling them of the historical solidarity between communities. Amrita University has designed Cultural education and Amrita Value programmes to inculcate this.

2) **Open schooling should be encouraged to make education more inclusive** --- Amrita University has adapted choice based open electives, where students has the option to select courses of their choice from any discipline.

3) **Students should be made to do social work especially among people of communities other than their own.** Amrita University has inculcated “live in labs”, where students and faculty work hand and hand in identifying the societal problem.

4) **The underlying basic unity of all religions can be taught by including sections from different religious books, all of whom teach love and compassion.** This is brought at Amrita University through Cultural Education and Amrita Values programme.

5) **Vocationalize Education so that the youth get employment or can take up self- employment** -- Amrita university has certificate courses on tailoring, craft etc which equip humans towards self employment.

It will be a form of bridging education --- that bridges the numerous divides that exists in the society. Very existence of human race is contingent upon the prevalence of harmony in the society. Development towards—Social, economic, political, moral and intellectual and progress in various spheres. An overview of the challenges to social harmony leads one to think that the
various problems and conflicts in the world which inevitably lead to disharmony, disintegration and chaos and not merely the result of our “diversities” in terms of beliefs, values, genders, race or religions. As a matter of fact, they are the result of misunderstanding and negative thinking, we have towards each other. While pondering over the ways and means, spiritual education can be an effective instrument in bringing knowledge and understanding thus creating harmony and peace. Education is a vital factor in the process of secondary socialization. Education should be universal to achieve the goal of social harmony.

Through education, a child is molded to suit the requirements of the society and thus become its effective, contributing member. It may be noted that Pre-British period In India, Education system was esoteric and was the privilege of the elite. A recipe for increasing social harmony is to inspire self-awareness through education. The aim of universal education should be to cultivate common sense, to diffuse good sense among people, which would qualify them to take up practical judgment of the circumstances by which they are surrounded. The end of education should make an individual responsible person in the society.

“The end of knowledge is wisdom
The end of culture is perfection
The end of wisdom is freedom
The end of education is character. And character consists of eagerness to renounce one’s selfish greed.

Education must award self-confidence, the courage to depend on one’s own strength.

The universe is a great university.

It is essential to practice spiritual disciplines along with academic studies”.

Bhagawan Sri Sathya SaiBaba
**Conclusion:**

Capacity building should include increased democratization of educational opportunities, raised profile of selected component of curricula and a pedagogical shift towards child-centered and activity based learning, rather than teacher centered learning. Inculcation of Spiritual and value based education along with academics play a vital capacity building for curriculum reforms.

**Bibliography:**

In this paper a case study of Amrita Vishwa Vidyapeetham is discussed based on the experience of designing curriculum on Environment and Sustainable Development for all the undergraduate courses in Amrita University, its implementation process, problems faced during its implementation and possible solutions.

The Paper also focuses on ensuring need of integrating sustainable development theme across subject areas for all streams with practical approach discussing current issues than just following text bookish knowledge. It also presents indicative framework focusing on eco-centric approach and discouraging human-centric approach. The need of studying egg shell model of Sustainability and giving more emphasis on conservation of natural resources, biodiversity and attitudinal change or adopting ethics practices than just promoting green technology is discussed in elaborate manner. Moreover it is also discussed that principle of sustainable development should be embedded in all the aspects of organizational culture, management strategies and governance. How sustainability education can contribute to bring change in the society is discussed by giving practical case studies in Rural India conducted by author.

Key Words: Sustainability Education, Societal Development, Amrita Vishwa Vidyapeetham, Eggshell Model, Eco-centric approach

INTRODUCTION

As a result of public interest litigation filed by Environmental lawyer Adv MC Mehata UGC has introduced Environmental Studies (EVS) as mandatory course for all Under Graduate courses of all the branches of higher education under UGC. However many colleges have not implemented environment education in true letter and spirit. Very few colleges have appointed faculty with specialization in Environmental studies to teach this particular subject for Under graduate courses. Many colleges have appointed already existing faculty with different background to teach this subject, which is an additional burden to that faculty and hence they do not do the justice to the subject. Moreover it was noticed that engineering colleges give more emphasis on Engineering aspects, technological solution than following holistic approach while teaching this subject. The author had opportunity to interact with 170 faculty teaching environmental studies in various colleges in India during the national training program conducted by IIT, where she was invited as a resource person. It was noticed that most of the colleges give emphasis on environmental technological aspects and
teach topics of their personal interest such as air pollution or energy. When preliminary data collected was analyzed it was revealed that only three colleges out of 170 taught subjects such as biodiversity, ecology and Forestry, which are the actual bases of Environmental Science.

It was also noticed that many people teach sustainable development model by giving more emphasis just economic growth and follow human centric approach. It was felt that there is a pressing need to understand the concept of sustainability by giving more emphasis on environment protection and societal aspects and following eco-centric approach.

As our fundamental dependency is on Ecosystems and Environment. We are dependent on environment for food, water, land, fuel, medicines and all industrial raw material. Ecosystems sustain societies and societies create economies…Its not other way round. This conceptual understanding needs to be imbibe among teachers who are this subject.

- Egg shell model by IUCN where environment protection is projected as key to long term sustainability needs to be given emphasis than three pillar model of sustainable development as human beings are just product of natural World. No development is possible without Natural resources. Moreover human beings need to live within the carrying capacity of the planet orelse our existence itself will be in question in long run. Not protecting Ecosystems is like Seating on the Tree branch and cutting the same branch. However it was noticed that most of the faculty give more emphasis on Technological solutions than understanding Fundamental Cause of unsustainability. Aspects such as over population, inequality, over consumption, need for attitudinal change, ethical behavior to achieve sustainability are mostly neglected in environment education in colleges in India. Adoption of Sustainability and social responsibility in organizational culture and management system is also most important. All colleges must adopt good practices such as Green Office, Paper free office, car free campus, video-conferencing, native plants gardens to reduce carbon footprint and other sustainability initiatives.

**Environment Education in Amrita through Education, Research and Extension:**

However in Amrita University our engineering and other schools have adopted Environmental studies in true letter & spirit and high credits are given for the course. We have adopted innovative teaching methods including power point presentations, world class documentary films, role plays, group discussions, group activities, games, field visits etc In all our schools emphasis is given on understanding current global, national & local environmental issues and possible solutions than just theoretical knowledge. High credits are given for project work where students work on various environmental and social aspects & gain practical experience. Eg.Green building, campus biodiversity, Lakes in Coimbatore, Human animal conflicts, E waste, Solid waste management in Coimbatore, Tribal culture in Western Ghats etc.
We also involve them in our ongoing projects such as capacity building of tribal communities by furniture making using lantana weed which cause threat to forest biodiversity and multi cropping organic farming in Siruvani hills and Walayar Reserve forest

Faculty development program are being conducted on regular basis for faculty teaching EVS in all the campuses of the University to enhance their capacities.

**Amrita Prakriti Samrakshan Samiti**

We sensitizing student community about their role in nature conservation, environment protection & sustainability, through informal activities through our nature club ie Amrita Prakriti Samrakshan Samiti. In a recent survey on bio-diversity conducted involving students it was noticed that campus has rich faunal diversity including 114 species of Birds, 91 species of butterflies, 21 species of mammals and 17 species of reptiles.

Activities such as plantation drives, wildlife nature trails, bird & butterfly surveys, wildlife photography competitions, poster making competition on various environmental themes, expert lectures, environmental film screenings, awareness campaigns on water, energy conservation and waste management etc are conducted on regular basis to give practical exposure to students. Environmental events such as World Forest Day, World water Day, Earth Day etc are also celebrated by students every year.

**Looking beyond our Campuses and reaching out to larger audiences.**

- Special lectures by various environmental experts including Nobel laureate Dr RK Pachauri, Padmashree G Shankar have been organised and webcasted through our innovative e-learning program A-VIEW
- Several colleges and Universities are getting benefited by this initiative.
- From Ettimadai campus we hosted and webcasted lectures on Water & waste management by Dr Brajesh Dubey, University Of Guelph, Canada, Dr Ligy Philip, IIT, Madras and Lecture on Human-animal conflict by Dr M Ananda from Nature Conservation Foundation, Valparai
- We also participated as key speaker in the session on training young minds in GRIHA International summit organized by TERI , January 2014
Adopting Sustainability in Organizational Culture

We have adopted sustainability in the campus by planting lacks of trees and many other initiatives as follows

- Amrita recycling center for waste management
- Well ventilated main canteen, No need of fans. Energy saving
- Biotoilet technology (using consortium of anaerobic bacteria which consume human waste) has been implemented on an experimental basis at our Amritapuri campus. Results in huge electricity cost savings at the waste water treatment plants
- On several Amrita campuses, almost all bio-degradable waste generated is composted.
RECOMMENDATIONS/SUGGESTIONS/ACTION POINTS:

The participants expressed appreciation for the new and interesting perspectives on design of curriculum aligned with sustainable development. The discussions led to the following general recommendations:

1. More such seminars to raise the awareness of, and sensitize, teachers and students on sustainable development – in a way that includes economic, social, political, cultural, technology and environmental aspects.
2. Curriculum should be designed in such a way that it addresses skill development for all three aspects: head, hands, and heart – i.e., developing academic skills (cognitive), job skills (psychomotor), and life skills (affective).
3. Develop a sound understanding of the United Nations Sustainable Development Goals (SDGs) – 17 in number – and plan promote alignment of curriculum design & delivery with the goals.
4. Develop greater number of hands-on courses that involve inculcation of values and social service (projects involving techno-social eco-friendly solutions for rural & urban areas).

Follow-up actions the institution proposes to undertake

1. A summary of the seminar was presented to the highest academic governing body of the institution, the Academic Council, on 22nd August 2016.
2. The institution proposes to form a committee comprising experts in the area of sustainable development.
3. The committee will undertake activities related to orientation and sensitization of faculty members and students of all its constituent schools and departments, with respect to sustainable development. This will include specific involvement of the various boards of studies.
4. The committee will also educate the faculty members and students on the 17 SDGs, and drive the incorporation of specific elements into the future design of curricula.
5. The committee will maintain records of existing and future projects that are in alignment with the SDGs – these will be used to inspire and stimulate the interest of faculty members and students, to take up more projects, with a greater spread of diverse issues.