



Engineering Education Empowers

Address and interaction with the members of GMR Institute of Technology

By Dr.APJ Abdul Kalam [Srikakulam, 12/Mar/2009]

*"In giving, you receive happiness.
Almighty will bless all your actions."*

I am indeed delighted to address and interact with the students of GMR Institute of Technology, Srikakulam. My greetings to the Principal, Faculty Members, Students and distinguished guests. I congratulate GMR Varalakshmi Foundation for starting a high-tech engineering institution for empowering the youth of this rural region. When I am in the midst of engineering students and faculty members, I would like to talk on the topic **"Engineering Education Empowers"**.

First I would like to present my experience of learning system design, system integration and system management while I was a student.

Learning integrated system design

While I was studying aeronautical engineering in MIT, Chennai, (1954-57) during the third year of my course, I was assigned a project to design a low-level attack aircraft together with six other colleagues. I was given the responsibility of system design and system integration by integrating the team members. Also, I was responsible for aerodynamic and structural design of the project. The other five of my team took up the design of propulsion, control, guidance, avionics and instrumentation of the aircraft. My design teacher Prof. Srinivasan, the then Director of MIT, was our guide. He reviewed the project and declared my work to be gloomy and disappointing. He didn't lend an ear to my difficulties in bringing together data base from multiple designers. I asked for a month's time to complete the task, since I had to get the inputs from five of my colleagues without which I cannot complete the system design. Prof. Srinivasan told me "Look, young man, today is Friday afternoon. I give you three days time. If by Monday morning I don't get the configuration design, your scholarship will be stopped." I had a jolt in my life, as scholarship was my lifeline, without which I cannot continue with my studies. There was no other way out but to finish the task. My team felt the need for working together round the clock. We didn't sleep that night, working on the drawing board skipping our dinner. On Saturday, I took just an hour's break. On Sunday morning, I was near completion, when I felt someone's presence in my laboratory. It was Prof. Srinivasan studying my progress. After looking at my work, he patted and hugged me affectionately. He had words of appreciation: *"I knew I was putting you under stress and asking you to meet a difficult deadline. You have done great job in system design"*.

Through this review mechanism Prof Srinivasan, really injected the necessity of understanding the value of time by each team member and brought out engineering education has to lead system design, system integration and system management. I realized that if something is at stake, the human minds get ignited and the working capacity gets enhanced manifold. That's what exactly happened. This is one of the techniques of building talent. The message is that young in the organization, whatever is their specialization, be trained to systems approach and projects, which will prepare them for new products, innovation and undertaking higher organizational responsibilities. Teacher has to be a coach like Prof. Srinivasan.

With this foundation, I would like to describe my visualization of the distinctive profile of India by 2020.

Distinctive Profile of India by 2020

1. A Nation where the rural and urban divide has reduced to a thin line.
2. A Nation where there is an equitable distribution and adequate access to energy and quality water.
3. A Nation where agriculture, industry and service sector work together in symphony.
4. A Nation where education with value system is not denied to any meritorious candidates because of societal or economic discrimination.
5. A Nation, which is the best destination for the most talented scholars, scientists, and investors.

6. A Nation where the best of health care is available to all.
7. A Nation where the governance is responsive, transparent and corruption free.
8. A Nation where poverty has been totally eradicated, illiteracy removed and crimes against women and children are absent and none in the society feels alienated.
9. A Nation that is prosperous, healthy, secure, devoid of terrorism, peaceful and happy and continues with a sustainable growth path.
10. A Nation that is one of the best places to live in and is proud of its leadership.

Integrated Action for developed India

To achieve the distinctive profile of India, we have the mission of transforming India into a developed nation. We have identified five areas where India has a core competence for integrated action: (1) Agriculture and food processing (2) Education and Healthcare (3) Information and Communication Technology (4) Reliable and Quality Electric power, Surface transport and Infrastructure for all parts of the country and (5) Self-reliance in critical technologies. These five areas are closely inter-related and if progressed in a coordinated way, will lead to food, economic and national security.

India's future missions

During the next decade, India will have the following missions:

1. Agriculture and Food processing: Increase the productivity into 3.4 times and concentrate on Food processing and marketing.
2. Infrastructure: Apart from rural and urban infrastructure, one million homes have to be built with energy efficiency and water efficiency.
3. Automobile: The export has to be 50% of our output
4. Ship Building: High Dead weight ships have to be built in the country.
5. Information and Communication technology: We have to keep pace with the growth inspite of global recession by applying ICT for India.
6. Pharma: India must account for atleast 25% of generic drug produced worldover.
7. Aerospace: 70 seater passenger jet aircraft has to be designed and developed involving 20 billion dollars of market
8. Railvision: Railway length has to be increased, metros have to come for faster transportation and multi-level station systems have to become operational to reduce city crowding, average speed of the train has to be doubled.
9. PURA mission: 7000 PURA complexes have to become operation to bring sustainable development to the rural sector.
10. Energy Independence: By 2030, we should attain energy independence through renewable energy sources such as solar and wind; nuclear and bio-fuels for transportation.

Now, let me focus on the sustainable development model for the rural areas where 700 million people of our country are live.

PURA Mission: The major mission is the development of infrastructure for bringing rural prosperity are through Provision of Urban Amenities in Rural Areas (PURA) through creation of three connectivities namely physical, electronic, knowledge leading to economic connectivity. The number of PURA for the whole country is estimated to be 7000 encompassing over 600,000 villages. The theme of PURA, apart from concentrating on reinforcing agriculture, will emphasize on agro processing, development of Rural Craftmanship, dairy, fishing, silk production, so that the non-farm revenue for the rural sector is enhanced, based on the core competence of the region. Also the PURA complexes will be driven by renewable energy such as solar, wind, bio-fuel and conversion of municipal waste into power. In this approach, the aim is to make sustainable development using the core competence of the rural sector.

Periyar PURA (Tamil Nadu): I have worked with Periyar PURA Complex pioneered by Periyar Maniammai College of Technology for Women, Vallam, Tanjore consisting of a cluster of 65 villages having a population of over one lakh for the last 5 years. This model PURA complex has all three Connectivities - physical, electronic and knowledge - leading to economic connectivity. This has resulted in large-scale employment generation and creation of a number of entrepreneurs with the active support of 1800 self-help groups. Two hundred acres of wasteland has been developed into a cultivable land with innovative water management schemes. Villagers are busy in cultivation, planting Jatropha, herbal and medicinal plants, power generation using bio-mass, food processing with dedicated marketing centers. This model has emanated independent of any government initiative by a Women Engineering college.

GMR PURA On similar lines, I would suggest GMR Institute of Technology to take up a rural development mission in

Srikakulam district. The 2500 students and 150 faculty members of the Institute should mount a development programme for the 30 to 40 villages around Rajam within a radius of 25 kilometers having a population of over 1.5 lakh. Presently, the area is being used for cultivating paddy, groundnut, pulses, mesta (for jute) and sugarcane. Area also has low rain fall. Under these circumstances, we should examine, what alternative crops pertaining to semiarid region will be more useful for this area and the farmers to be guided to take up those plantations. Also, there is a need for introducing agro-processing industries which will provide sustainable revenue to the farmers. In addition, while planning the PURA complexes, the students may take into account the non-farm activities which can be productively done using the core-competence of the people of this region. In essence, GMR PURA should transform Rajam and the neighbouring villages into developed villages of Andhra Pradesh within the next five years. Aim should be to increase the percapita income of these village citizens by three times, all the villagers should become literate, every citizen should be able to have value added employment, there should be adequate availability water for all through de-silting of all water bodies and connecting to the inlet and outlet, power must be available through renewable energy sources and the infant mortality rate of the region should be below ten.

The message here is: PURA is an integrated sustainable rural development programme with focus on employment generation through rural entrepreneurship by providing physical, electronic, knowledge and economic connectivity. PURA is a tool for bridging the Rural – Urban divide. Friends, I would like to present the life of a street boy who with his determination and perseverance became a noble laureate.

Birth of Creativity in a difficult situation

Mario Capecchi had a difficult and challenging childhood. For nearly four years, Capecchi lived with his mother in a chalet in the Italian Alps. When World War II broke out, his mother, along with other Bohemians, was sent to Dachau as a political prisoner. Anticipating her arrest by the Gestapo, she had sold all her possessions and given the money to friends to help raise her son on their farm. In the farm, he had to grow own wheat, harvest; take it to miller to be ground. Then, the money which his mother left for him ran out and at the age of four and half years, he started sometimes living in the streets, sometimes joining gangs of other homeless children, sometimes living in orphanages and most of the time hungry. He spent the last year in the city of Reggio Emilia, hospitalized for malnutrition where his mother found him on his ninth birthday after a year of searching. Within weeks, the Capecchi and his mother sailed to America to join his uncle and aunt.

He started his 3rd grade schooling afresh over there and started his education, interested in sports, studied political science. But he didn't find interesting and changed into science, became a mathematics graduate in 1961 with a double major in Physics and Chemistry. Although he really liked Physics, its elegance and simplicity, he switched to molecular biology in graduate school, on the advice of James D Watson, who advised him that he should not be bothered about small things, since such pursuits are likely to produce only small answers.

His objective was to do gene targeting. The experiments started in 1980 and by 1984, Capecchi had clear success. Three years later, he applied the technology to mice. In 1989, he developed the first mice with targeted mutations. The technology created by Doctor Capecchi allows researchers to create specific gene mutations anywhere they choose in the genetic code of a mouse. By manipulating gene sequences in this way, researchers are able to mimic human disease conditions on animal subjects. What the research of Mario Capecchi means for human health is nothing short of amazing, his work with mice could lead to cures for Alzheimer's disease or even Cancer. The innovations in genetics that Mario Capecchi achieved won him the Nobel Prize in 2007. Noble laureate Capecchi life indeed reveals: -

"When you wish upon a star,
Makes no difference who you are"

Conclusion

I have seen three dreams which have taken shape as vision, mission and realization. Space programme of ISRO (Indian Space Research Organization), AGNI programme of DRDO (Defence Research and Development Organization) and PURA (Providing Urban Amenities in Rural Areas) becoming the National Mission. Of course, these three programmes succeeded in the midst of many challenges and problems. I have worked in all these three areas. I want to convey to you what I have learnt on leadership from these three programmes:

a. Leader must have a vision.

- b. Leader must have passion to realize the vision.
- c. Leader must be able to travel into an unexplored path.
- d. Leader must know how to manage a success and failure.
- e. Leader must have courage to take decisions.
- f. Leader should have nobility in management.
- g. Leader should be transparent in every action.
- h. Leader must work with integrity and succeed with integrity.

For a sustainable growth of any organization, the important thrust will be on the generation of a number of creative leaders through nurturing the talent, and promoting innovation in every sector and R&D leading to patents. Emergence of such leaders particularly will facilitate global competitiveness and help in transforming any nation as a knowledge society.

My greetings and best wishes to all the members of GMR Institute of Technology success in their mission of becoming societal transformers of this region.

May God bless you.

Eight point Oath for Engineering Students

1. Engineering and Technology is a life time mission. I will work, work and work and succeed.
2. Wherever I am, a thought will always come to my mind. That is what process or product I can innovate, invent or discover.
3. I will always remember that "Let not my winged days, be spent in vain".
4. I realize I have to set a great technological goal that will lead me to think high, work and persevere to realize the goal.
5. My greatest friends will be great scientific and technological minds, good teachers and good books.
6. I firmly believe that no problem can defeat me; I will become the captain of the problem, defeat the problem and succeed.
7. I will bring a change in the lives of the people of one district using my knowledge in Engineering and Technology.
8. My National Flag flies in my heart and I will bring glory to my nation.

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