

FOCUS

Science and Technology for the Welfare of People

by Dr M Muniruzzaman

Mass awareness of problems, is a vital step towards their solution. It must be said however, that our educational institutes need to do better in developing skills of the students in relation to environmental protection, energy utilization and preservation, limiting population as well as interdisciplinary thinking.

SCIENCE and technology have profoundly influenced the way we live and think. Scientists have put man and machine into space, explored the farthest corner of our known universe, broken the code of human genome, cloned animals, genetically engineered fruits and vegetables, created a virtual world as well as a whole new domain known as cyberspace. Hundred years ago scientists questioned the existence of atoms and knew almost nothing about space, time and the universe. Today, they can arrange individual atoms on a surface and make an image of the result. Technology also surrounds us in many ways that we no longer notice. From computers to cellular phones, internet to home entertainment, hovercraft to magnetically levitated trains, airline bookings to traffic lights — technology makes our life, run smoothly and comfortably. The close connection between science, technology and the economy of a country has also been established. A major part of all US economic growth is a result of technological progress. Technology helps build capitals, jobs, new goods and often new industries. Without doubt, technology is the principal driving force behind Japan's economic success. In fact, according to the Office of Science and Technology Policy (OSTP), USA "technology is the single most important factor in sustained economic growth."

As we step into the next millennium the question important to us all is how can we use the knowledge of science and technology to change the lives of the ordinary Bangladeshis? Despite the huge progress made by the industrialized west, the scarcity of the simple things in life clean drinking water, health care, basic education, housing, and employment still plagues the lives of most people. Rather than trying to predict what Bangladesh will be like in 2025, it might be more worthwhile to focus on the areas where science and technology can be fruitfully used for the benefit of common man. The areas are (1) Population, (2) Energy and Environment, (3) Bio-diversity, (4) Weather and Climate, (5) Information Technology.

Keeping Population in Check: October 12, 1999 was observed as "Day of Six Billion" on the planet. This number is nearly two and a half times as many as in 1948. The last billion was added in 12 years. The average population increase of 2.5 fold that we witnessed in the last fifty years will probably not be repeated in the next fifty due mainly to mass awareness and availability of improved contraceptive techniques. The population of Bangladesh is about 126 million with an annual growth rate of 1.6 per cent. That Bangladesh has cut population growth rate by half in 25 years is a remarkable achievement indeed. However according to experts the popu-

lation of the country could stabilize in the next century with a population somewhere between 175 million and 225 million in 2025. Most of the challenges that Bangladesh will have to overcome — at least during the first quarter of the next century — are sustained food production, clean drinking water, energy, housing, health care, education, employment and various other ingredients of a meaningful life for all its citizens. The challenges of course will be more acute if the population is at the higher end of the projected range than if it is at the lower end. As part of the strategy, the government, NGOs and other relevant organizations should strive for the lower end of the population range. This could be addressed by emphasizing on, for example, the optimum size of a family for social and economic benefits. In this respect the education of women is of prime importance. The present method — and the always improving contraceptive techniques should be employed whenever possible to avoid unwanted births.

Energy Needs and Protection of the Environment: In 1998 a staggering 6.3 billion tons of carbon dioxide was released into the atmosphere mostly by the industrialized west, Japan

and to a lesser extent by China, India and Brazil. It is estimated twenty-five years from now this figure would rise to about 10 billion tons. This huge amount of carbon dioxide released into the atmosphere would raise its concentration to about 500 parts per million — almost 1.75 times more than the pre-industrial level. The hard to control greenhouse gases could also lead to a global warming of 0.5°C to 1.0°C. It is generally believed, but yet to be firmly established, this increase in temperature could lead to melting of polar ice caps with subsequent inundation of low-lying areas around the world. Although Bangladesh contributed very little to this increased concentration of carbon dioxide and other greenhouse gases, we have however, unfortunately, become a party to its effect. Bangladesh may not have contributed much to global degradation of environment, however the opposite is true locally. The threat of arsenic poisoning to half the population, the smog, soot and dangerously high level of lead concentration in Dhaka's air, the shrinking forest, the dwindling number of rare species of animals, birds and plants all point to the utter negligence with which we have treated the environment.

Preservation of Bio-diversity: There are between ten million and twenty million species on the planet of which only about two million have so far been identified and recorded. The Global Bio-diversity Assessment estimated "that up to a third of the species in tropical forests — the largest reservoir of bio-diversity on the planet — may be lost over the next several decades". If this estimate is true even to orders of magnitude then we are at risk of losing the invaluable species that are unique to our tropical forests. The records of species much less the biota of our country is very difficult to come by. We must remember that extinct species are "irreplaceable losses", in spite of the tremendous advances in biotechnology

there is no way these species can ever be recovered.

Preservation of bio-diversity is essential not only for fresh air, water and clean environment but also for recycling natural control of diseases etc. The genetic information contained in these species could be used to produce better fruits, crops and vegetables. There is a great interest in recent times on herbal cure of previously incurable diseases. The Chinese and Indians in particular have made great progress in this area. Studies of traditional herbal medicines are being pursued with renewed vigour and results obtained are now being brought into the rigours of science. The medicinal value of Tulsi, Neem and Ashok are well known to all. Who knows, the cures of cancer, AIDS and other deadly diseases may not be found in herbs! If, however we destroy the bio-diversity we may never really know what "information" these contained. Our scientists and technologists have great opportunities not only to record and analyze the huge bio-diversity available in our country but also to understand and preserve the delicate balance that sustains diversity.

Understanding Climatic Changes: The injection of huge amounts of carbon dioxide and other greenhouse gases into the atmosphere and to a lesser extent the deforestation have combined to contribute to the changing global weather patterns we see today. The changed weather pattern was manifest recently as El Nino and La Nina. The draught in Sub-Saharan Africa, the unprecedented flooding in China,

etc. These are jobs requiring a lot of skill. Do we have sufficient manpower to handle such jobs at the international level? The answer is a yes and no. Let me explain we have highly trained and skilled individuals both at home and abroad who can take on jobs, but to form groups at home like a software firm for instance and complete the jobs is a very difficult task. May I take the liberty to narrate a personal experience that may clarify the point further. A friend, an IT Professional and owner of a related firm in the USA visited Bangladesh some years back. Knowing my interests in the subject, on his return to the USA, he sent me a computer software for debugging, with the stipulation that I complete the job in a given time. Debugging programmes are time consuming and manpower in the USA is expensive, so he was looking for cheap alternatives. I tried to find experts to collaborate with me. Needless to say I failed in my attempts. Things have surely improved since then. But the fact remains that unless we have institutional and professional support to build and organize the manpower it will be difficult competing in the international IT market.

Conclusion: The areas discussed are by no means unique to Bangladesh. Various combinations of the above can be found in almost all developing countries. Mass awareness of problems is a vital step towards their solution. It must be said however, that our educational institutes need to do better in developing skills of the students in relation to environmental protection, energy utilization and preservation, limiting population as well as interdisciplinary thinking.

The author is professor of physics at the Jahangirnagar University.



OUR national politics dominates the daily lives of the ordinary peace-loving citizens so much that we feel embarrassingly pampered (if not victims), making it impossible for us to think of or plan any personal, private, business or professional work without the powerful influence of politics directly or indirectly. Politicians are always in the background, (like the air we breathe, or the mosquitoes, which are coming in the winter to compete with them). Their omnipresence and omnipotence cannot be ignored, but, alas, it is simply at the mundane, not moral plane. Hyperbole has been used in ample doses in these capsules. Don't pellets, to penetrate the thick skin, and closed minds of our formidable politicians, who have eyes that do not see, ears that do not hear, and feelings that are motivated the wrong way. This is not a hate cam-

Some "Dont's"

by Alif Zabr

(that's a tall order).

- Don't chase the opposition. There is nothing in the chase. Sit with us (not standing please, hiding behind the mike). We could mould the future (if you know what we mean).
- Pay attention to the ladies. They are the better half (it is time they did, to come up as the equal partner). They rock the cradle which rule the world (the rate has come down to 1.9 per cent per annum, from 3.5).
- Like to be called a genius? Uncover Dhaka!
- How to be unpopular and remain in power? Wipe out the moustaches, starting with home-cleaning. You have some option: do clean or wet clean. Wash the dirty linen in public.

— Resist temptation: specially while gazing longingly at empty plots, river banks, and water bodies. River banks and bank loans have something in common (it is too elusive for the layman to decipher). The next DCC Mayor's election may be decided on this, according to a recent public poll (DS report). Practice sunnata, the mystique of Zero (Zen). Remember zero is above one. Zero does not mean nothing; it is one of the great secrets of Cosmic consciousness.

— Define 'parliament'; but do not stick to your version.

— Patronisation is the noble practice of helping others. Don't believe it.

— Your power is leaking! Pfltered by PDB, DESA and DESCO. Don't be so generous! Recharge, and come back. You can't get rid of us!

American System of Education

Interesting and Enjoyable Process of Learning

by M Afsaruddin

The US education system puts great emphasis on analysis, observation and creativity. It never encourages memorisation. Knowing facts and having ideas from class lectures and reading are not sufficient. Students must analyse, synthesise and evaluate them. Their creative faculty is thus exercised.

EDUCATION in the United States has three basic levels: elementary, secondary and higher education. Vocational training, adult education, schools or classes for special types of children and kindergartens also form part of the programme in most states. The vast majority of students in the primary and secondary levels go to public schools. Most of those who attend private schools go to Church sponsored parochial schools.

The academic duration of a school year is usually nine months, from early September to mid-June. The common pattern of organisation, referred to as the 6-3-3 plan, includes elementary school from grades 1 through 6, junior high school from grades 7 through 9 and senior high school from grades 10 through 12. However, the older 8-4 plan, in which grades 1 through 8 were the elementary school and 9 through 12 the high school, continues in many localities. There is also a 6-6 plan, grades 1 through 6 in elementary school and 7 through 12 in secondary school. Today, unified systems operating in both elementary and secondary schools most commonly use the 6-3-3 plan or the 1-6+2+4 variation. However, many variations on the patterns exist in the United States.

A child's introduction to formal education is usually in kindergarten classes operative in most public school systems. Many systems also provide music and art. The age group is commonly four and five years. These pre-school education programmes maintain a close relationship with the parents, and aim to expose children to useful experiences which will prepare them for elementary school. The programmes are flexible and designed to help the child grow in self-reliance, learn to get along with others, and form good work and play habits.

The main purpose of the elementary school is the general intellectual and social development of the child from 6 to 12 or 15 years of age. Curricula vary with the organisation and educational aims of individual schools and communities. Promotion from one grade to the next is based on the achievement of specified skills in reading, writing, spelling, arithmetic, history, geography, music and art.

At secondary school level, most public institutions follow a course that includes English and physical education. Elective subjects may be chosen in the fields of foreign languages, fine arts and vocational training. Pupils usually elect about half of their subjects in grades nine to twelve.

The vocational programme may impart training in four

fields: agricultural education, which prepares the students for farm management and operation; business education, which trains students for the commercial field; home economics, which trains students for home management, child care and also for taking care of the sick; and trade and industrial education, which provides training for jobs in mechanical, building manufacture and other trades. This programme prepares students either for employment or further training.

I have to mention here that the educational system of USA may be understood in the context of Plato's idea of education. Plato considered a sound educational system as the basis of social justice. Though in his idea of education, Plato advocated education for all, he actually entertained the view that higher education should be meant for the students with extraordinary merit. In an elaborate study of literature, music and mathematics for students up to the age of 17 to 18 years and the practice of rigorous physical exercise and military training for those between ages of 18 and 20 years, and the study of mathematics for a smaller number of brilliant students through selection between the ages of 20 and 30 years. The study of dialectics/philosophy and theoretical education was to be set aside for selected groups of students between the ages 30-35. These selectively educated students would be appointed to various positions in the higher sections of State Administrative Management bodies within the age of 35-50 years so that they could gather experience of the practical life. Finally, these students would achieve perfection in their practical and theoretical knowledge and employ their time and knowledge in enhancing the qualities of State Administration.

The western countries have tried to follow some fundamental principles to establish Plato's educational scheme in their own educational system. In the USA though educational system apparently has enormous diversities in structure, form and grading, the basic philosophy of the system always imbibes Plato's idea of education. The structure of the American educational institutions seems to be classificatory. The classifications are difficult to make because of decentralised administration and control. For example, there are some universities that do not offer degrees beyond bachelors while there are some colleges that offer doctoral degrees. So generalisation about

institutions on the basis of their official titles is very difficult to make.

In USA the terms "college" and "university" are often used interchangeably, although the former often is a part of the latter. An American college typically offers a blend of natural and social sciences and humanities studies. Students traditionally 18 to 22 years old, attend classes for approximately four years to complete all requirements, a bachelor's degree in arts or sciences. A university, on the other hand, is usually composed of an undergraduate college of arts and sciences plus graduate schools and professional schools and facilities.

Higher education in the United States has evolved two unique institutions. They are the two-year junior college, or community college as it is popularly called, and the four-year liberal arts college.

Two-year colleges usually offer academic programme suitable for transfer to four-year institutions, and also terminal technical and vocational courses. This is the preparatory phase for various technical fields of education. These institutions usually serve local populations within specific areas. In addition to these, there are also a few private two-year colleges to prepare students for transfer to four-year colleges and universities.

Four-year liberal arts colleges are institutions that mainly offer undergraduate education including studies in the humanities, language, arts, social sciences and physical and natural sciences and also professional study programmes for up to four years. These liberal arts colleges that offer four-year bachelors degree are mostly non-public or independent. This phase of education is completed (usually) in preparation for graduate and professional schools. Major universities also offer undergraduate liberal arts programmes like these colleges.

There are also a great many state and private four-year colleges. Many of these were formerly teacher training colleges and offer only official programmes or special training along with liberal arts. Credit from these colleges is normally recognized by universities for admission into graduate and professional studies.

The US Universities impart graduate, undergraduate and professional education (post bachelor's degree). These universities usually offer bachelors, masters and doctoral degrees and in many instances also professional programmes in medicine, law and engineering.

There are also other types of institutions specially for secretarial training, trade and vocational programmes, some adult education and extension services, some health related programmes such as computer programming. The training imparted here is mainly profit-oriented and not for further study in other colleges or universities.

Courses in US colleges and universities are of many different categories. For instance, lecture courses, independent study, courses seminars, laboratory courses and courses in research work. Technical institutions provide firsthand experience with necessary tools and equipment. But what is more important and needed is an extensive work outside the class. Assignments are also given by teachers.

Most American university degrees are awarded on completion of specified number of courses which earn students credits or points. The number of credits awarded for each course relates to the number of hours of work involved. At the undergraduate level a student generally takes about five 3-hour a week courses every semester. Semesters usually run from September to early January and late January to late May. Most students complete 10 courses per academic year and it usually takes them around four years to complete a bachelor's degree requirement of about 40 three-hour courses or 120 credits.

The US education system is both practical and academic in its objective. Emphasis is given to gaining practical knowledge from experience and observation all the way. Sometimes it seems quite different from the academic system of other countries from where students arrive for study in USA. What makes US education system stand out is the following:

The US education system puts great emphasis on analysis, observation and creativity. It never encourages memorisa-

tion. Knowing facts and having ideas from class lectures and reading are not sufficient. Students must analyse, synthesise and evaluate them. Their creative faculty is thus exercised. Even the examination may include new problems that were not encountered before.

In matters of grading, the final examination is not crucial; class attendance, level of participation in discussions and periodic quizzes contribute greatly to final grading. Written paper, if required must be completed in due course. Work load is very heavy and many students have to spend busy hours outside class.

It is not the teacher rather the students, who have the greatest responsibility for their own learning and generating a spirit of acquisition of knowledge. Students have to work hard to solve problems given in class. The credit of success or failure goes directly to the students.

The academic atmosphere is highly informal and teacher-student relationship is most casual. This aspect of intellectual development through interaction makes students feel greatly inspired and stimulated.

The greatest offence in the US academic system is plagiarism and cheating. One cannot write paper for others as take material from other's writing and pass it under his own name. The cases of cheating and plagiarism are severely dealt with and may even result in expulsion from University.

The US system of education is thus highly challenging. But the teacher-student relationship is greatly informal, cooperative and congenial. It renders the whole process of learning interesting and enjoyable. The students may freely communicate with the teachers and the teacher's accessibility facilitates continuous exchange of ideas. Students receive guidance and work on their own responsibility.

American teachers are expected to be highly qualified. Only extraordinary scholars

