The Bangladesh Times

Modernising science education

With the introduction of GCSE (General Certificate of Secondary Education) syllabuses, much interesting change is taking place at present in the United Kingdom in science and technology education at various levels. In a paper—Modern Trend in Chemical Education—based on a seminar talk given at the Chemistry Department of Dhaka University on 27 August, Dr. M.N.G.A Khan of the Loughton College of Further Education observes that 'an overview of changes in UK and other countries can be very helpful in incorporating the appropriate modern ideas an trends in science education in general and chemical education in particular in Bangladesh. Excerpts from the paper

Chemistry is a central science. The life processes are a series of complex but well regulated chemical reactions. An understanding of creation of the universe and the natural cycles require a chemical explanation. The basic requirements of life in the form of food, fibre, fuel, shelter, water, medicine and new and improved materials are met essentially through chemiacl activities. Chemistry plays a pivotal role in the study of other scientific disciplines e.g. medicine, agriculture and material science. Chemical industry is not only important in its own right, but is the nerve centre of many other industries. The protection of the environment and therefore the survival of all living beings require an understanding and application of chemistry. The planning for chemical education is therefore of special significance. A well planned and organised chemical education provides a firm foundation for science education overall.

However, science education for this to be meaningful and effective, should be an integral part of education in general. It is needless to emphasize the importance of education for this is key to optimum utilisation of the most fundamental of all resources, the human resources. Science education should share this basic aim of education which seeks to develop a sustained interest, enthusiasm and ability to crate, acquire, understand, disseminate and apply knowledge to enable an individual or a community to cope with the uncertainties and change. A sound education should impart to an individual, amongst others, irrespective of subjects studied: problem solving skills, decision-making skills, communication skills, ability to work in teams, a lifelong interest and enthusiasm for education and personal development, abilities to cope with uncertainties and change, appreciation to differing value and perceptions, and an ability to coexist with these, ability to acquire, understand and apply knowledge, awareness to wider social, environmental, technological and economic impacts of development and change, and opportunity to reach and give expression to ones highest potential.

A worthwhile chemical education has to be consistent with these requirements.

MODERN TRENDS IN CHEMICAL EDUCATION

The modern trends in science vis-a-vis chemical education include: provision of a balanced and coherent programme for all pupils up the age of 15/16, a change in emphasis away from a content domination to a skills and process approach, set in everyday contexts and experiences that have greater relevance to all pupils, stronger emphasis on what a student "understands and can do" rather than can just recall, a focus on the student as an autonomous and active learner, awareness to technological, social, economic and environmental impacts of applying science, clearly set achievement targets, internal assessment (teacher assessment), emphasis away from specialisation too early, and wider choice for further studies and career options.

These ideas are reflected in the recently introduced GCSE (General Certificate of Secondary Education) syllabuses which have replaced 'O' level in the United Kingdom. The 'A' level syllabus have also been amended as a result.

These will have profound effects on the way universities will organise their teaching programme from 1990 onwards.

The fundamental objectives of the introduction to GCSE are to improve the quality of education, and to raise standards of attainment by stretching and stimulation of students throughout the ability range.

Some GCSE syllabuses have less factual content than the GCE 'O' level courses, but they have greater emphasis towards awareness and understanding of concepts, development of skills, the handling of information and application of knowledge.

The whole emphasis of GCSE is to enable students to show what they "know, understand and can do." The process of learning is as important as the final product, the concept of student-centred learning is introduced and students are encouraged to involve themselves in investigation and the application of knowledge, rather than their success being judged solely upon the memorising of sufficient facts to get through a final examination. The ways in which subjects are taught in the classroom, particularly chemistry, have changed radically through the introduction of GCSE.

Internal assessment of practical has increased students' motivation and interest in chemistry as the students are able to improve individual performance through their own efforts. Although some students initially find planning and designing experiments difficult, but gradually this disappears and their freedom to make choices and suggestions help them gain confidence. They begin to realise that there is more than one way a problem can be tackled and that solutions to real life problems can not all be found in books. Some weak students can also show more positive achievements compared to their performance in written papers. This is to be expected as the skills require for these two aspects are not the same GCSE should be of special benefit to lower ability

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students as they can learn at their own pace, rather than be dictated by the pace of the most able students in the class. The more able students are also not restricted and can show more positive achievements through undertaking more difficult and challenging tasks.

Introduction of GCSE has necessitated rewriting A-level syllabuses. University of London A-level Chemistry syllabus has been rewritten.

IMPLICATIONS FOR UNIVERSITY UNDERGRADUATE CHEMISTRY

It is obvious that these profound changes in chemical education at GCSE and 'A' levels are bound to change the way chemistry will be taught in UK universities from 1990 onwards. Chemistry teachers whether at school or university will have to adjust to these changes and assume new roles. Lecturing from material collected from text books will no longer be the main mode of chemistry teaching. A teacher's role will increasingly become that of a motivator and facilitator rather than the main source of chemical knowledge. Increased use of computers for both teaching and testing can help reduce the heavy burden of routine work for a teacher and should be taken advantage of. Teachers would require training for taking on this new role.

Teachers should be prepared to respond to the initiatives taken by the pupils and cope with the demands on them.

Universities will be more interested in students who are interested, enthusiastic and show an ability and positive attitude to learn and adjust, rather than those with merely high academic qualifications.

IMPLICATIONS FOR BANGLADESH

New ideas usually trickle down to developing countries over a long period of time. Usually mature and well tried ideas and approaches are adapted in such countries. This is undoubtedly a sound way of dealing with such an important subject such as education. However, this wait and see policy has one disadvantage. Developing countries sometimes end up adapting ideas and methods which are on their way elsewhere. The same holds ... chemical education.

... situation in Bangladesh ... different. The SSC ... been based on Nuf... his is an integ... ch has many ... curri... text ... practi... ver.

... too early specialization and gender bias.

2. Student centred approach.
3. A fairer examination system with reduced emphasis on single final examination in which ability to recall is the dominant criteria for success.
4. Students should not be required to resit all the subjects in a national examination if they fail only in one.
5. Curriculum which emphasises knowledge, understanding and application, motivates both teachers and students, and raises the standards of attainment by stretching and stimulating all students.
6. Internal assessment of course/practical work with external moderation.
7. Increased use of computers both for science/chemistry teaching at school / college / university level, and for conducting tests and examination and for their administration.
8. Availability of attractive and up-to-date text books and resource material.
9. Teacher training on modern trends and methods in science/chemistry teaching.
10. Safety considerations in science/chemical laboratory.
11. Syllabuses which provide for continuity and progression between schools to college and college to university, rather than big jumps at these interphases.
12. Clearer setting of achievement targets at various ages starting from schools to universities.
13. Stronger international linkage on science/chemistry education and research.
14. Participation by professional bodies and the industry.

Much interesting change is taking place at present in UK in its science and technology vis-a-vis chemical education provision at various levels. Due to the historic linkage of the education systems in these two countries, in spite of these being out of phase, it would be beneficial to Bangladesh to note closely the events in UK. Some of the ideas may not be relevant in Bangladesh context, but an overview of changes in UK and other countries can be very helpful in incorporating the appropriate modern ideas and trends in science education in general and chemical education in particular in Bangladesh. There is also a need to more critically examine ... school/college/university ... to raise both science/chemical ... standards of attainment of all students. In ... activities, apart ... government and the ... authorities, the ... bodies and the learned ... have valuable ... to play. ... ying chemical education ... Chemical Industries ... and the Bangladesh Chemical Society can be ... help by participating ... sions and production ... books, posters and ... materials in the ... particular, and ... part of modern trends.