Feature — Education

Higher Secondary Science Education in Bangladesh

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THE Higher Secondary stage comprises grades 11 and 12. After having passed the Secondary School Certificate (SSC) examination, the first public examination held at the end of grade 10, one qualifies for admission to grade 11. The next public examination, Higher Secondary Certificate (HSC) examination, is held at the end of grade 12. HSC is the minimum requirement for admission to degree colleges, general universities, technical universities and medical colleges.

Higher Secondary is part of the college education rather than of the school in most cases. Secondary schools in Bangladesh generally impart education up to grade 10. Only a few institutions like the cadet colleges, residential model school and college and some private and public schools offer courses up to higher secondary level. Generally, HSC course is taught in degree colleges. However, there are some colleges exclusively for HSC, called the Intermediate Colleges.

There were 367 intermediate colleges in 1990 as against 263 in 1981. In addition, there are 481 degree college as against 324 in 1981 which, in addition to degree courses, offer HSC courses. However, not all of them offer science courses. A total of 699 colleges, 261 intermediate and 438 degree, offer science courses at the HSC level. In addition, 206 Madrasahs offer science course at Alim level which is equivalent to HSC. Of the 848 colleges, 215 (intermediate : 8, degree : 207) are government colleges and the others are private.

Tables 1 and 2 show the statistics of HSC results for the last five years along with that of 1981. It is seen that although the number of candidates appearing from the science group has almost doubled over the period from 1981 to 1990, it has decreased from 34.78% to 28.82% of the total number of candidates appearing over the same period. The increase in the total number of candidates appeared during the period is 140%. This may be attributed to the unplanned growth of colleges but without provision of adequate facilities for science teaching.

Table 1 also shows that the percentage of pass in 1989 and 1990 is remarkably lower than those of the previous years. This may be due to rather stringent measures taken to prevent adoption of unfair means in the examinations of these years. But this also shows the poor quality of education at the higher secondary level. In general, the pass percentage is higher for science group than for other groups. However, except in 1989 and 1990, between 40-50 per cent of the candidates appearing from the science group failed to pass. Most of them discontinue their studies at this stage. Also less than 50% of the output from the HSC level continue on courses of higher studies. Thus HSC is the terminal education for a large number of students. In order that they may be able to contribute positively to the socioeconomic development of the country, they should be appropriately educated. For those who would like to proceed to higher studies, a solid foundation should also be laid at this level. The importance of the higher secondary level of education thus becomes obvious.

Curriculum Development

A curriculum relevant to the needs of the society and of the learners is essential for improving any educational system. It should reflect the aims and objectives of the educational policy of a country. However, as a result of rapid increase in knowledge in the modern world, and emerging needs of the society, curriculum development is a systematic effort needing continuous evaluation, reviewing, revision, redesigning and up-dating.

Before the independence of Bangladesh, the major change in curriculum was made in 1961 following the recommendations of the Pakistan National Education Commission Report of 1959[1]. For the first time, science was made compulsory up to grade 10 and a multi-stream system was introduced from grade 9, the courses being divided into such groups as science, humanities, commerce, agriculture, etc. physics, chemistry, mathematics and biology were taught as separate disciplines in the science group. For the other groups a 'general science' course was introduced. Before 1961, science in the name of general science, domestic science, hygiene, etc. was taught as an additional/optional subject up to grade 10 and multi-stream courses used to commence from grade 11. The other major changes that took place as a result of the recommendations were the creation of four Boards of Intermediate and Secondary Education (BISE) in Comilla, Dhaka, Jessore and Rajshahi, in place of the one in Dhaka only, and redesignating the Matriculation Examination, the first public examination at the end of grade 10, as SSC examination and Intermediate Examination at the end of grade 12 as HSC examination. Thus higher secondary was made part of the secondary stage. Before that it used to be called intermediate stage and comprised the first two years of college education.

After the independence of Bangladesh, a National Curriculum and Syllabus Committee (NCSC) was set up in 1975 following the recommendations of the Bangladesh Education Commission Report of 1974[2]. The NCSC was entrusted with the responsibility of reviewing, redesigning and improving curricula and syllabuses up to higher secondary level. Special emphasis was given to modernize the content, teaching approach and application of science. Accordingly, the NCSC developed a new set of curricula and syllabuses during 1976-78 which were implemented, in phases, at the primary and secondary levels during 1978-84.

As recommended by the NCSC, National Curriculum Develo-pment Centre (NCDC) was established in December 1980 under the Ministry of Educa-tion (MOE). The NCDC was merged in October 1983 with the Bangladesh School Text-book Board into a single auto-nomous body named National Curriculum and Textbook Board (NCTB). The NCTB is now responsible for continuous evaluation, revision, updating and improving curricula and syllabuses as well as for producing textbook, teacher's guides and other teac-hing/learning materials up to HSC level.

The Present Curriculum

The present HSC science curriculum is virtually the same as it was 3 decades ago. Naturally, it has become obsolete, in respect of subject matter as well as teaching-learning approach and methods. The NCSC revised the curriculum in 1977 and NCTB did it again in 1989 but these have not been implemented as yet. The report has not been published as well. Meanwhile, the SSC curricula and syllabuses have been revised, updated and implemented. Attempts have been made to follow the modern trends of science and technology education making it relevant to life and living. Emphasis has been given on the understanding of science and technology for economic and social development and improving the quality of life. New textbooks have been written with modern contents and approaches. New topics, such as : (a) Ecological balance; (b) Plants in the service of mankind; (c) Food, nutrition and alimentary system; (d) Human life cycle; (e) Sericulture apiculture and (f) Population, public health and environment, have been included in the syllabus.

Teacher's guides have been written for the first time for grades 9 and 10 in general science course. New text-books, and teacher's guides have been implemented in phases starting from grade 6 in 1981. For grade 9 these were introduced from January 1988.

The implementation of the new curricula and syllabuses has, however, not been very successful as yet. The main problem is probably the teacher. They are inclined to teach the same things in the same way as they were taught when they had been students. A lot of motivation is required to change their attitude. They need, at the same time, intensive training. There have been complaints from the students and the guardians about the syllabuses being two heavy and textbooks badly written and produced with lots of mistakes. These complaints are to some extent true, perhaps because the authors are not adequately experienced in writing modern textbooks and teacher's guides. NCTB has already initiated reviewing and revising the curriculum and it is hoped that the next generation of books will be much better.

An examination of the HSC science curriculum and the detailed syllabus shows the following weaknesses and deficiencies :

(a) all the subjects taught are traditional age-old ones:
(b) mathematics is not a compulsory subject for the science group;
(c) there are considerable duplication/overlapping of contents with the new SSC syllabus;
(d) there are no prescribed rationale, aims, objectives, and attainment targets;
(e) emphasis is on rote learning rather than on learning for understanding;
(f) education is seen merely as a matter of accumulation of organized knowledge learned by acquisition of predetermined facts with little emphasis on its application in the daily life;
(g) there is not enough emphasis on development of skills and methods by means of which a student can apply his newly acquired knowledge in solving problems of practical life;
(h) the practical works are pre-set, i.e., confirmation of previously taught theory and not investigation oriented, i.e., the processes of science as away of enquiring;
(i) it lacks the vertical continuity of subject matter from SSC to degree level as a result of which a kind of vacuum has been created between SSC and degree courses.

The Bangladesh Education Commission Report, 1988 proposed a revised curriculum for HSC level. The only significant changes that have been proposed are the introduction of computer as an optional subject and making mathematics compulsory for all science groups. But this is not enough. There is need for—

— updating the content of the existing subjects
— inclusion of new subjects
— change of attitude
— adoption of new approach in writing textbooks, teacher's guides
— new teaching-learning methodology
— new philosophy of science teaching
— science, technology and society of approach
— appropriate system of assessment
— wide use of educational technology
— extensive teacher-training programme

There is, therefore, an urgent need to review, revise and modernize the HSC science curriculum to give it a new direction keeping in view the national needs as well as the international trends. The HSC curriculum is particularly important since it should be so designed as to cater for those who will not study science any further as well as those who will.

Recent Trends

The recent global trend is for a flexible, multi-directional life-long eduction. This has become necessary because advances in science and technology are continuous. Due to rapid advance of knowledge, fresh information is piling up at an enormously high rate, quickly rendering obsolete the subject matter of a number of disciplines. One cannot, therefore, be educated once and for all at school. The approach is thus to "learn how to learn" and be prepared for life-long education.

Another trend is towards interdisciplinary education. Nowadays there is no sharp dividing line between biology, chemistry and physics. Physics, for example, cannot be studied without mathematics, and zoology without ecology. Modern biological science uses concepts from all areas of science. Topics like energy, atom, molecule and electron may be included in all the subjects.

Science, technology and society approach is still another recent concept. It has arisen out of the necessity of making education relevant to the needs of the society. The study of the environment and conservation of resources is now an integral part of any secondary science curriculum.

Linking education, in general, and science education, in particular, with national development is another educational priority today — perhaps the most important one. Education is no longer considered as an intellectual exercise or an aid to developing the mind of the affluent society. It is not only the educated elite of the society, but the society as whole, who contribute to the socio-economic development of the nation. Education should, therefore, be related to work and to production in industry, in agriculture — in all fields, for that matter.

Innovation in Curriculum

In Bangladesh, a national curriculum is followed up to the higher secondary level. The HSC syllabuses of physics, Chemistry, and Biology, for example, are the same for all groups — general, pre-medical, or pre-engineering. Whether it is desirable to be so is debatable. In many countries there is an enormous range of syllabuses to choose from according to the interest and ability of the student. These include.

— "Single-subject" syllabuses —the traditional discipline based syllabus — physics, chemistry, biology;
— "Combined science" syllabus which cover elements of biology, chemistry and physics in one with some overlap;
— "Integrated Science" syllabuses based on themes or topics such as diet, food chains, energy, which are studied applying the knowledge and methods of physics, chemistry and biology;
— "Modular Science" syllabuses consisting of a number of blocks of study called modules from which the student can select.

Some innovation sin curriculum development may also be evolved in our country relevant to the local needs.

Level of Secondary Education

In the developed countries and many of the developing countries, grades 11 and 12 are part of the secondary education and are taught in schools. The Bangladesh Education Commission, 1988, has also recommended that secondary education should gradually be extended up to grade 12. Thus secondary level will consist of 2 stages — junior secondary (grades 6 to 8) and secondary (grades 9 to 12) and will be imparted in the same institution — secondary schools or intermediate colleges. The Commission has also recommended that ultimately SSC examination should be abolished and there should be only on terminal public examination at the end of grade 12.

Most of the existing secondary schools are, however, not capable of teaching up to grade 12. There is lack of physical facilities — laboratories, equipment, chemicals — as well as dearth of appropriately qualified teachers. For teaching up to grade 12, the minimum qualification of teachers should be a master's degree whereas the existing school teachers are graduates. Thus, while it is desirable to implement the recommendation of the Commission, it cannot be done immediately. Considerable efforts and resources will be required to improve the physical facilities and qualifications of secondary teachers at first.

Changes in Content

Content of education should be relevant to real life and meet the needs of the society. The society is changing rapidly making it necessary to change the content. Bangladesh is basically an agricultural country. SO emphasis should naturally be on subject areas relevant to agriculture. However, there is also the need to develop industries other than agricultural, such as electronics industries. The recent trends of science education as described above should also be taken into account.

The three traditional science disciplines — physics, chemistry and biology should still be taught at HSC level as separate subjects. The content will no doubt contain basic principles, laws and theories. But the approach should be different. For example, the students should be able to appreciate the great advantage that a knowledge of Newton's Law of Gravitation has been to astronomers and space research in addition to conventional knowledge about the law. Various need-oriented courses may also be designed with the basic knowledge of these subjects.

Some of the topics which may be included in the HSC syllabus are :

— the use of land, water and mineral resources;
— information technology and transfer;
— sociology of science;
— human engineering;
— effects of technological development;
— biotechnology;
— use of computers;
— materials;
— floods, cyclones and natural hazard mitigation.

New subjects such as computer studies and craft, design and technology may also be introduced.

Conclusion

The higher secondary level education is perhaps the weakest link in the whole education system at present. The revised curricula and syllabuses as prepared by NCSC in 1977 and again by NCTB in 1989 are yet to be implemented. Meanwhile, the need of the society has changed.

The HSC graduates, therefore, lack the skill and knowledge required to meet the challenge of life and earn their living. Since HSC is the terminal education for the majority of the students, the quality of manpower at the mid-level has deteriorated with the consequent adverse effect on the socio-economic development of the country. Also, those who continue their studies enter the institutions of higher studies with weak background.

The NCTB should, therefore, take immediate steps to publish the revised HSC curricula and syllabuses. These should be reviewed and, if necessary, revised in the light of the modern developments in subject matter as well as in teaching-learning methodology, keeping a balance between the need of the country and the resource constrains — human, financial and physical. The curriculum of each subject should contain specific aims, objectives and attainment targets.

To improve the quality of education, in general, and science education, in particular, some other factors should also be considered, apart from the curriculum. Two major areas of concern are the examination system and the training to teachers.

The present examination system in Bangladesh is perhaps the least developed area in the education system. It encourages learning by memorizing and leaves much scope for adopting unfair means. Also, a large number of candidates fail to pass the SSC and the HSC examinations every year. This is a national wastage and a cause of frustration for both the students and their guardians. The examination system should be revised and reformed to make results more meaningful reflecting the student's true knowledge, understanding, ability, aptitude and attitude.

The death of appropriately qualified teachers is also a major problem in Bangladesh. There is no facility for training of teachers of HSC level at present Pedagogical knowledge is necessary for teachers of HSC level as well. For motivation, orientation, and keeping the teachers informed about the latest developments in content as well as in teaching-learning methodology, it is necessary, therefore, to crate facilities for both preservice and inservice training for college teachers.

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Table 1

HSC Examination Results

Year	Number Appeared			Number Passed			Percentage of Pass	
	Total	Science		Total	Science		Total	Science
1981	122837	42728	(34.78)	67705	26846	(39.65)	55.12	62.83
1986	263249	108205	(41.10)	148578	56856	(38.27)	56.44	52.54
1987	232391	77674	(33.42)	110264	42484	(38.53)	47.45	54.70
1988	297120	89116	(29.99)	131091	47670	(36.38)	44.10	53.49
1989	315889	91024	(28.82)	78452	31109	(39.65)	24.84	34.18
1990	294391	82825	(28.13)	87419	30965	(35.42)	29.70	37.38

Source : Bangladesh Bureau of Educational Information and Statistics (BANBEIS)

(Figures in parentheses indicate percentages of total)

Table 2

Analysis of HSC Input and Output

Year	Input (1981 = 100)		Out put (1981 = 100)	
	Total	Science	Total	Science
1981	100	100	100	100
1986	214	253	219	212
1987	189	182	163	158
1988	242	209	194	178
1989	257	213	116	116
1990	240	194	129	115

A science student at work in a college lab. —Star photo

Literacy Campaigns in Danger of Budget Axe

by Prakash Candra

NEW DELHI: The recently installed government of Mr Narasimha Rao has an important item on its agenda — education, and more specifically, the spread of literacy. For more than 56 per cent of the country's 700 millions are still unlettered and, therefore, unaware of many contemporary developments.

Significantly, Mr Rao himself was Minister for Human Resource Development in Mrs Gandhi's Cabinet. And later Mr Rajiv Gandhi, when he became Prime Minister, launched the National Literacy Mission Authority.

Analysts in New Delhi are wondering if the former Education Minister and now Prime Minister, Mr Rao, will give a new lease of life to the literacy campaign. For, just before Rajiv Gandhi was driven out of government, the literacy campaign had achieved some highly significant results.

For instance, 14 districts of the South Indian State of Kerala and now Burdwan district in West Bengal have achieved 100 per cent literacy thanks to a determined campaign and an investment of some Rs 200 million (US$7.7 million) in the Kerala project, apart from Rs 100 million (US$3.8 million) raised by the local community.

The Burdwan campaign has cost the Literacy Mission Authority Rs 30 million (US$1.1 million). And another Rs 200 million are being spent on literacy campaigns in some 40 districts of the country. These are all funded by the Central Government.

Now educationists are wondering whether the country, which is facing a tremendous economic crisis, can afford to continue these projects and finance the follow-up campaign.

As one expert points out, "It is quite customary to cut down education and health budgets when a country faces the need of cutbacks in its budget. It has happened before and is likely to occur again."

According to Dr A K Jalaluddin, a former Director of Adult Education who conducted earlier campaigns, "A whopping 90 per cent of those who become literate could actually lapse back into illiteracy. This means just a measly 10 per cent are propelled forward and stay literate taking advantage of the available reading material."

What is worrying the experts here is the fact that both in Kerala and in Burdwan district people are demanding continuing education. This, of course, means more money for buying books and setting up libraries.

As one campaigner remarks the neo-literates in Kerala are riding high on the crest of literacy. They are demanding the better levels of education which were denied to them all these years. Many women in particular, are demanding basic school education. They will not be satisfied with just more literature for neo-literates.

In Burdwan district, for example, the neo-literate community is demanding that the existing education centres be continued for a few more months.

A distressing aspect of the situation is that not many people remain literate as there is no follow-up action.

According to a study conducted by two academics, Mr P Roy and Mr J N Kapur, who published a book *Retention of Literacy*, some 45.4 per cent of the males who did a ten-month course in literacy had forgotten all that they had learned.

Those included in the survey had done the adult literacy course three to ten years earlier. The number of rural women who lapsed back into illiteracy was a staggering 51.3 per cent.

In 1961, there was a village literacy movement in Satara district of Maharashtra. Six to eight-week literacy courses were organised and villages vied with one another in their enthusiasm to get literate. But there was no post-literacy programme. A few years later it was found that there was no visible or tangible impact of the movement launched with great fanfare.

After the latest tremendous campaign efforts for literacy, if this kind of relapse is to happen it would, indeed, be an unforgivable shame. Heady as the successes of Kerala and Burdwan are, attaining the National Literacy Mission norm is just acquiring the initial level of literacy.

"To call it a functional level of literacy," or a "retrainable level of literacy" is wishful thinking, says an evaluation report of the Burdwan programme.

"To expect that those who have acquired a bare minimum of literacy — when reading is yet a labour and not a pleasure — would flock to continuing education centres seems totally unrealistic. "It is better to respect the judgement of the learners about their own ability than to impose upon them a policy of closing down guided learning after six months, at the fall of a hammer."

Experts in Delhi point out that literacy campaigns cannot have the verve and the fire to stay alive in perpetuity. The energy that generates interest in literacy peters out after six month. So whatever has to be achieved in terms of literacy targets must be in that period only.

Plans have been drawn up for setting up literacy centres with reading rooms and discussion facilities. But not many have come up because of budget cuts.

Analysts say that you have to set up libraries and centres for the motivated literacy-hungry community. This requires the purchase of land and buildings and spending of money to run the centres.

According to Professor Dharam Narain, a keen observe of the literacy scene, creative writing is a must to produce literature for neo-literates.

Schoolboy's Robot Helps to Blaze a Technical Trail

AN 18-year-old boy has put India on the world robotic map, by winning the bronze medal at the First International Robot Olympics staged in the Scottish city of Glasgow.

He almost didn't make it to Glasgow, his five-foot-tall creation being a last-minute entry.

"I just couldn't believe it," recalls Ashish Panwar, an unassuming student from a school in Lucknow, north India. The eldest son of a farmer from Meerut, he has always taken a keen interest in assembling gadgets for science exhibits.

His robot, called SIAS, moves backward and forward on four wheels, in response to Ashish's claps. It can keep track of number of people entering a building or any defined area; can raise an alarm when rain falls on it; automatically switch on and off lights; and sound a burglar alarm.

Ashish bought the components — integrated chips, fibreglass body, electric motor — and with a little help from friends and teachers, managed to make it work. Indeed, it was his friends and supporters who made his Glasgow trip possible.

When Ashish noted a newspaper report on the Robot Olympics last year, his school principal, Ms Sadha Choramani, contacted organiers in London who promptly agreed to accept Ashish's entry.

Then the problems started. Funds were needed as the robot cost 30,000 rupees (US$1,485) with an equal amount needed for conveyance. The Uttar Pradesh state government, local industrialists and others refused to sponsor Ashish's entry. Some even called it a "hoax."

Then Jagdish Gandhi, proprietor of the City Montessori School, and students came forward to help. The students decided to cancel last year's annual sports day and give the fund instead to Ashish. Thai Airways decided to fly the robot free. As the logistics were being arranged, Ashish and just two weeks to assemble the robot.

Banking on such skills — of teenagers adept at meeting 21st century challenges — India is encouraging computer education, and on a large scale.

India earns foreign exchange from computers, and aims to increase its earnings. By September this year, for instance, it hopes to export US$400 million worth of computer software. In 1990, software exports were around US$100 million.

The Department of Electronics coordinates computer manpower development. It is associated with about half of the 500 private institutions which offer computer education. Many of these computer schools emerged under a Department of Electronics program of computer manpower development drawn up in 1983.

Between 1985 and 1989, about 40,000 Indians graduated from these computer schools, or half of the computer manpower required for the period.