<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Science and technology education and culture in Bangladesh.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Shahjahan Mian.</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>1997</td>
</tr>
<tr>
<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10220/2743">http://hdl.handle.net/10220/2743</a></td>
</tr>
<tr>
<td><strong>Rights</strong></td>
<td></td>
</tr>
</tbody>
</table>
Science and Technology Education and Culture in Bangladesh

Dr. Md. Shahjahan Mian (Tapan)*

Introduction

Bangladesh, one of the least developed countries in South Asia, has an area of 144,499 square kilometer. It has a population of about 120 million (1992) with a growth rate of 2.17 percent and 828 persons per square kilometer. With an average annual growth rate projected to be 1.8% during 1989-2000 the population is estimated to increase to 128 million by the year 2000 and 176 million by 2025.

Majority of the population in Bangladesh are illiterate and poor. The literacy rate is 44 percent. The per capita income is US $ 220 and nearly 50 per cent of the people live below the property line. Education, in general and science education in particular, is an indispensable necessity for transforming this large population into human resources. Science and technology education can accelerate the human resource development of a country by improving productivity, health and nutrition and slowing population growth. Recently, it is a known fact that education in general and science education in particular is the best contraceptive against over burdening of population.

Along with the programme of ‘Education for All’ by 2000 AD, most countries of the world are now adopting programmes of “Science for All”. In such a programme basic scientific literacy becomes not only a part of the curriculum of school, but also an important element of the out of school activities for the youths and adult alike. At present to relate science more closely with technology (i.e. application of science to production) on the one hand and the socio-economic development programmes of the country, on the other, is an important trend. A very effective slogan has been “Science for Technology and Development”. Another similar formulation is the “Science Technology Society Approach.

Dr. Mian is a Professor of Science and Mathematics Education, Institute of Education and Research, University of Dhaka.
Such an approach has particular relevance to a developing country like Bangladesh where socio-economic development is not only a matter of urgent national concern but also a life-and-death question for the nation. The prime need of the hour is to improve the quality of life of the individual, the community and the nation as a whole through the application of science and technology.

The role of science and technology in the development of the Bangladesh society has been highlighted by various high level documents, including the Policy of National Science and Technology in Bangladesh (1986). The report of the Bangladesh National Commission (1972 and 1988) has rightly pointed out that the study of science in a developing country like Bangladesh has a very special significance.

Structure of the Education System

The educational system of Bangladesh is structured as:

(a) Primary; (b) Secondary; (c) Higher education. Following one or two years of pre-primary education (mostly found in cities and district headquarters and managed in nursery, kindergarten schools, tutorials and pre-cadet schools) the primary level starts at the age of 6 and extends over a period of five years (grades 1-5). The age group of primary school children is 6-11 and primary education is compulsory and free. There is no public examination at the end of the primary level but the headteacher issues school leaving certificate to the successful candidates. The percentage of enrollment of the primary age-group children is 92 which is encouraging no doubt.

Secondary education consists of 6-12 grades and is divided into three stages: Junior Secondary (grades 6-8), Secondary (grades 9-10) and Higher Secondary (grades 11-12). Secondary Education has three major subsystems:

(i) Secondary Education, General
(ii) Secondary Education, Madrasah
(iii) Secondary Education, Vocational
STRUCTURE OF EDUCATION SYSTEM IN BANGLADESH (1997)

- PRIMARY
  - MADRASH SUBSYSTEM
  - GENERAL SUBSYSTEM

- SECONDARY
  - MADRASAH SUBSYSTEM
  - GENERAL SUBSYSTEM
  - VOCATIONAL SUBSYSTEM
    - SCIENCE GROUP
    - HUMANITIES GROUP
    - BUSINESS EDUCATION GROUP
    - TAJBID
    - HIFJUL QURAN

- HIGHER SECONDARY EDUCATION
General Secondary Education has three groups viz. (a) Science, (b) Humanities and (c) Business Education. Madrasha subsystem has five groups viz. (a) Science, (b) Humanities, (c) Business Education, (d) Tajbid, and (e) Hifjul Quran.

This division of group starts from grade 9. In this paper I shall discuss the general subsystem in detail.

The academic program is intended to be terminal at the end of grade 10. Students then appear for the first public examination known as the Secondary School Certificate (SSC) Examination. Based on the outcome of the SSC Examination, the student can qualify for entry into the two year higher secondary level of grades 11-12. At the end of grade 12, the students have to pass another public examination, the Higher Secondary Certificate (HSC) Examination for admission to higher education.

Higher education system is categorized into: (i) general education consisting of arts, commerce, science and social science; (ii) agriculture, (iii) engineering/architecture; (vi) textile and leather, (v) medicine, (vi) teacher education, (vii) law and (viii) post-graduate research.

Bangladesh has 1684 Junior High Schools, 9663 high schools and 603 intermediate colleges. (About 14 percent of the high schools being exclusively for girls). The number of government managed high schools are 317 (170 for boys and 147 for girls).

Current Structure of Technical and Vocational Education (TVE) Systems

Formal technical and vocational education (TVE) in Bangladesh is offered in three tiers, viz. (a) certificate courses (grades 9-10 offered by Vocational Training Institute (VTI) and Technical Training Centers (TTC), (b) Diploma level courses (grades 11-13 offered by Polytechnic and Monotechnics and (c) Degree courses (grades 13-16) offered by universities and Institutes of Technologies. From 1995 SSC vocational, a course equivalent to SSC in general subsystem, was introduced in TTCs. HSC vocational will also be introduced from
this year. Besides, the students of secondary schools can take trade courses (taught in nearby TTCs) as elective subjects. The SSC vocational and HSC vocational courses are offered in curriculum areas authorized by the statutory accreditation organization called the Bangladesh Technical Education Board (BTEB). For the present study of secondary education institutional training offered by VTIs and TTCs at the level of grades 9-10 have been considered. The VTIs are administered by the Ministry of Education (MOE) through the Directorate of Technical Education (DTE) and the TTCs are run by the Ministry of Manpower and Labor (MOML) through the Bureau of Manpower, Employment and Training (BMET).

Vocational Training Institute (VTI). The Directorate of Technical Education (DTE) under MOE operates 51 VTIs at various district and subdistrict levels. Of these, 4 VTIs are of large sizes (with enrollment of about 200 each) located in large district towns and the remainder with enrollment of about 80 each are generally located in rural areas with low levels of industrialization. The VTIs mainly offer instructions in any of 13 curriculum areas authorized by the statutory accreditation organization called the Bangladesh Technical Education Board (BTEB). Initially the subjects offered as trade courses did not match the local demand. Consequently enrollment remained low.

Technical Training Centers (TTC): The Bureau of Manpower and Training (BMET) of MOML runs 11 TTCs. These centers are located in the larger cities and have full time enrollment ranging from about 110 to 550. The pattern of instruction is similar to VTIs.

Science Education at the Primary Level
At this level the enrollment, retention and dropout rates are 92%, 61% and 39% respectively. The ratio of boys and girls is 53:47. Following the recommendations of the 1972 National Education Commission, a major reform in the Science Curriculum was made in 1974. Science was made compulsory at the primary level in the form of Environmental Studies. At present, all pupils in the primary classes 1-5 (age 6 to 10 yrs) are required to study a subject called Environmental Studies. This consists of (i) Introduction to
Environment Social Studies and Introduction to Environment Science. There is no textbook for Environmental studies in grades 1 and 2 but there are teacher’s guides for teaching the subjects. For grades 3-5 there are prescribed texts for Environmental Science. The syllabi include topics from physical science, biological science, geography, hygiene and population control. The main objectives of science teaching at this level is to (a) develop interest and curiosity about natural phenomena, (b) observe and acquaint with immediate and local environment of the children, (c) develop the habit of solving problems using scientific methods and scientific attitude, (d) understand the importance of contribution of science and technology to improve the quality of life, (e) to develop interest for applying science and technology, (f) to develop attitude to leading healthy life, (g) to help developing creativity.

Science Education at the Secondary Level

The gross enrollment at this level (grades 6 to 12) is 19%. The percentage of male and female enrollment is 25% and 13% respectively. Science is compulsory at the junior secondary level. All students of grades 6-8 have to study General Science as a compulsory subject. The syllabi of the subject has been prepared keeping in mind previous experiences in environmental science at the primary level. All the science students of grades IX and X have to study three subjects from physics, chemistry, biology and mathematics. Students may take all the four subjects but one as an elective subject. General Mathematics is compulsory for students of all groups but higher mathematics is an elective subject only for a science student. At present general science is compulsory subject for students of all groups except science group. A good number of students, specially, majority of the girls of science group do not opt for mathematics as an elective subject. So, in Bangladesh science can be read at the secondary level without taking mathematics as a subject. General Science is also compulsory for the secondary students of Madrasah subsystem. In Madrasah subsystem, there is a provision for science group also. But only 8% of the Madrasahs offers science at the secondary level.
The objectives of science teaching at the secondary level are to:

1. reinforce and expand knowledge and skill acquired at the primary level.
2. understand the nature, scope, use, misuse and limitations of scientific knowledge.
3. understand the importance and characteristics of scientific process such as observation, classification, measurement, experimentation and decision making.
4. develop ability to use scientific process.
5. develop scientific attitude and values such as logical thinking, open mindedness, respecting others views and intellectual honesty.
6. develop interest and curiosity about environment and natural phenomena and for practical experiments.
7. know some basic concepts, laws, principles and theories of science.
8. develop skill of observation and ability for applying scientific knowledge and skills in solving problems of daily life.
9. know contribution, relation and need of science and technology for improving socio-economic conditions and quality of life.
10. develop ability to think logically.
11. help practicing and applying scientific skill and process.
12. relate science education with productivity and to improve quality of life through conservation of natural resources.
13. develop interest in scientific process rather than information and theories of science.
14. learn and appreciate the usefulness, contribution and relevance of science and technology in the development of society and improving the quality of life.

There is a decreasing trend in the enrollment of students in science at the secondary level. The trend is revealed from in the table below.
Table 1: Trends of Science Students At the Secondary Level 1991-1995

<table>
<thead>
<tr>
<th>Year</th>
<th>Sex</th>
<th>IX</th>
<th>X</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>42.66</td>
<td>44.00</td>
<td>43.77</td>
</tr>
<tr>
<td>1991</td>
<td>Boys</td>
<td>47.64</td>
<td>49.17</td>
<td>48.34</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>31.58</td>
<td>32.15</td>
<td>31.83</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>36.09</td>
<td>36.66</td>
<td>36.35</td>
</tr>
<tr>
<td>1992</td>
<td>Boys</td>
<td>43.72</td>
<td>44.50</td>
<td>44.08</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>24.75</td>
<td>24.61</td>
<td>24.68</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30.71</td>
<td>31.53</td>
<td>31.08</td>
</tr>
<tr>
<td>1993</td>
<td>Boys</td>
<td>31.01</td>
<td>36.84</td>
<td>36.39</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>23.15</td>
<td>23.38</td>
<td>23.25</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>30.55</td>
<td>31.52</td>
<td>30.98</td>
</tr>
<tr>
<td>1994</td>
<td>Boys</td>
<td>35.91</td>
<td>37.11</td>
<td>36.46</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>23.30</td>
<td>23.34</td>
<td>23.32</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>27.12</td>
<td>27.17</td>
<td>27.14</td>
</tr>
<tr>
<td>1995</td>
<td>Boys</td>
<td>32.25</td>
<td>32.29</td>
<td>32.26</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>20.49</td>
<td>20.07</td>
<td>20.31</td>
</tr>
</tbody>
</table>


The general Science courses for grades 6 to 10 covers topics selected from natural science (Biology, Chemistry and Physics) and some topics from Earth Science, Geography, Geology and Astronomy. In addition, issues on population, environment, gender and development are addressed. Life orientation, a key features of the new curriculum, is found in some of the topics like food, nutrition, health, diseases, population and the environment. Another emphasis, work orientation is reflected in the choice of practical applications of science to economics.

Table 2: HSC Examiners in Different Groups in 1996

<table>
<thead>
<tr>
<th>Group</th>
<th>Sex</th>
<th>Total No. of Examiners</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science</td>
<td>Male</td>
<td>64156</td>
<td>19.31</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>18022</td>
<td>10.81</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>82178</td>
<td>16.48</td>
</tr>
<tr>
<td>Humanities</td>
<td>Male</td>
<td>199223</td>
<td>59.98</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>141056</td>
<td>84.64</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>340269</td>
<td>68.22</td>
</tr>
<tr>
<td>Commerce</td>
<td>Male</td>
<td>68803</td>
<td>20.71</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>7571</td>
<td>4.54</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>76374</td>
<td>15.30</td>
</tr>
<tr>
<td>Grand Total</td>
<td>Male</td>
<td>332172</td>
<td>66.60</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>166649</td>
<td>33.40</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>498821</td>
<td></td>
</tr>
</tbody>
</table>

Science Students at the Sec. Level

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% of Science Students
At the higher secondary level the enrollment of the age-group is 19%. Due to lack of enrollment data in different groups at this level participation of students in science group were calculated from students appeared in Higher Secondary Certificate (HSC) Examination in Science group and trends of science education at this level was also calculated from the data of appeared students in different years. It is found that only 24.88 percent students of higher secondary level was in science group in 1990 which decreased to 16.48 percent in 1996. The percentage of female students in science groups in 1996 was only 10.81 percent.

Table 3: Trends of Science Students at the Higher Secondary Level (1990-1996)

<table>
<thead>
<tr>
<th>Year</th>
<th>Humanities</th>
<th>Science</th>
<th>Commerce</th>
<th>Percentage of Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>98081</td>
<td>73244</td>
<td>66774</td>
<td>24.88</td>
</tr>
<tr>
<td>1991</td>
<td>86093</td>
<td>63992</td>
<td>63800</td>
<td>24.49</td>
</tr>
<tr>
<td>1992</td>
<td>79024</td>
<td>53530</td>
<td>61379</td>
<td>22.52</td>
</tr>
<tr>
<td>1993</td>
<td>112392</td>
<td>78256</td>
<td>65890</td>
<td>24.59</td>
</tr>
<tr>
<td>1994</td>
<td>261408</td>
<td>75602</td>
<td>61530</td>
<td>18.97</td>
</tr>
<tr>
<td>1995</td>
<td>318518</td>
<td>77812</td>
<td>72471</td>
<td>16.60</td>
</tr>
<tr>
<td>1996</td>
<td>82178</td>
<td>340269</td>
<td>76374</td>
<td>16.48</td>
</tr>
</tbody>
</table>

Source: Bangladesh Education Statistics 1995, BANBAIS, 1996

Science group students at this level is divided into two major sub-groups, Physical Science and Biological Science. A physical science students has to take physics, chemistry and mathematics as compulsory subjects and may study biology or statistics or geography as an elective subject. A biology group student has to take physics, chemistry and biology as compulsory subjects and mathematics, or geography or statistics as an elective subject. An HSC science students may study science without taking mathematics.

Popularization of Science

Science and technology have always been important factors in shaping human society. The rapid advancement of science and technology in modern times can bring benefits such as greater productivity and better quality of life, but only if the general populace can comprehend and keep pace with the changes being made. No significant effort for popularizing science and technology and developing scientific and technological
Science Students at H.S.C. Level

% of Science

awareness among the people in Bangladesh have been made before the last decade. Although over the eighties substantial modification of the science curriculum of the schools has taken place. New textbooks and teacher's guides have been introduced, new science equipment has been provided to most schools, activity and inquiry-oriented science teaching is being encouraged through large scale teacher training programmes and academic supervision of the schools.

Some efforts have been made to popularize science and technology education among the school students and out-of-school children through organization of science clubs based on the school and the local communities. The National Science Museum, the only science museum in Bangladesh, patronizes the organization of science clubs providing some grants, suggestions and advice. School children and adolescents and out-of-school adolescent and youth usually organize science clubs and do some scientific observation, experiments and activities in terms of science fair, lectures, seminars, discussion meeting etc. Sometime they publish some science magazines too.

Since 1978 Annual National Science Weeks and Science Fairs have been organized every year in which school pupils and science club members participate at the district and national levels. Bangladesh Shishu (children) Academy also arranges competition for school children at the district and national levels where small science project developed by the children are exhibited and the children are awarded prize for the best performance. The projects so far undertaken by the club members may be divided into following categories among others (a) experimental proof of established laws and principles; (b) improving/preparing apparatus/equipment; (c) survey and mapping; (d) observation and recording; (e) collection of information/data through handmade instruments; (f) production oriented activities; (g) inventions; (h) innovations etc. No significant role was played by the media in Bangladesh to popularize science and technology education. Bangladesh Betar (Radio) and Bangladesh Television broadcast insignificant number of programmes for popularization of science. The number of popular magazine in science is very little in Bangladesh.
Women in Science and Technology

About 50% of the Bangladesh population is women. Bangladesh, therefore, cannot achieve its developmental goals leaving its women outside the developmental stream. Women are second to none in every field of human activity. Scientific and technological arena is no exception. There was a time when it was taken for granted that women are not suitable for science and technology education. Then there was a time when it was thought that women cannot excel in the field of science and technology. But now the time has come when all these notions have been disproved. All over the world women are emerging as successful personnel in the profession of science and technology, fully capable of competing with men. The change of attitude towards women has changed a lot. The number of women students, academicians and professional are steadily on the increase, the fact remains that a very low percentage of an even lower proportion of women of the total educated populace are encouraged in these fields. This is partly due to the widespread belief that it is difficult for women to comprehend scientific and technological knowledge. As professional in the field of science and technology one has to spend more time, therefore, a women professional in this field may have less time for their personal and family lives. The social attitude, therefore, towards them is not always favourable. Inspite of these unfavourable attitudes meritorious girls are being attracted by science and technology education. The girls who opt for science and take mathematics as a subject usually perform better in the SSC and HSC examinations. A good number of girls are placed in the merit list of the results. Sometimes they top the list also.

In Bangladesh constitution women has equal right as men. They have voting rights. Ten percent of the seats in the parliament are reserved for them. Fifteen percent of the Government jobs are reserved for them also. Women in Bangladesh are in disadvantageous position and special encouragement and facilities are often needed to bring them up to a position equal to that of man. To attract girls to science and technology very little has been done in this countries. To encourage female education, girl's education up to higher secondary level is made free of cost which may help some poor but meritorious girls to participate in the science and technology education. Besides this, no significant efforts have been made to popularize science among women.
School and Community

In Bangladesh only those selected students who have good academic career study science at the secondary and higher secondary level. Usually parents or teachers play a key role in selecting subjects or opting for science. Parents of meritorious children usually allow and encourage their children to take science as an elective subject and they are also keen to see that their children do well in science. Because, they think that their children may get admission to some good institutions for higher studies with their good result. Literate parents help their children to learn science. Usually schools in Bangladesh, do not have links with the community. They don’t have link with local industry, local agriculture and ways of living. But very recently some NGOs developed primary curriculum for non-formal primary education. Their primary Science and Social science curriculum have some relevance with the local agriculture, local environment and real life situation of the children. But the science and social science curriculum of primary and secondary levels in formal education of Bangladesh have very little relevance with the local community, industry, agriculture, environment and real life situation of the learners.

Political leaders in this country are less concern about science and technology education of the people. Sometimes they emphasizes the needs for science and technology education in the country but do very little to implement programmes relating to science and technology education. The parents, usually, do not worry about science education of their children and they do not come forward with suggestions for improvement of science and technology education because they think that this is the duty of the government and the teachers.

One way to enhance development in Bangladesh to harness science and technology so that they will directly benefit the community and its people. This can be done by providing scientific literacy among the people. Defining scientific literacy APEID Report 1991 mentioned.
"It entails providing the population with a venues by which they can become scientifically literate, self-reliant, self-sufficient and responsible as members of society. To be scientifically literate means that people understand the basic scientific principles governing the world around them, that they are open-minded about ideas and experiences, and that they are critical-minded in securing or dealing with information. Furthermore, they are able to use simple scientific processes, e.g. practical skills, problem-solving and decision-making in dealing with phenomena occurring in everyday life."

In Bangladesh Science and technology has not yet been developed as a culture but has to be developed in course of time in order to make the country self reliant. In order to do that science should be an integral part of primary and secondary level not only in general subsystem of formal education but also in madrasah subsystem and vocational subsystem. There should be opportunities for learning science through nonformal system of education. Scientific and technological activities in terms of seminars, workshops, fairs, exhibition, tours discussion, debate, etc. should be practiced very frequently in schools and communities so that school children and adolescent; out-of-school children; adolescent and youths; the workforce, including vast number of functional literate and educated adult of the populace can take part in the above mentioned relevant activities.

References