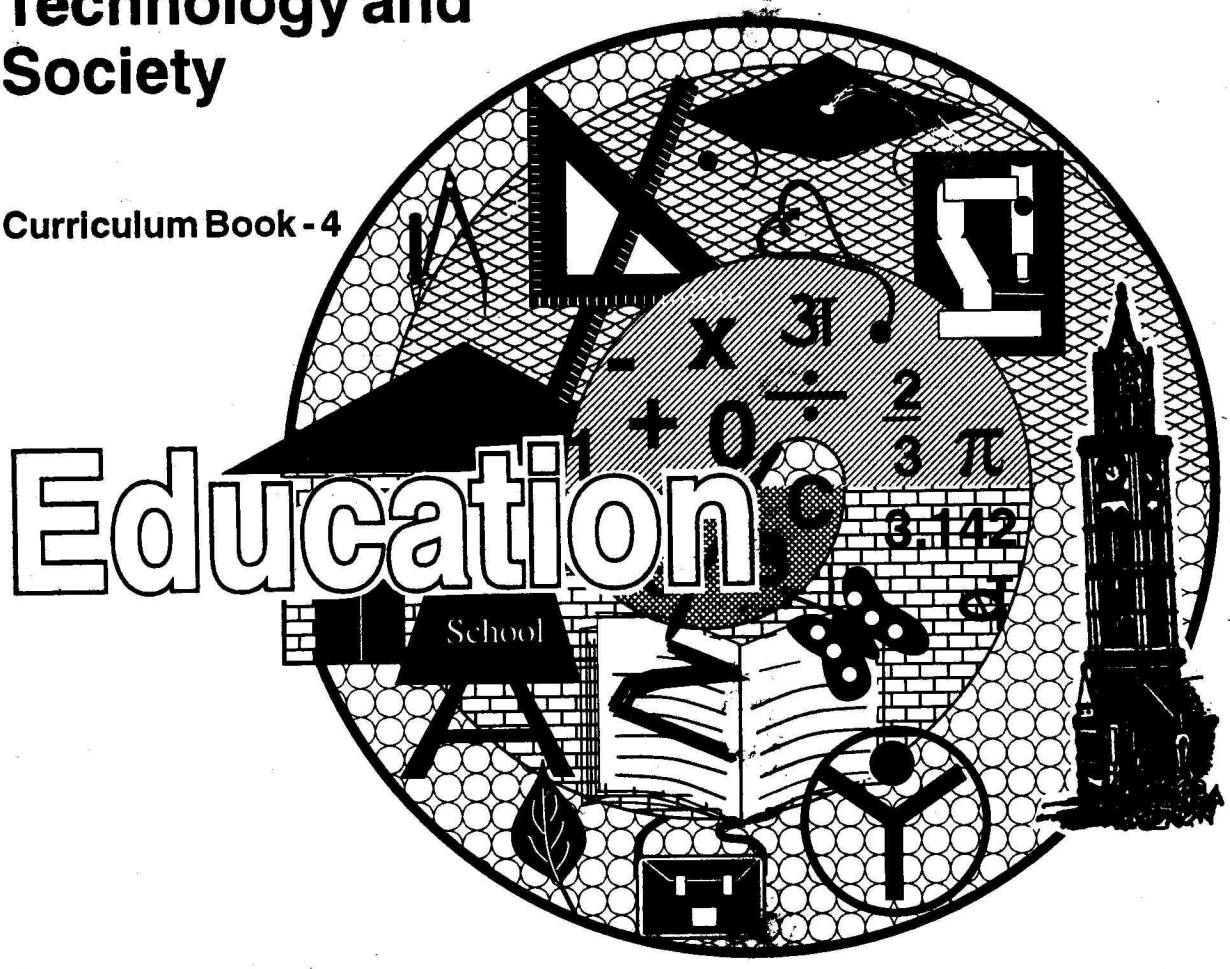
Activity based Foundation course on Science, Technology and Society

Curriculum Book - 4



G. C. Pal

Series Editor: Chitra Natarajan

Homi Bhabha Centre for Science Education
Tata Institute of Fundamental Research

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Foundation course
on Science,
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and Society

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Education

G. C. Pal

Homi Bhabha Centre for Science Education
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The sensitivity to current issues and concern about education of young people evinced by Mr. V.G. Kulkarni, Founder Director of HBCSE, guided the project from its inception. Discussions with Dr. Phondke and Mr. Kulkarni have enriched the content of the series. Besides deriving the benefit of his rich experiences in the areas covered by the project, I have been inspired by Dr. B. M. Udgaonkar's keen interest in the curriculum.

HBCSE Director, Dr. Arvind Kumar's commitment to enriching students' knowledge, and his participation and support in drawing up the content and format of the programme, contributed immensely to the success of the project. The series of books, of which this is one, is a direct outcome of the programme. Dr.Arvind Kumar has been actively involved in planning the overall content of the books. His encouragement and gentle nudges have been useful in bringing them out in print over a reasonable time span.

Besides Dr. Arvind Kumar, Drs. Bakhtaver Mahajan, Sugra Chunawala, G.C. Pal and Ms. Sandhya Karande conducted several sessions during the programme. Besides encouraging the project, Dr. H. C. Pradhan, through the programmes he has coordinated, has provided me opportunities to test some of the activities included in this book on selected students of secondary and higher secondary levels.

The participants of the programme in Mumbai were students from arts, com-

merce and science faculties of two junior colleges in the vicinity of the Centre. The programme was also conducted at the D. B. F. Dayanand College of Arts and Science, Solapur, by Dr. N. S. Dhayagude and his team, where it was received well by the local participants. The participants of the Mumbai and Solapur programmes performed many of the activities included in the books, and enriched this endeavour by their enthusiasm and feedback. These young people's quest for meaningful activities is the *raison d'etre* for this activity based curriculum.

Bringing out books of this kind involves a variety of tasks, like clarifying references, getting drafts printed, choosing appropriate illustrations, cover-page layout, photocopying, and so on. As in the earlier books, in referencing, wordprocessing, printing and illustrations, it is a pleasure to acknowledge Ms.Yogita Parab's help, which was often sought and willingly given. Drs. G. Nagarjuna, Porus Lakdawala and K. Subramaniam have been of immense help in providing the needed human interface in all our computer interactions. Everyone at the Centre contributed to providing a problem-free working atmosphere.

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G. C. Pal

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1.1 The need

The complex web of interactions between all spheres of human activity demand that prospective decision makers possess a repertoire of skills complemented by a reasonable capability to communicate their strengths, in oral and written form. Many of these skills are dependent on the domains of specialization: the study of biology may hone observational skills and the ability to classify and categorise; mathematics calls for logical skills, and the pursuit of sociological sciences calls for critical thinking and the ability to make complex linkages.

Both teachers and the taught readily acknowledge that science, technology and society are intimately linked. However, these linkages are complex. Hence, there is a need to adopt different methods in classrooms to encourage students to form such links. These pose problems for the teacher.

A factor that makes teaching issues at the interface of science, technology and society even more difficult is the proliferation of information. The information boom also comes in the wake of crumbling national barriers for trade and information exchange and a global notion of neighbourhoods. Societies and individuals are reacting more rapidly to global changes than they ever did before. Changing environmental perspectives in Europe have led to mi-

gration of polluting industries into the developing countries. Tension in the Middle East or West Asia becomes an immediate cause for concern in Kerala. War, destruction, concern, recovery, rebuilding, and war again - cycles that used to take hundreds of years in previous centuries, now have a periodicity of less than ten years. Contemporary issues not only affect all citizens to some extent, but also call for a systems approach to its understanding and resolution, considering among other things, the technological, economic and socio-cultural linkages. This approach requires a certain attitude to problem solving.

Appropriate training can enable students to acquire problem solving abilities. However, increasing content specialization after grade ten, and lack of an integrated approach to learning before that, are hurdles to such a training. This situation can be partially remedied through intervention training programmes, be they at the level of higher education, or during professional on-the-job training.

1.2 A programme for post-school students

Such a training formed the principal objective of the programme funded by the J.N.Tata Endowment Trust, and implemented by HBCSE over three years at Mumbai and also for two years at Solapur. Developing a sensitivity to, and an understanding of, the complex linkages between science, technology and society, was the basis for the programme that aimed at promoting 'good citizenship' qualities among post-school students. The other vital input was strengthening the comprehension and communication skills of the students.

1.3 The curriculum

1.3.1 Genesis

The success of the programme, measured in qualitative terms — heightened sensitivity of the participating students, and their sustained interest — has

inspired this Foundation Curriculum. The curriculum has been embodied in a series of books. The objectives of the curriculum preclude these books from being textbooks. Instead, these books outline a series of activities that lead from simple issues and ideas to complex ones, requiring the students to make the necessary linkages. The activities are also designed to develop the skills necessary for a practical understanding of issues at the interface of science, technology and society.

Most activities suggested in the books have been tried with post-school students during the programme. These could be used by any interested person — a teacher or leader of a forum — to develop comprehension and communication skills among members of a group of young people. They will be working on a broad canvas of issues at the interface of science, technology and society. Outlined below are the objectives of the curriculum, guidelines for interaction, and the topics, chosen for convenience, under which various issues will be discussed.

1.3.2 Objectives

The objectives of the curriculum can be summarised as follows.

- Offer guidance to students in improving their English comprehension, communication and analytical skills, besides quantitative reasoning. English has been chosen in the light of its being the language of global information flow.
- Integrate students' curricular knowledge with environmental and developmental issues of concern, thus giving a broad exposure to several disciplines.

1.3.3 Guidelines

Setting guidelines for interaction between the group of students and the teacher will go a long way in achieving the objectives stated above. A possible set of guidelines are listed below.

a. Sessions should be conducted in a participatory and interactive mode.

b. Sessions should involve thinking across disciplines, stretching the ability of participants to think beyond the obvious connections.

c. Relevance of the issues to daily life should be stressed, and participants should be guided in making decisions.

d. Weaknesses and lacunae should be assessed at intervals, through appropriate questionnaires.

e. Skills should be developed through suitably designed activities. These could include the following.

   - writing persuasive essays, poems, letters to local newspapers,
   - writing and staging street plays,
   - organised formal debates,
   - analysis of tabulated information,
   - comparison and quantification,
   - drawing charts and graphs,
   - designing games,
   - conducting interviews and surveys, and
   - visits to industries, research institutes.

1.3.4 Content

Activities designed to meet the objectives of skill development are grouped under issues of current concern. The issues are all interlinked and need to be treated that way. For convenience of presentation, these are discussed under the following topics.

- Survival of Humankind: Curricular Philosophy, and The Population Problem
- Education

- Health — Diseases, Drugs, and New Challenges
- Resources: Land and Air
- Resources: Food and Water
- Resources: Energy
- The Environment — Balance in Nature
- The Environment — Degradation, Science and Technology
- Information Revolution and the Media
- Social Conflicts, Gender Issues and World Peace

The present chapter, an introduction to the curriculum, is a part of each book, with a variation only in Section 1.4. It would be useful to revisit the discussion on *Survival of humankind* given in the book on "The Population Problem", whenever in doubt about the goals of the session.

1.3.5 Duration and target group

The activity books are designed to be adequate in content for a 2-year course in Science, Technology and Society at the Higher Secondary level. The activities in the curriculum can be completed over a span of 200 contact hours. Some of the activities require the participants to collect data by library search or survey outside contact hours. However, many activities, mentioned in Section 1.4 of the respective books are essential for giving students a flavour of the issues. These may be covered over a span of 100 contact hours, about 10 hours per book. The large number of activities given in each book allow ample scope for a flexible and innovative approach to teaching.

The activities outlined in the books can, however, be used with any group of individuals with a minimum schooling of standard X (grade 10). It has been found to be harder to work with groups exceeding 30 members. This problem can be overcome by dividing the group into subgroups of smaller size. It would certainly help to have a common language of communication within

the group. Since it is most likely that the books will be used in a classroom situation (say, higher secondary class), the participants are referred to as *students* in all the books.

1.3.6 The group leader

The objectives will be patently met if the group consists of a leader or coordinator, who has more than a cursory interest in the developmental issues of concern today, and enjoys making linkages. The students should be guided not only in making the obvious links, but also to go beyond them.

A coordinator with a formal training in cross-disciplinary thinking has a clear advantage, but a person with an open mind to the ideas of others, and one who feels that students cannot be all wrong, would do just fine. It would be useful for the group leader to be proficient in English, so as to be able to read and comprehend the proliferating information and communicate this to the group. It is most likely that the leader will be the teacher, and hence *teacher* in the books will mean the leader or coordinator of the group.

The leader plays a special role in all the activities outlined. The cardinal principles that govern the interaction of the leader with the group include the following.

i. Understand and value individual and group perceptions.

ii. Encourage listening by setting an example.

iii. While moderating discussions, support the apparently indefensible viewpoint.

iv. Attempt to raise the discussion from the level of free-standing personal statements —'I feel', 'I think', etc., with no accompanying justification — to coherent and logical arguments, with quantification wherever possible.

v. Allow for changing and evolving views during discussions and show a willingness to learn from the students.

vi. Encourage following firm rules during a debate.

vii. Facilitate and liven up discussions by introducing a new angle whenever possible.

viii. Use the 'let us find out' mode as often as is appropriate.

The role of the leader is far from a passive one. Encouraging the diffident student, guiding the overly confident one, finding loop holes in the arguments of a member without lowering self-esteem and being in control of the situation in a class full of thinking individuals is a challenging task. Yet, if viewed as an opportunity to improve one's skills of critical thinking, at the same time creating a generation of thinking individuals, the joy of such interactions can be infectious.

1.3.7 What this is, and what it is not

As already explained in Section 1.3, these books are not substitutes for textbooks, nor are they comprehensive. They are meant to give students a feel for 'real world' problems, without introducing the intractable complexities all at once.

There are very few problems of concern today that have either globally applicable, or locally unique, answers. As in any reasonable developmental approach, the answers to many questions must be sought within a local framework of society, politics and economics. In fact, increasing students' sensitivity to local needs and problems and putting these in the context of global concerns, constraints and opportunities, with examples of solutions arrived at in different contexts, is a tacit aim of the Foundation Curriculum.

Hence, it is an advantage for leaders and group members to have access to information, both local and global. The bibliography is indicative rather than exhaustive. Definitions and concepts can be sought and found in any relevant textbook available in a junior or senior college. Newspapers and locally available magazines could be additional and sometimes valuable sources of issues of debates. Many newsgroups and voluntary agencies provide information and clippings files free of cost or at a nominal charge. The group must, in

the course of the interaction, generate and catalogue its own set of clippings files on issues of concern to the group.

The important, but rather difficult, questions of evaluation have not been addressed here. In this curriculum, more than in any other, evaluation of any form is a measure not only of participant's comprehension, but also of the effectiveness of the leader. Test questionnaires have been provided in some of the books as guidelines to assess effectiveness of interaction in the course and to help take corrective measures.

1.4 This book

Fourth in a series of books planned on issues in *Science, Technology and Society*, this book deals with the issues in education. Over the years, policy makers have stressed the importance of education for the prosperity of our people. Since the dawn of independence in our country, Universalization of Elementary Education (UEE) has been a goal of the Indian Constitution. Yet, we have failed to achieve a reasonable quality of life in this country even 50 years after independence. India is home to more than a third (about 35%) of the World's illiterates, and contributes to a fourth of the World's child labour. That education has not fostered a sustainable livelihood for all our people is a telling failure of our society and our education system.

This book addresses some of the complex issues in education. These include the basics of our education system, the elementary, secondary and higher education stages, national efforts in education, and its social relevance. There is special emphasis on children outside schools, illiterate adults and the necessary non-formal and open school support systems.

Completion of all the activities will take about 20 contact hours. Some activities, like surveys, will also require students to volunteer their leisure time. Sections 2.1, 2.3, 3.2, 3.3, 4.2, 4.4, 5.3, 5.5, 6.2, 7.1 will suffice for a bare outline for a shorter course of 10 contact hours.

Chapter 2

Education: a primer

The word "education" is derived from the Latin word "educare" which means to bring up, to train, to put in, to instruct, to draw out, to extract and to lead forth. Education is expected to develop capabilities in the individual and the society to adapt to an ever-changing social environment. To this end education itself has changed in one way or another over the years. In this chapter you will discuss these changes, including some milestones in education from ancient times to modern days. This chapter also provides opportunities for you to discuss alternative classrooms and evaluation systems.

2.1 Education over the years

1. Over thousands of years humans have passed on their knowledge to their successive generations. Another very important human characteristic has also been transmitted: the power to modify existing knowledge to suit changing circumstances. From your knowledge of human history, list the events that support this transmission of knowledge and adaptability. Discuss the lists in the class.

2. How did the children of ancient *Stone Age* people learn to make stone tools? And how did children of *hunter-gatherers* grow up to become hunters and gatherers? Imagine a 'learning situation' involving a family

in the *Stone Age*. Form groups of 5 students and write the script for a skit. Look up in your library or ask a history teacher in your institution for help with recreating the situation. This is how plays are 'researched'. Repeat this for a family at the dawn of agriculture. Put up your skit. Which seemed the most authentic? What were its important features?

3. During the Vedic period, education was free and accessible to all who sought it, and the rulers of the country did not directly control it. It was managed by the Brahmins. The immediate aim of education was to prepare different classes of people to fill specific niches (and needs) of society. Why do you think the Brahmins managed the education of all people?

   If education was free to all, why was it specified according to the vocations of different classes? In what sense was it a free education, and how was it constrained? What, according to you is free education?

4. You have heard of the *Gurukula* system of learning. These still exist in India in certain places. How is this system different from the schools that you know? What, according to you, is the most important feature of the Gurukula system? Discuss in the class. How many features figured in the discussion? Was 'oral transmission of knowledge' one of them? What is its role today?

5. What were the roles of parents and elders in their children's learning? Has this role changed in any way? Justify.

6. When was writing invented? In Sumer over 5000 years ago, children would write with a wedge shaped tool on clay tablets. Inscription on stones and copper, the palm leaf records of the temples and in recent years the wide spread manufacture of paper, all indicate that some functions were served by writing. How were these functions/ uses of writing different from your experiences?

7. Today education is intimately connected with 'reading' and 'writing'. Since when has it been that way? Which came first: writing or education?

8. Although writing in one form or another has existed for a few thousand years, printing is a relatively new technology. What is the role of

printing in education now? Do you think dependence on printed materials will ever decrease? Elaborate and justify your answer. What will education be like in 2050 AD?

9. You have discussed the dependence of education on the printed material. Has any of you wondered about the dependence of education on the existence of a teacher? You will discuss in detail the merits of education at-a-distance in Section 6.4. List the functions that a teacher performs in your classroom. Do his/her functions extend beyond the classroom?

You have thought about the ancient *schools* and the systems of education. You will take a break in your journey through the history of education in India to discuss your perception of classroom situations and how you would like them to be.

2.1.1 Possible classroom situations

Most of you have probably seen very little variety in classroom situations. This section invites you to expand your ideas about what a classroom can possibly be. Either based on your own information, or by talking to people who have seen other types of classroom conditions, discuss the four types of classroom situations depicted in Figure 2.1.

1. Describe the 4 classroom situations, in a paragraph each. How are they different for the teacher? In what ways would they provide a different experience to a learner?

2. Which of the situations is more conducive for interactions among learners. Which fosters learning of facts from the teacher?

3. Which of these would require a greater preparation by the teacher to ensure that everyone in the class learns? In which can a teacher prepare a limited amount of material and deliver to the learners?

4. Which of the classrooms depend greatly on the learners' motivation and initiative? Which classrooms demand attention and concentration?

Figure 2.1: Four types of classroom situations

5. Which classroom situation would you prefer: (a) for children, (b) for young adults? Justify each case.

6. You have already thought about the functions of a teacher within the classroom and beyond it. List the tasks that a teacher may be engaged in at any time of the day that is related to his/ her school job. Collect the lists made by the whole class. You should have listed at least 10 tasks of a teacher.

7. Take a sheet of paper, a thicker one would be easier to handle. Make 10 to 15 smaller slips, say about 7 cms by 5 cms. On each slip write one task of the teacher.

8. Each task helps the teacher perform one of his/ her various functions. Form groups of 5 members. Each group sorts the cards according to the function of the teacher to which it is closely related. These functions could include evolving methods of teaching, organising the classroom, motivating the students, assessment, and others. For instance, "making a chart" and "writing notes" may be categorised under *evolving teaching methods*.

9. Within each group, rank the functions according to your perception of its importance — from the most important to the least important.

10. Discuss the ranking in the classroom. Was there a majority choice? Could you reach a consensus?

Now you are ready to resume your journey through the education system in India during British times.

2.1.2 Education in British times

Formal education system as we know it today began under the British rule. The educational activities that the East India Company undertook in India in 1698, however, were meant for the children of Europeans, not Indians.

Between 1765 and 1813, the East India Company encouraged traditional *Oriental* learning in Sanskrit and Arabic for Indians, with the establishment of

some centres of higher learning like the Madrassah in Calcutta and the Banaras Sanskrit College. In 1813, missionaries from Europe landed in India and established English schools. They spread 'Western light and knowledge'. These were the beginnings of the modern education system.

The British formulated various policies for educating the Indians during the period from 1813 to 1947. The education during British times was mired in controversies. The debates were concerned with the following 4 issues.

- Aim of education: Spread of Western knowledge versus preservation of Eastern learning.
- Medium of instruction: English, Sanskrit, Arabic, or modern Indian languages.
- Agencies entrusted to spread education: Christian missionary schools, institutions controlled by the Company, or local schools run by Indians.
- Target of education: For the masses, or only for a few Indians.

1. Why did the East India Company initially restrict education to Europeans?
2. If you were an Indian during the British times, what would your choices have been in each of the four issues above? Justify. How many in your class agree with your choices? Discuss in the class and arrive at the choices preferred by the whole class.
3. By 1900, the neglect of indigenous schools led to the near extinction of the indigenous system of education in India. From 1854 to 1902, the education system was increasingly westernised. At the same time, the agencies of education became largely Indians. During 1890-1905, there was a National Education Movement.

   At this juncture, what might have been the demands of the National Education Movement?
4. Gopal Krishna Gokhale introduced a bill demanding free and compulsory elementary (grades 1 to 7) education in 1910. However, it was turned down. If it had been adopted, how would it have benefited us?

5. During 1920-22, M. K. Gandhi advocated the boycott of Government schools and colleges. He passed a resolution for "gradual withdrawal of children from schools and colleges owned, aided or controlled by the British Government and the establishment of national schools and colleges." Madan Mohan Malaviya opposed Gandhiji's appeal strongly, and hence Gandhiji withdrew the movement altogether.

   The movement for a National education however, created a new national leadership and a wave of patriotic feelings among the student community. This was more of a political gain than an educational one. Explain how.

6. During 1945-47, there were few changes in the educational system other than a report called "Sergeant Report" in 1944. The report recommended a national system of education in India. It even provided a basis for the education policy after independence. Discuss the development during the period that must have led to the report and the conditions that postponed its coming into effect.

2.2 The Constitutional provisions

You have seen above that education has not meant the same thing to people over historical times. You will find in this section that even in the short span after India's independence, the goal of education has varied from time to time. You will discuss these variations, and the accompanying policy changes in the activities suggested here.

First you will read what our Country's Constitution has to say about education. The aims and objectives of the Indian Constitution are reflected in its Preamble:

"We, the People of India, having solemnly resolved to constitute India into a sovereign socialist secular democratic republic and to secure to all its citizens

Justice, social, economic and political;
Liberty of thought, expression, belief, faith and worship;

Equality of status and opportunity;
and to promote among them all
Fraternity, assuring the dignity of the individual and the unity and integrity of the Nation."

1. What implications does the Preamble have for education? Discuss this in the class.

2. Some of the Articles in the Directive Principles refer to education.

   Article 41: "... the State shall, *within the limit of economic capacity and development*, make effective provision for securing the right to education."

   Article 45: "... the State shall *endeavour to provide*, within a period of ten years from the commencement of the Constitution, for free and compulsory education for all children until they complete the age of 14 years."

   Article 29: "... no citizen shall be denied admission into any educational institution on grounds of religion or language, and shall have the right to establish and administer educational institutions for their choice."

   What do each of these Articles imply for (a) education of the whole population, (b) preservation of minority cultures, (c) parents who refuse to send their child to school, (d) local citizens who want to force the parents to send their child to school?

3. Given the Articles refering to education in the Constitution, what does compulsory education mean? Discuss.

4. You will read about the University Grants Commission (UGC) in Section 5.2. It was formed in 1956 to revamp the college education system. The National Scientific Policy, (1958) was formulated in line with the Nehruvian dream of progress in science and technology in the country.

   The National Scientific Policy led to the establishment of Institutes like the Council of Scientific and Industrial Research (CSIR), Indian Council

of Agricultural Research (ICAR), Indian Council of Medical Research (ICMR), Department of Atomic Energy (DAE) and others.

How would you rate the success achieved so far in the area of science and technology? Discuss the effectiveness of the policy.

5. According to you, in which areas of science (such as agriculture, medicine, space, energy, telecommunication, information, media etc.) has India achieved the maximum progress? Why do you think so?

6. Which area of scientific endeavour should be given the highest priority, considering the needs of the Indian people? Write a paragraph justifying your choice. Which area was chosen most often by the class? Which areas came second and third? Discuss the justification given by all.

7. The National Council of Educational Research and Training (NCERT) was established in 1960 to address issues related to elementary education (grades 1 to 8). If you were a member of NCERT, what steps would you suggest to improve the existing situation in elementary education?

8. Till the 1970's students went through 11 years of school, followed by 4 years to graduation. That was replaced by the 10+2+3 pattern of education in 1975. Talk to your parents, and older people who experienced the earlier pattern. Compare their experiences with your own. List the differences in the two systems. Do you think, the vocational stream introduced with the new system has benefited a lot of people? Discuss the role of the vocational stream, and list its advantages and disadvantages.

9. The present education system is said to follow a 3-language formula. What are the 3 languages? At what level (grade) are these three languages introduced? Do you think this should be changed? How? Justify you suggestion. Discuss the suggestions in class.

10. "The destiny of India is now being shaped in our classrooms," were the beginning words of the report entitled "Education and National Development," by the Kothari Education Commission (1968). Do you agree with this statement? Write a page justifying your point of view.

11. The Kothari Education Commission, was constituted in 1964 to advise the Government on the evolution of a national system of education for

the country, considering all aspects and sectors of education. A unique feature of the Commission was its international composition: it included 11 Indian members and 5 foreigners; one each from France, Japan, UK, USA and USSR. The recommendations of this Commission led to the formulation of the first National Policy on Education.

Considering that the commission was supposed to look into the needs of Indians, why were foreigners included? What role could they have played in drawing up the policy?

Do you think all commissions concerned with national educational policies should include foreigners? Justify your answer.

12. The salient features of the New Education Policy (1986) included mass enrolment and retention, non-formal education, child-centred and activity based teaching, restructuring teacher training programmes, and alternative forms of education.

    Do you think classroom facilities and teachers normally found in India are sufficient for implementing the recommendation? What else, if anything, is needed? According to you, what is the most important factor that will help increase enrolment and retention of children in schools?

13. If you were to take charge of the textbook writing bureau, what changes would you bring about in the present textbooks? List as many changes as you can think of.

14. There is a strong move towards 'decentralisation of planning and management' of education. This means the democratic participation of elected representatives of the people in decision making at the district, sub-district and Panchayat levels. Do you think this will make any difference to the education? In what ways?

15. Recently there has been "talk" in the media about *reducing the load of the school bag*. Name the popular scientist and educationist who was associated with the Committee that suggested this change. What suggestions do you have to reduce the burden of the school child?

16. In 1993, the Chaturvedi Committee suggested that there should be 210 teaching days per academic year in schools. How many did you have? How was it in your parents' time? Design the number of school days

and the number of school hours in an ideal education system of your choice.

17. Universalization of Elementary Education (UEE), according to Article 45 of the Constitution, should have been achieved by the year 1960. This has now been deferred to 2000 AD. List the main factors responsible for the failure to achieve this goal in the recommended time. Can the goal be achieved by the year 2000 AD? Give reasons for your answer.

18. Imagine that by the year 2005 AD India is 100% functionally literate. That is, its population above the age of 7 years can read and write to take care of its daily needs. Imagine again, that you are invested with all the powers you need to bring about any changes you want in the social, economic or education systems. List all the possible alternatives that you can come up with at that time (2005 AD).

2.3 The present education system

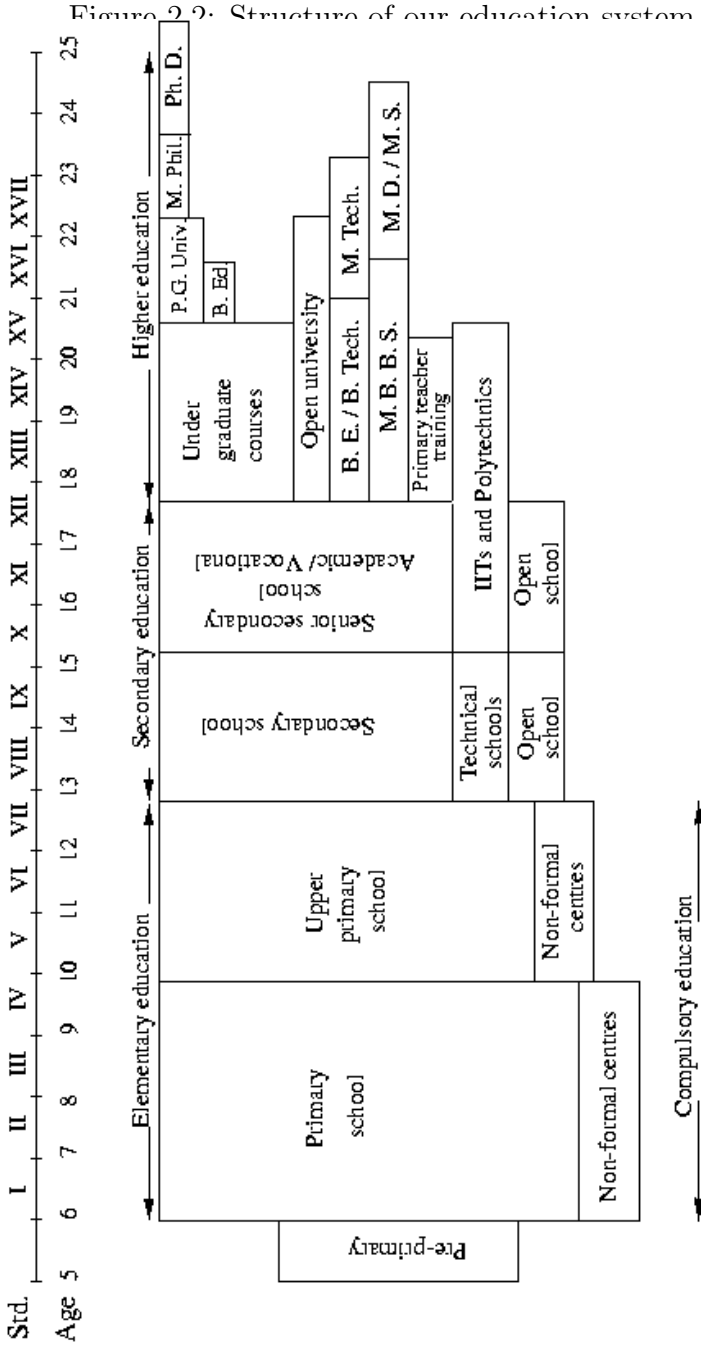
You are now aware of some of the historical milestones in the Indian education system. You will see how our education system is organised in interlinked stages, each stage a preparation for the succeeding one. This is illustrated schematically in Figure 2.2. Study the figure and discuss the issues raised below.

1. If you were asked to change this structure, what would you change first?

2. The ancient schools in India did not have a graded structure. The *Brahmanic* and *Buddhist* schools, the *Maqtabs* and *Madrasas* of the Muslims were meant for instructions in a limited number of fields. Any one interested in those areas attended them irrespective of age. The present education structure specifies the minimum age of an individual for each level of education. Are you in favour of these age limitations? If not, what change would you make?

3. Recently, newspapers highlighted that some gifted students younger than the required minimum age demanded entrance to higher education. How would you solve their problem?

Figure 2.2: Structure of our education system



4. The hierarchical structure of education is uniform throughout the country to ensure that migration of students from one State to another is problem-free. Should the same conditions apply for the children of the rich in metropolises and the rural poor? Justify your answer.

5. The size of the rectangle in Figure 2.2 varies among the different education levels. Explain this variation.

An hierarchical education system implies that certain (lower) levels are minimum requisites for entry into higher levels. This requires an assessment system that separates students who have satisfied the criteria from those who have not. This is a *sticky* problem for those who formulate assessments as well as those who are evaluated. You will discuss this in the next section.

2.4 Difficult choices: evaluation modes

Assessments often include examinations, tests and interviews, all of which are intimately connected with your life. Have some fun discussing the form and function of evaluation in the education system.

1. Do you think evaluation is essential in the education system? (Forget about getting jobs, etc, that are really outside the education system itself.) Justify your answer. By an informal vote, find out how many in your class want any assessment at all.

2. There is a belief that evaluations are important for the teacher, to gauge how well the goals of teaching have been accomplished. Do you agree with this? Give reasons.

3. List the ways in which assessment can possibly benefit a student.

4. Almost after every test or examination, you may have been asked about your performance. Your response is a self-evaluation of your performance. Do you think this is an important skill? Do you possess it? How close does your evaluation of yourself match other people's evaluation of you?

5. You have often *discussed* your teacher's teaching skills or *like-ability* among your friends. Have you ever told her/ him about it? Do you think it is important to evaluate your teachers and let them know about your assessment? How will it help you, the teacher, or future generations of students?

6. Imagine that you are a teacher. Write up a proforma of questions (questionnaire) that students can fill up to evaluate you. This should provide you with an honest assessment of your skills as a teacher.

7. Did your questionnaire include subject content, method of teaching, classroom control and organisation, and affective qualities like empathy with students? Which of these should you most definitely include? On which of the criteria are opinions likely to vary across the class?

8. A variety of methods could be used for assessment. List as many methods as you can. Compare the lists made by different members of the class. Discuss the merits and demerits of the different assessment methods suggested and their applicability.

9. What should be done with the assessment of a student? List the possible things that it can be used for.

10. Did your list of possible uses of assessment include feedback to the students? How should this feedback be given — in writing, orally, or in any other form you can suggest? Which of these forms of feedback is preferred by a majority of the class?

11. You could actually use a set of criteria to evaluate feedback (for that matter any situation). For example, to evaluate the effectiveness of a teacher's feedback, you could use the criterion of how motivating it is to the student.

    Table 2.1 lists along the left-most column, all forms of possible feedback that need to be evaluated. You may add a new one of your choice in the last row.

    The top row of the grid corresponds to the criteria against which each feedback type is to be evaluated. Table 2.1 shows one such criterion, namely *acceptance by various groups of people:* the student, teacher and parent. Moving one column at a time, rank the feedback type in terms

Table 2.1: Evaluation grid.

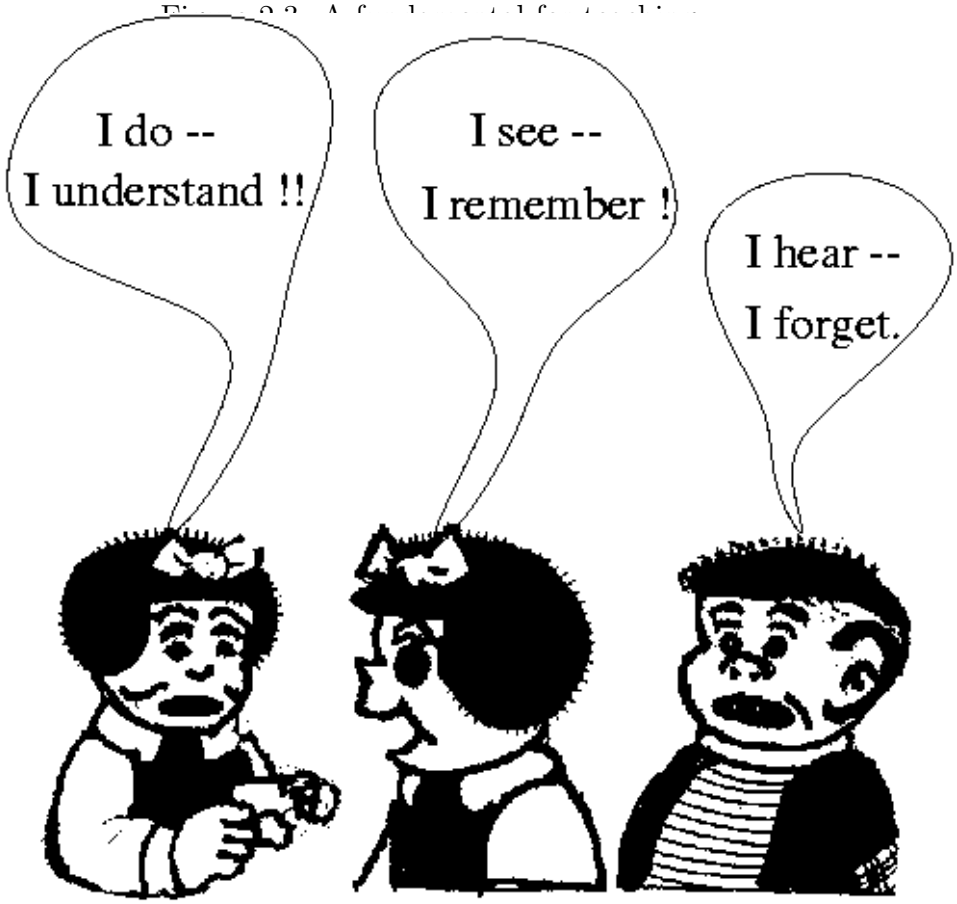
Types	**Criteria: Acceptance by**			**Total Score**
	Student	**Teacher**	**Parent**	
Written feedback				
Oral feedback				
Material feedback				

of the criterion in that column. For the first column, for instance, you would rank as 1 the form of feedback which you think would be most liked by students. Similarly, in the same column, mark the other feedbacks as 2, 3, etc. depending on how likeable you think they are for students. You should complete one criterion column before moving to the next.

12. Once you have evaluated the feedback types according to all columns, sum up each row and fill the last column. The feedback with the smallest sum is the most liked.

13. Add other types of criteria to Table 2.1, like usefulness of the form of feedback and carry out a similar exercise.

You could use the evaluation grid method to evaluate any situation with several options. Having familiarised yourself with the past, present and some fundamentals of the Indian education system, you will now discuss the growth of the education system in greater detail.


I do --
I understand !!
I see --
I remember !
I hear --
I forget.

Chapter 3

Elementary education

After independence, there has been an increase in the number of institutions, students, and teachers, with a concurrent increase in literacy rates, and signatures of scientific and technological progress. In this section you will discuss the growth at the elementary school level. The activities involve estimation, calculation, graphical representation, data tabulation and comparison.

3.1 Pre-primary education

The child is not only an inheritor of human culture and values but also the agent for its transmission into the future. Hence a child has to be nourished with love and care, protected from all kinds of exploitation. This concern was formally expressed in the Universal Declaration of Human Rights by the United Nations General Assembly on 10th December, 1948. The Declaration proclaims that a child is entitled to special care and assistance. In 1959, the UN General Assembly passed a resolution called "The Declaration of the Rights of the Child".

On 20th November 1989, UN General Assembly declared the child's rights in different Articles. Its salient features are embedded in the Articles listed below.

Article 6 - Every child has the inherent right to life.

Article 7 - The child has the right to a name, a nationality and the right to be cared for by his or her parents.

Article 12 - The child has the right to express opinion and views in all matters concerning him or her.

Articles 13, 14, 15 - The child has the right to freedom of expression, freedom of thought and freedom of association.

Article 17 - The child has the right to access information from various sources, and the right to health and enjoyment.

Article 28, 29 - The child has the right to education.

Pre-primary education is considered important for the physical, emotional and intellectual development of children. The programme of pre-primary schools, therefore, consists of various types of play, and manual and learning activities. In India, there are a variety of pre-primary schools. These are listed in Table 3.1.

1. Are pre-primary schools necessary to give the child its right? Can this aim be achieved in any other way?
2. Will the different types of pre-primary schools affect later intellectual development in different ways? Explain.
3. Is the social development in a pre-primary school different from what a home can provide?
4. Will there be any negative impact of early schooling? Justify your answer.
5. If you are given a chance to plan the daily routine of a pre-primary school, what would you include in your ideal schedule? Prepare the schedule individually, discuss with the class and come up with a common schedule. Compare it with the actual schedule of a pre-primary school in your locality.

Table 3.1: Pre-primary school types in India.

School type	**Agents**	**Beneficiary**	**Remarks**
Kindergarten	Convents, missions	Subsidised by charitable organisation for some	Medium of instruction – English; Cost – high; Not necessarily play way.
Nursery schools	Individuals	Mainly wealthy	Close to the students' culture.
Montessori schools	Indian individuals	Wealthy, middle class	Montessori method (play way)
Pre-basic schools	Government	Lower socio-economic class	Inexpensive, aim to relate home and school, play-way.
Privately sponsored	Individuals	Mainly wealthy	

3.2 Growth in elementary education

Since pre-independence times, Indians have been in favour of increasing the numbers in the education system — number of students, teachers and schools. As a result there has been a marked growth in elementary education (grades 1 to 7) during the post-independence period. Table 3.2 gives the number of institutions, teachers and students in 1947 and 1993 at the elementary level [16]. This includes primary (grades 1 to 5) and upper primary (grades 6 and 7). You will analyse this growth of elementary education through the activities below.

1. Of the two elementary school levels given in Table 3.2, which shows a greater increase in number?

2. Calculate the average annual percentage growth rate of students, teachers and institutions at each level from 1947 to 1993. Fill the *growth rate* columns (GR) for primary and upper primary levels.

   You may use the following formula to calculate average annual growth rates.

Table 3.2: Number of institutions, teachers and students in 1947 and 1993 at elementary school levels in India (in thousands).

	Primary level		**Upper Primary**	
	Nos.	GR	Nos.	GR
Students(S)				
1947	10500		1600	
1993	105400		38700	
Teachers(T)				
1947	344		50	
1993	1682		1082	
Institutions(I)				
1947	141		9	
1993	573		157	
Ratio (S/T)				
1947			—	—
1993			—	—

Note: GR — average annual percentage growth rate.

$$GR = \frac{N_{1993} - N_{1947}}{N_{1947} \times (1993 - 1947)} \times 100$$

where, N_{1993} is the number (of students, teachers or institutions) in 1993, and N_{1947} is the corresponding number 1947.

3. At each level which of the three — number of students, teachers and institutions — grew the fastest? Which showed the smallest rate of increase? Over all, which category showed the fastest growth and which one the slowest?

4. Explain the results you have found in about a paragraph.

5. Calculate the student to teacher ratio, that is, number of students per teacher (S/T). Do this for the two levels in the years 1947 and 1993, and fill the corresponding rows in Table 3.2.

Table 3.3: Enrolment in elementary education (in millions).

Year	Total			Boys			Girls		
	P 1-5	**UP 6-7**	**Ave. UP/P**	**P 1-5**	**UP 6-7**	**Ave. UP/P**	**P 1-5**	**UP 6-7**	**Ave. UP/P**
1951	19.2	3.1		13.7	2.6		5.4	0.5	
1961	35.0	6.7		23.6	5.1		11.4	1.6	
1971	57.1	13.3		35.7	9.4		21.3	3.9	
1981	73.8	20.7		45.3	13.9		28.5	6.8	
1991	99.1	33.3		58.1	20.8		41.0	12.4	
DGR 1951-61			—			—			—
DGR 1961-71			—			—			—
DGR 1971-81			—			—			—
DGR 1981-91			—			—			—

3.2.1 Decadal growth rates

Now that you have an idea of the average annual growth rates in elementary education from 1947 to 1993, you must be curious to know whether this rate has been uniform over the 4 to 5 decades since independence. You will enjoy discussing the details of decadal growth rate in elementary education in this section. Table 3.3 gives the enrolment of boys, girls and total students from 1950 to 1990 at elementary school level [20]. The years refer to academic years. The enrolment in grades 1 to 5 (primary = **P**) and in grades 6 and 7 (Upper primary = **UP**) are shown separately. Study the values given in the table and discuss the issues raised below.

1. From the values given in the table, roughly estimate the decade in which each of the groups grew at the fastest rate.

2. Calculate the decadal growth rate in enrolment at each level for each decade. For an example, the decadal growth rate (**DGR**) over 1951-61

would be given by —

$$DGR = \frac{Enrolment_{1961} - Enrolment_{1951}}{Enrolment_{1951}}$$

Fill the corresponding rows in Table 3.3.

3. Which group increased the fastest? Which increased at the slowest rate? Is there a pattern in growth rates? Has it always increased over every decade? Explain in a paragraph what a decrease in growth rate means.

4. Calculate the ratio of the average number of students per grade upper primary level to the average number per grade in the primary. Fill the corresponding columns for boys, girls and total students.

5. What similarities and differences do you notice in the trend in primary and upper primary enrolment of boys and girls over different decades?

6. Plot graphs of decadal growth rates (DGR) for boys, girls and total number of students in the primary as a function of years from 1951 to 1991. Choose an appropriate y-scale to include the 3 plots in the same graph.

7. On similar lines, plot graphs of decadal growth rates (DGR) for boys, girls and total number of students in upper primary as a function of years from 1951 to 1991.

8. Draw 2 bar charts showing the same information as in the last two activities. Use colourful patterns to distinguish the different groups. Discuss the bar charts made by different members of the class. Which were more effective in communicating the information — bar chart or the graphs? Can you come up with other ways of representing the information?

9. Write a page comparing and contrasting the 3 groups: all students, boys and girls, with respect to primary and upper primary education over the 40 years.

10. What should the education system aim to achieve with respect to elementary education of our country's children?

3.3 Children out-of-school

The Constitutional goal of *Universalization of Elementary Education* (UEE) still remains a dream. One of the problems in achieving this goal is that many children remain out of school after being enrolled. These children are termed as *dropouts*. You will soon discover that this term is an unfair reference to the children.

The nations census and its statistical analysis show that nearly half the children enrolled in primary level leave school before completing primary education, and about two thirds before completing their secondary education. In the World, India has the distinction of having the largest number of such *out of school* children of school-going age. About 22% of the World's total children who are out of school are in India. Hence, one of the greatest challenges the country faces today is not only increasing the enrolment but also increasing the retention in schools. In this section you will analyse the relevant data and discuss the seriousness of the situation.

3.3.1 Dropout rates over the years

Table 3.4 gives the dropout rates for boys, girls and all students for 2 levels: primary (1 to 5) and elementary (1 to 7) for the years 1971, 1981, 1991 and 1996.

- Study the table and engage in the activities given below [16, 22, 33]. Calculate the ratio of dropout rate of boys to that of girls. Fill the corresponding columns with these values. What pattern do you find? Write a paragraph on the differences between the dropout of boys and girls.

  What do percentage dropout rates mean? Sample calculations of dropout rate will help clarify. First, a calculation of dropout rate in grades 1 through 5 over the period 1984-89. It can be referred, for convenience as DR15 (1988-89). This is a measure of students not retained in the system for the 5 preceding years.

Table 3.4: Dropout rates of boys (**B**), girls (**G**) and total (**T**) students from 1971 to 1996 at elementary school level.

Year	**Grades 1-5**				**Grades 1-7**			
	B	**G**	**T**	**(B/G)**	**B**	**G**	**T**	**(B/G)**
1970-71	58.90	70.90	67.00		74.80	83.40	77.90	
1980-81	56.20	62.50	58.70		68.00	79.40	72.70	
1990-91	40.10	45.97	42.60		59.12	65.13	60.91	
1995-96	37.92	41.31	39.37		54.99	61.70	57.77	

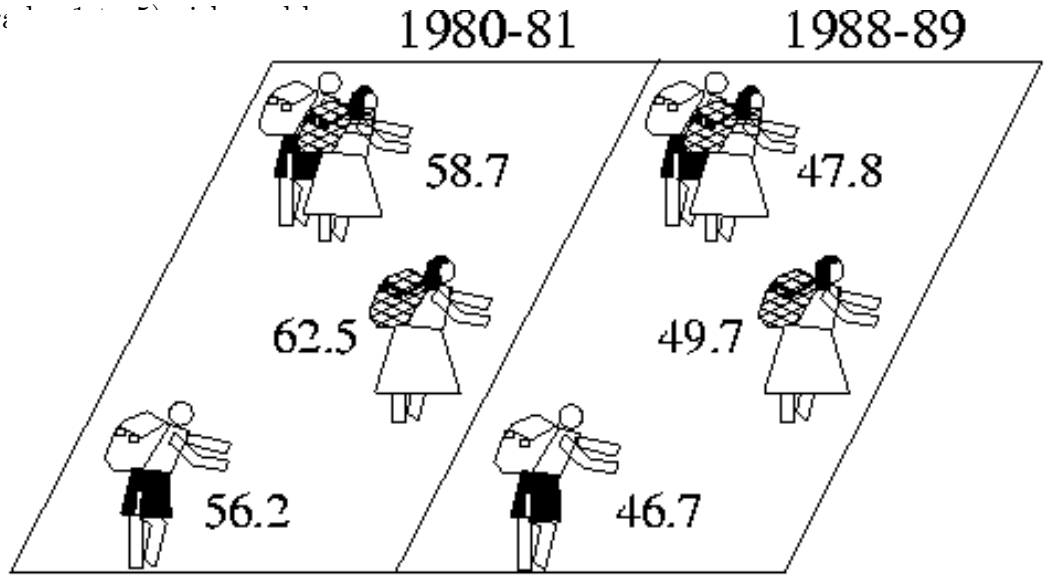
Note: B/G – ratio of the dropout rates of boys to that of girls

If N_1 is the number of students enrolled in grade 1 in 1984-85, and N_5 is the number of students enrolled in grade 5 in 1988-89, then

$$DR15(1988-89) = 100 \times \frac{N_1 - N_5}{N_1}$$

1. Arguing on similar lines, write down the formula for percentage dropout rate DR17 for 1988-89, which is a measure of the students not retained in the system for the preceding 7 years.
2. Plot a graph of boys, girls and total dropout as a function of years from 1971 to 1996. You will get a trend line. You have done a similar activity in the book *The Population Problem.*
3. Using the trend line predict the dropout rate for 2001, 2011 and 2021.
4. Knowing the trend in the growth of dropout rates in the past, how certain can you be about the dropout rates for a future period? List the factors that could alter your estimate based on trend lines.
5. Figure 3.1 shows in a stylised way the dropout rates among all students, boys and girls for the years 1980-81 and 1988-89. Use a similar or more innovative style to represent the data for 1970-71, 1990-91 and 1995-96.
6. Dropout rates in the States of India are given for the years 1990-91 and 1993-94 in Table A.1 in Appendix A. How many States or Union Territories (UT) have dropout rates above the national

Figure 3.1: Dropout rates in 1980-81 and 1988-89 among elementary school (gr



average at the primary level (grades 1 to 5) in 1990-91? List the possible reasons for some States having very high rates, and others rather low.

7. Name the States or Union Territories in which dropout rates of boys and girls in 1990-91 are either nearly equal or the girls have only a slightly lower (1-2%) dropout rate. What reasons can you attribute for this desirable scene?

8. Goa, Kerala and Pondichery show a negative dropout rate at the primary level. What could this possibly indicate?

3.3.2 Survey and calculate

You are now ready to carry out some *real* dropout rate calculations. Table 3.5 gives the enrolment in a batch of boys and girls at the primary level (grades 1 to 5) in all schools in one locality. Discuss the information in the table along the lines suggested below.

Table 3.5: Enrolment of boys and girls of one batch in grades 1 to 5.

Grade	**Enrolment of students**			
	Girls	**G %**	**Boys**	**Total**
1	155		860	1015
2	147		444	591
3	177		462	639
4	94		438	532
5	78		423	501
Total	651		2627	3278

1. Has the number of girls changed in the same proportion as the number of boys? How can you tell?

2. Calculate the percentage of girls enrolled in each class and fill the third column marked **G%**. Is it easier to tell now whether the numbers changed in similar proportion?

3. What differences do you notice in the enrolment of boys and girls in different grades over the 5 years?

4. Using the formula given at the beginning of Section 3.3.1 find out the drop rates of boys, girls and total students in primary schools in the locality.

5. Form groups of 5 students. Each group should survey 2 schools in your locality. Get the enrolment of students 5 years ago in grade 1, 4 years ago in grade 2, and so on until the present enrolment in grade 5, for one batch of students.

6. Calculate the dropout rates for this batch, for boys, girls and total students separately.

7. The whole class will have data of many schools in your locality. Calculate the dropout rate of all schools together. This will give you an idea of dropout in your locality.

8. Suggest what you, as concerned citizens of the locality can do to increase retention in local schools and decrease dropout rates.

3.3.3 Causes of dropout

Through the activities in this section, you will explore the possible causes of dropouts. Figure 3.2 shows a set of ovals. The central oval represents the main issue at hand, namely *students not retained in the primary grades*. The figure also has 5 ovals for **Family, School, Curriculum, Teacher** and **Student** attached to the central oval. These 5 ovals represent 5 agents of schooling that may contribute to the problem. And there are 5 more outer ovals attached to each of these ovals. These outer ovals represent the malfunctions leading to dropout. For example, teacher is one of the agents of schooling. Teacher absenteeism would increase dropouts.

You should identify some specific causes connected to each agent and fill all the ovals. You may add as many ovals as you need.

Debate: pull or push

You have discussed the possible causes for a dismal state of retention of students in school, especially at the primary level. In this section, you will categorise these causes, and engage in a friendly debate on which of these plays a major role in keeping children out of school.

1. Of the several factors that keep a child away from school, some may be related to the educational system. These demotivate the child, making life miserable within the system. You can call this the **push-out** effect. Using the chart you have made in the last section, categorise all the causes that are systemic in origin under the head 'push-out'.

2. On the other hand, **personal and social** factors include those pertaining to the child's immediate family, neighbourhood, as well as the attitude of the child. These factors drag the child out of class. You may call this the **pull-out** effect. Categorise all the causes that are personal or social (outside school) in origin under the head 'pull-out'.

3. Take a stand on whether the 'push-out' or 'pull-out' effect is more important in keeping children out of school and justify it in about a page.

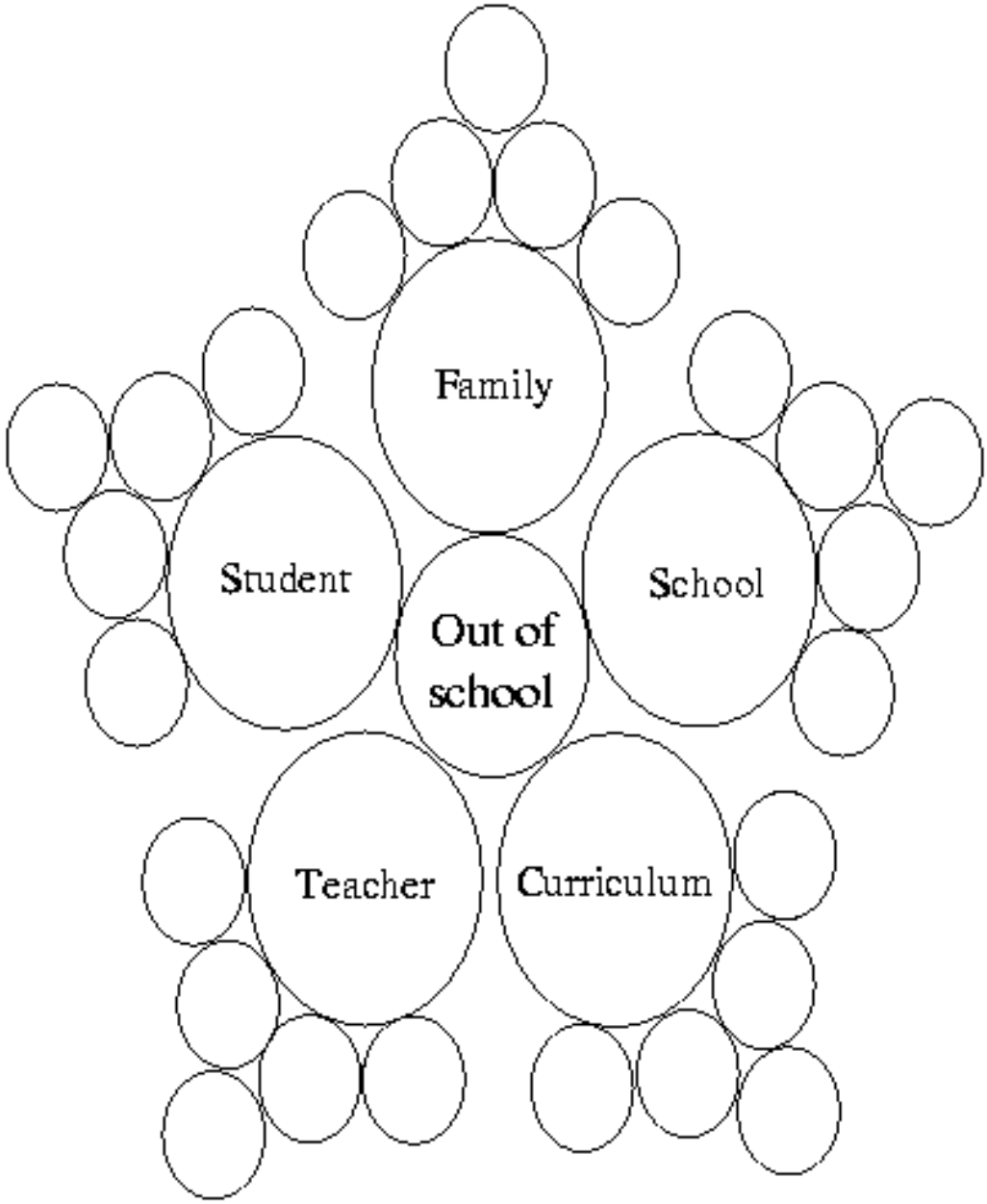
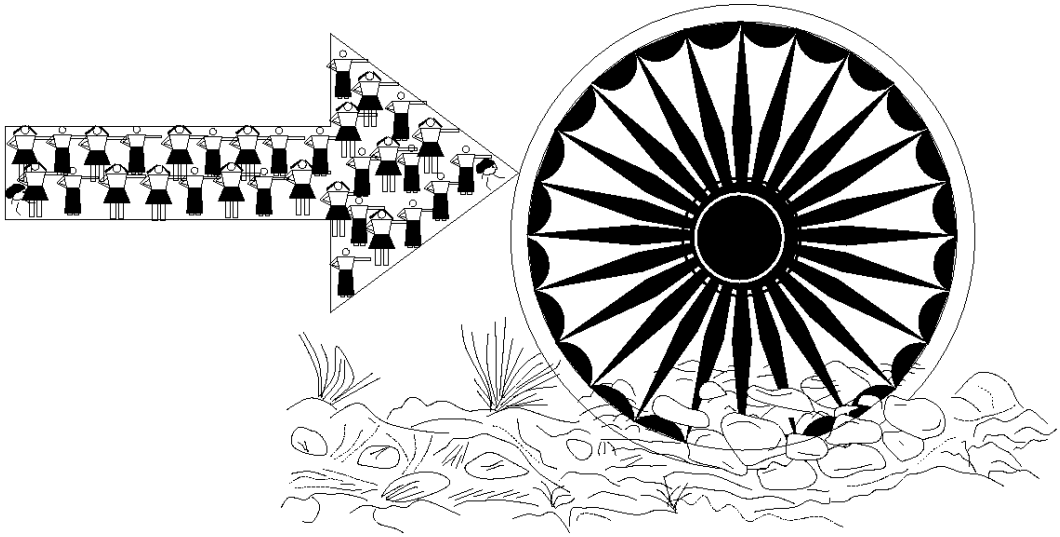

Family
Student
Out of school
School
Teacher
Curriculum

Figure 3.3: Pushing the wheel of education out of the dropout mire.



4. Organise a debate, with appropriate rules, on the topic: **Children out of school: pushed out or pulled out?**

3.3.4 Free the wheel of education

The wheel of educational progress is stuck in the mire of dropouts. This is shown in Figure 3.3. The arrow indicates forces which can push the wheel out. In this section, you will each contribute your might to forcing the wheel out of the muck.

1. List your suggestions for solving the dropout problem.
2. On the blackboard or a large sheet of paper, make a list of the suggestions from the whole class.
3. Each of you could copy down this list, and rate each suggestion made in terms of its effectiveness in increasing retention. You could use a 3-point scale and the format given in Table 3.6. Add as many rows as

Table 3.6: Format for comparing remedies for reduction of dropouts.

No.	Suggested remedy	Points
1.		
2.		

you need. Give 3 points for a very effective remedy, 2 for a moderately effective remedy and 1 for a remedy that is not so effective. You may note the points against each suggestion.

4. How many suggestions scored a 3, and how many scored a 1 on your list? Add up the ratings for all suggestions. What is your average score per remedy? Calculate the average score of the whole class for each remedy (sum of everyone's score for each suggestion divided by the number of students in the class). It is the **effectiveness score** for each suggestion.

5. Rank the suggestions from the most effective to the least effective.

6. Draw up a draft letter detailing your findings and send it to the Education Officer in the local governing body.

3.4 The vulnerable child

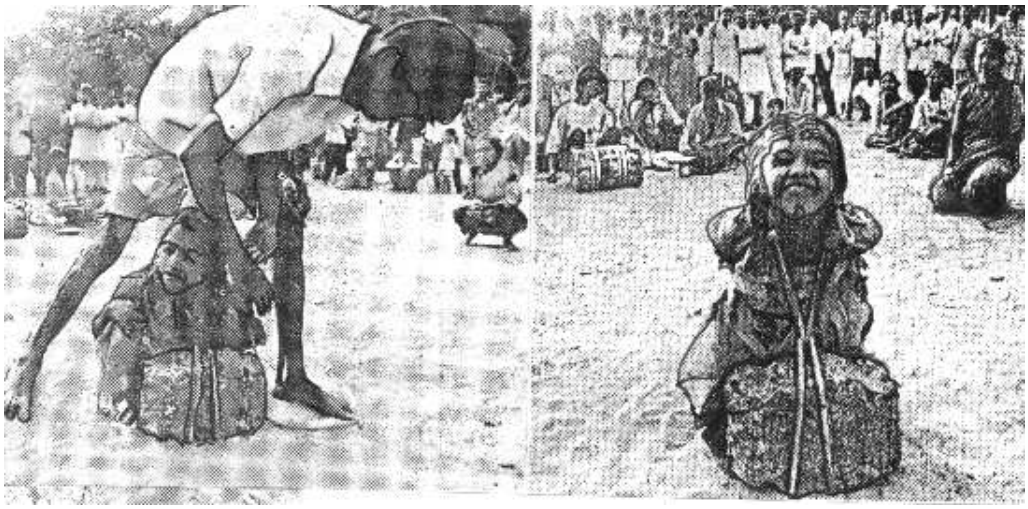
Six year old Rani spends her day digging out rags from stench-filled garbage heaps. Eight year old Raja weaves around the maze of cars at the traffic lights, selling evening newspapers. Seven year old Lata works all day making bidis in an ill-ventilated small room with 20 others like her. Nine year old Lara works 14 hours in a restaurant while his friends work for 12 hours in hazardous industries. Whether they are on the street or working, these children are exposed to exploitation.

There are over 50 million children in the World slaving at jobs which adults should have been doing. India has the dubious distinction of having the

largest child labour force in the World: about 17 million children by one count. According to International Labour Organization (ILO) as we approach the 21st century over 100 million children under the age of 15 will be working.

In this section, you will continue the discussion on how to increase retention in schools with special reference to child labour.

1. Children working in factories as well as street children work to earn a living. How would you differentiate between them?
2. What are the opportunities and joys that you associate with childhood which children are deprived of by having to work? List them.
3. List the factors responsible for child labour. Make a final list of all possible factors given by the whole class.
4. Based on your observations around you and from media reports, list the sectors where child labour is most prominent.
5. Find out (from an advertisement or from local labour office) those industries that are considered as hazardous for children. Identify the hazardous industries from your list.
6. Our Constitution mentions the "right to childhood". Article 24 of the Constitution warns that children below the age of 14 should not be employed in hazardous occupations. The Child Labour Prohibition and Regulation Act 1986 aims at prohibiting employment and at regulating the conditions of work of children in areas where child labour is legally sanctioned. Do you find a contradiction in all this? Explain your stand in a paragraph. Discuss in the group.
7. Rishiraj is the eldest child of a poverty stricken ailing mother. All of 6 years old, he works as a cleaner in a restaurant to support himself, his mother and his 2 year old sister. A Supreme Court directive empowering action against employers of children below 14 years forces Rishi's employer to terminate his services. Other employers also refrain from employing child workers. How can you help Rishiraj?
8. How are the laws relating to child labour connected with the laws concerning education, stated in the earlier chapter?



9. Imagine that you are a child working in a hazardous industry. Write the autobiography of this child in about two pages.

10. Have you seen children perform acrobatics at street corners (as in Figure 3.4)? Would you associate this with child labour? Would you call them street children?

11. Write a poem on child labour or street children. Or, a picture of a child at work or street children. The poem or picture must reflect their life. Collect all the poems and pictures from your class and make a collage/ poster. Display all the pictures on a bulletin board in your school.

12. Poverty is most often the root of this problem. Do you think it is ever possible to eliminate child labour? Justify your stand.

13. If you were the final authority responsible for reducing the exploitation of children, what steps would you take? List them.

14. Efforts to eliminate child labour are resisted by child workers themselves. Explain why this should be so. What should be the priority task: elimination of child labour or combating exploitation? Discuss in class.

15. In order to bring education within the reach of every child, you could think of teaching the children at their work place. Suggest some ways of doing this. Do you think the content and method of teaching should be the same as in formal schools? Justify.

16. You have listed the causes of child labour earlier in this section. Each of you could conduct a survey of at least one child in this category from your locality. See Appendix B for a survey format. List the causes found by the whole class. Now compare these causes with your earlier list. How close was your list?

17. One question in your survey related to their interest in quitting work and going to school or working while studying. What were your findings? What conclusion do you draw regarding education of child labour? Now you can send the findings of your survey to the editor of your local newspaper.

3.5 Disparities in elementary education

Neither the enrolment nor the dropouts are the same for all social groups. You have discussed the boy-girl differences in enrolment in elementary school. In this section, you will discuss the differences among scheduled castes, scheduled tribes and others with regard to enrolment at elementary school level. First, here is some terminology that will help you compare the groups.

The percentage gross enrolment ratio (**GER**) is the percentage of students enrolled in an educational level, regardless of age, of the population in the age group which officially corresponds to that level. For example, if there were 315 students in grades 1 to 5, of which 300 were in the age group of 6 to 11 years, then

$$GER = \frac{315}{300} \times 100 = 105\%$$

The percentage net enrolment ratio (**NER**) is the percentage of students in an educational level of a specified age group of the population in the same

Table 3.7: Gross enrolment for the year 1990-91 and dropout rate for the year 1989 of SCs, STs and general categories

Educational Indicators	**SCs**		**STs**		**All**	
	1 - 5	6 - 7	1 - 5	6 - 7	1 - 5	6 - 7
Gross enrolment	102.2	47.7	103.3	39.7	101	60.1
Drop-out rate %	49.6	67.8	64.5	78.1	47.9	65.4

age group. In the above example, since there are only 300 children in the specified age group in the village, certainly all students in the primary are not within this age group. Let us say there are 275 students in the specified age group in the educational level. Then

$$NER = \frac{275}{300} \times 100 = 91.7\%$$

Some values showing the gross enrolment ratios and dropout rates for SCs and STs are given in Table 3.7.

1. What patterns do you find in the **GER** of the 3 groups at the primary level? How does this differ from enrolment ratios in the upper primary? What could be the possible reasons for this?

2. What conclusions can you draw from the dropout rates of the 3 groups at the two levels?

3. What suggestions would you make to improve the enrolment rate of SCs and STs in the elementary school?

3.6 Investment in elementary education

This section will familiarise you with the changes in investments on elementary education. Education is financed largely from the Central and State Government budgets supplemented by a little from other private sources of

Table 3.8: Plan expenditure on elementary education (rupees in crore).

Plan	**Year**	**Elementary Education**	**Total**	**GR**	
				Elem.	**Tot.**
1st	1951-56	85	153		
2nd	1956-61	95	273		
3rd	1961-66	201	589		
Plan Break	1966-69	75	323		
4th	1969-74	239	786		
5th	1974-79	317	912		
6th	1980-85	836	2530		
7th	1985-90	2849	7633		
1990-92	1990-92	1729	4727		
8th	1992-97	920	19600		

funding. The government's share in 1991 was 85%, having increased from 68% at the time of independence. In 1947, the total expenditure on education was about 55 crore. By 1991, it increased to 25156 crore. The amount is normally allocated through two kinds of budgetary provisions.

Plan grants - These are mainly allocated for institutions and infrastructure development.

Non-Plan grants - These are meant to meet the expenditure of salaries of staff, scholarships, and other recurring expenses.

1. It is seen in Table 3.8 that elementary education had a bigger share of the educational budget in the first plan [21]. What can you say about the pattern of investment in elementary education since the first plan? List the possible reasons for a higher share for elementary education in the 1st and 8th plans?

2. How would you estimate the relative change in investment over the years? In groups of 3 members, discuss how you would analyse the data to yield a reasonable measure.

3. Relative change in investment over the years can be measured in terms of percentage growth. For example, the percentage growth in investment from the 1st Plan to 2nd Plan would be

$$Percentage\ growth = \frac{2nd\ Plan\ amount - 1st\ Plan\ amount}{1st\ Plan\ amount} \times 100$$

4. Calculate the percentage growth in each successive plan on elementary school expenditure and total expenditure. Fill the values in columns marked **GR**. Ignore the periods of plan breaks.

5. Plot your calculated growth values for elementary and total investments on the same graph. Do the plots show a similar trend? What conclusions can you draw from the plots?

6. You have already discussed growths of institutions, students and teachers at the elementary (primary and upper primary) level from 1947 to 1993 in Section 3.2. You have just seen the growth of investment on elementary education. Are these commensurate with each other?

   Which of the educational inputs — institution, students and teachers at primary or upper primary — reflects most closely the investment pattern on elementary education over the years?

7. Do you think the investments have been somewhat irregular? Do you think there might be a good reason for that? Justify your answer.

You are now familiar with the scenario of elementary school education in India, and are ready to move on to secondary school education in India and education in a global perspective.

Chapter 4

Secondary education

School education is divided, for administrative and evaluation purposes, into pre-primary, elementary and secondary levels. The first 10 years of schooling which include the secondary grades, deal with education of all subjects. In the higher secondary stage which follows the secondary stage there is a provision for separate streams of vocational education. Thus, though not specialised in itself, the secondary level appears to be the essential step to specialised higher education.

4.1 Idea generator: SCAMPER

After secondary school education, students need to make decisions about their professional goals. Imagine now, that you are a secondary school student. Whenever faced with such situations, exploring your interests about your options can help in making your future plans. In this activity you will use divergent thinking to consider the options of a secondary school student.

SCAMPER, the acronym, is a type of idea checklist in which ideas are substituted (S), combined (C), adapted (A), modified, magnified, or demagnified (M), put to other uses (P), eliminated (E) and rearranged (R). The SCAMPER technique is used here to discuss the issue of life after secondary school in many different ways.

1. List some ways of furthering your education after secondary level that do not include going to a University. (Substitute)

2. List some ways in which you could combine your favourite occupation with the possible education towards it. (Combine)

3. In what ways would you need to adapt, when you go from secondary school to a college? (Adaptation)

4. How would you have to change your study habits when you go to college? (Modify)

5. In what ways can you make your social relationships more meaningful in your college life? What occupational and educational advantages might a metropolitan city offer over a smaller city? (Magnify)

6. In what ways might going to a college in a small town be beneficial? (Demagnify)

7. What purpose, other than strictly social or academic, do you think going to a college serves? (Put to other uses)

8. If your parents were unable to support you in any way after your secondary education, in what ways would your plans change? (Eliminate)

9. List the merits and demerits of starting out on a career before completing your college education. (Rearrange)

You have now acquired a powerful method to generate ideas. Use this method as often as you can while brainstorming or planning for a discussion.

4.2 Growth and investment

Table 4.1 gives the number of students (S), teachers (T) and institutions (I) catering to secondary education in the years 1947 and 1993 [16]. Table 4.2 gives the budgetary allocations for secondary education in each 5-year plan [21].

Table 4.1: Number of institutions (I), teachers (T) and students (S) in 1947 and 1993 in secondary school levels in India.

	Number in thousands		
	1947	**1993**	**AGR**
S	700	22700	
T	9300	135300	
I	4	88	
S/T			

Note: AGR – annual growth rate.

Table 4.2: Plan expenditure on secondary education, rupees in crore.

1st	2nd	3rd	plan break	4th	5th	6th	7th	1990-92	8th
20	51	103	53	140	156	530	1832	1053	3498

1. Calculate the percentage average annual growth rate of students, teachers and institutions and fill the column marked AGR. You could use the formula given in Section 3.2.

2. Of students, teachers and institutions, which grew the fastest? Which showed the slowest growth? Why do you think this happened? Explain in about a page.

3. Calculate the number of students per teacher at the secondary level in the years 1947 and 1993, and fill the last row in the table. How does this compare with your results in Section 3.2 for primary and upper primary?

4. Table 4.2 shows the plan expenditure on secondary education. Using Table 3.8 for total expenditure on education, calculate the percentage share of secondary education. Fill the last row.

5. As you have done for elementary education in Section 3.6, calculate the growth rates of expenditure between two successive plans. Ignore plan breaks. How does secondary education compare with elementary education with regard to growth of investment?

Table 4.3: Dropout rates in India for some years from 1981 to 1996.

Year	**Grades 1 to 10**		
	Boys	**Girls**	**Total**
1980-1981	79.80	86.63	82.46
1985-1986	73.97	83.16	77.62
1990-1991	67.50	76.96	71.34
1995-1996	66.36	74.07	69.58

6. Compare the patterns suggested by Table 4.1 and 4.2. The growth of which educational input — students, teachers or institutions — most closely resembles the investment in secondary education?

4.3 Dropouts: a debatable problem

Table 4.3 gives the dropout rates for total number of students, boys and girls up to secondary level (grades 1 to 10) in the years 1980-81, 1985-86, 1990-91 and 1995-96 (provisional) [22]. Use the data to discuss issues related to dropouts at secondary level.

1. Revisit Section 3.3.1 for a calculation of dropout rates and Table 3.4 for the data for elementary education. How do the total school dropout rates in Table 4.3 compare with the elementary level dropout rates? Explain the differences and give their implications.

2. In the last chapter you have discussed various causes of dropouts at the elementary level. Do you think all these causes are equally important in explaining dropouts at the secondary level?

3. There is one school of thought that suggests that secondary school dropout is not to be looked down upon. Those desirous of taking up productive activity after completing elementary school should be helped in their endeavour. How can this be achieved on a local scale? What would be different if you wanted to implement a programme on a national scale?

4. Debate on the issue: **Secondary education should be valued only as a step to higher education. Otherwise it is a waste of productivity**.

4.4 School education: India versus World

Table 4.4 gives gross enrolment ratios for elementary and secondary education in some countries of the World during the years 1986-91 [51]. It also includes the percentage of grade 1 students reaching grade 5. The table should help you discuss the position of India in the World with regard to school education.

1. How does the percentage of students of grade 1 reaching grade 5 relate to dropout rates? What does a value greater than 100 mean?

2. List the countries that have elementary dropout rates less than that of India. How many of these are industrial countries?

3. Do you find any relationship between gross enrolment ratios and dropout rates at the elementary school?

4. List those countries where the gross enrolment ratios in primary is comparable to India, but the percentage of grade 1 children reaching grade 5 is not comparable to India's date. What could be the reasons for these differences?

5. Which countries show large differences between male and female gross enrolment ratios at (a) the elementary level and (b) the secondary school level? Is there a pattern that you can link to development? Justify your answer.

   Do you think the countries may have been specially chosen to show this pattern? Find out data about other countries and verify whether the results are any different.

6. Write a page on the relation between male and female enrolment in schools and the development of the country.

Table 4.4: Gross enrolment ratio at elementary and secondary school levels in some countries of the World, and percentage of grade 1 students reaching grade 5.(1986-91)

Countries	**Gross enrolment ratio**				**Passing from grade 1 to 5**
	Elementary		**Secondary**		
	Male	**Female**	**Male**	**Female**	
Australia	105	105	82	85	63
Bangladesh	78	68	23	12	46
Bhutan	31	20	7	2	26
Brazil	101	97	31	36	22
Canada	106	104	106	107	96
China	140	129	53	41	81
France	112	110	93	100	96
India	109	83	54	33	53
Indonesia	119	114	49	41	79
Italy	96	96	78	79	100
Japan	101	101	94	97	100
Rep. of Korea	106	109	89	86	100
Malaysia	93	93	55	58	96
Mexico	113	110	52	53	70
New Zealand	106	105	88	91	95
Nigeria	82	63	22	17	52
Norway	99	99	98	102	100
Pakistan	47	26	29	13	51
Somalia	20	10	12	7	37
Spain	109	108	102	112	94
Sri Lanka	108	105	72	77	94
Thailand	95	96	33	32	89
USA	105	104	92	91	90

Chapter 5

Higher education

5.1 Pre-independence trickle

Higher education involves specialisation of knowledge and skills. Higher education of Indians was first started in 3 Universities, Bengal, Bombay and Madras, in 1857. The twenty Universities that were set up before independence are listed in Table 5.1, along with the years in which they were started [32]. Over half of these Universities had colleges affiliated to them. Some landmarks in the total number of colleges and students is also given in the table.

1. Guess the possible reasons for the 4th and 5th Universities starting at Punjab and Allahabad.

2. Mark the location of the Universities in pre-independent India on a map of India (given in Appendix C.1). Comment on their distribution.

3. Calculate the annual growth rate of Universities and colleges from 1857 to 1887 and 1887 to 1947.

4. Find the ratio of Universities and colleges in the years 1887 and 1947. List the possible reasons for the difference you find in the proportion.

Table 5.1: Growth of Universities in the pre-independence period.

No.	Name of University	Year	Remarks/ Colleges
1	Calcutta	1857	
2	Bombay	1857	
3	Madras	1857	Total of 27 Colleges
4	Punjab	1882	
5	Allahabad	1887	Total of 75 Colleges
6	Banaras	1916	
7	Mysore	1916	
8	Patna	1917	
9	Osmania	1918	
10	Aligarh	1920	
11	Lucknow	1920	
12	Delhi	1922	
13	Nagpur	1923	
14	Andhra	1926	
15	Agra	1927	
16	Annamalai	1929	
17	Travancore	1937	
18	Utkal	1943	
19	Sagar	1946	
20	Rajputana	1947	636 Colleges, 2.5 lakh Students

5. Make a pictorial representation of the growth of Universities over the years. Each of you should make an independent effort.

5.2 Post-independence spurt

Table 5.2 shows the growth of higher education after independence [46, 47]. Through the activities given here you will discuss one of the issues that concerns you most — higher education in the country today and in the future.

The University Grants Commission (UGC) was set up in 1956 to monitor higher education in the country. Institutions of higher education are of the following categories.

Table 5.2: Number of Universities and colleges and enrolment over different years in the post-independence period.

Year	Univ.	DGR%	Coll.	DGR%	Students	DGR%
1950-51	27	—	695	—	396,745	—
1960-61	45		1819			
1970-71	105		3694		3,112,404	
1980-81	123		4722		2,752,437	
1990-91	184		7436		4,924,868	
1995-96	218		9278		6,425,624	

Universities (Central and State) like Hyderabad University and Shantiniketan are funded by the Centre, while Osmania and Calcutta Universities are State funded.

Deemed Universities cannot award degrees except through a State or Central University. They have no affiliated colleges.

Institutions of national importance are centrally funded. They have autonomous administration, and can confer degrees themselves.

Autonomous colleges are State funded, and have autonomous administration.

1. Find the names and locations of Central, State and Deemed Universities in your State.
2. Calculate the percentage decadal growth rate (**DGR %**) of Universities, colleges and enrolment of students from 1951 to 1991 using the given data. Fill the corresponding columns in Table 5.2. You have done this for elementary education in Section 3.2.1.

$$DGR\ \% = 100 \times \frac{(Q_{Y2} - Q_{Y1})}{Q_{Y1} \times (Y2 - Y1)}$$

3. How would you calculate the decadal growth for the period 1990-91 to 1995-96?
4. Which period saw the fastest growth of Universities, colleges and enrolment of students?

5. Plot decadal growth of Universities, colleges and enrolment as a function of years on the same graph. Compare the three growths.

6. How does the growth in student enrolment in higher education compare with the growth in elementary education over the same period?

7. Do you think higher education is equally accessible to every person at the present time? Justify. Do you think the situation needs a change? In what ways?

8. Do you believe that every citizen should be given an opportunity to pursue higher education? Justify your stand. Discuss this in the whole class. What would this involve in terms of funding and building, staff and other infrastructure requirements? How should the country go about it?

9. Organise a debate on the topic: **Higher education: to each according to his/ her aptitudes and from each (payment) as per his/ her economic capacity**.

5.3 Increase in S & T personnel

In 1990, India ranked third in the World in the sheer number of S & T personnel. Four million people in India are trained in science and technology areas, about 3 lakh of whom are employed in research and development (**R & D**) institutions in the country. However, the nature of their work varies: 35.2% are engaged in basic research; 32.2% in applied work and auxiliary activities; 32.2% in administrative and non-technical support in different scientific institutions.

All this sounds impressive. However you should discuss how all this compares with the nation's population and to what extent our human resources satisfy the country's S & T needs.

1. Using the information about India's population in 1990 and the number of S & T personnel given in the paragraph above, calculate the number of S & T personnel per 1000 people in the country. Compare this

Table 5.3: Students enrolled in scientific and technical faculties in India.

		Various faculties under S & T			
		Natural Science	Agri- -culture	Engg.	Medical
Colleges	1950	–	33	58	33
	1993	–	141	470	213
	AGR %				
Doctorate	1950	79	4	0	0
	1993	64093	11233	7456	930
	AGR %				
Postgraduate	1950	1438	154	50	164
	1993	667228	65358	101773	162907
	AGR %				
Graduate	1950	9628	1100	2029	1564
	1993	3451647	237664	808632	377205
	AGR %				

with the corresponding numbers for some industrial countries: 184.81 in Canada, 111.14 in Japan and 77.84 in Germany.

2. Table 5.3 gives the number of colleges and students at different levels of higher education in various faculties in the year 1950 and 1993 [5]. Calculate the average annual percentage growth rate **AGR%** of colleges and students in different faculties at different levels from 1950 to 1993. Fill the corresponding rows. Refer to Section 3.2 for the formula.

3. Which faculties grew the fastest in terms of the number of colleges? Which faculty appears to be increasingly attractive to students? Which faculty was least attractive to students? What does this imply for the country's S & T progress?

4. Explain the possible reasons for the pattern of enrolment in various faculties at each level.

5. How would you rate our growth of S & T personnel by international standards? Do you think we need to improve? In what ways?

Table 5.4: Women in higher education, 1950-51 and 1995-96.

Enrolment	**1950-51**	**1995-96**
Total enrolment	396,745	6,425,624
Women enrolment		2,191,138
Percentage of women enrolled		
Number of women enrolled for 100 men	14	

5.4 Disparities: gender and caste

Gender disparities

Table 5.4 shows the enrolment of women and total enrolment in higher education in 1950-51 and 1995-96 [47]. Use the data in Table 5.4 to discuss whether women have received an equitable share in education.

1. Table 5.4 has a few gaps. Fill these values using the given data.
2. How many folds has enrolment of women increased since 1950-51? How does this compare with enrolment of men?
3. Is there a difference in growth rate between men and women? What could be the main reasons?
4. From the data, can you predict when we will have 100 women for every 100 men, in higher education?
5. Study the pie chart in Figure 5.1 [47]. Which faculty attracts the largest number of female students? Which attracts the least?
6. Women at graduate level form 33.6% of the total enrolment, while at the post-graduate level they are 35.6% of the total. Give possible explanations for this situation.
7. Some people opine that most women go for a "soft" option like the Arts because they lack the intellect and perseverance needed for "harder" options like Engineering. Do you agree with this opinion? Justify your stand in about a page.

Figure 5.1: Faculty-wise enrolment of women, 1995-96

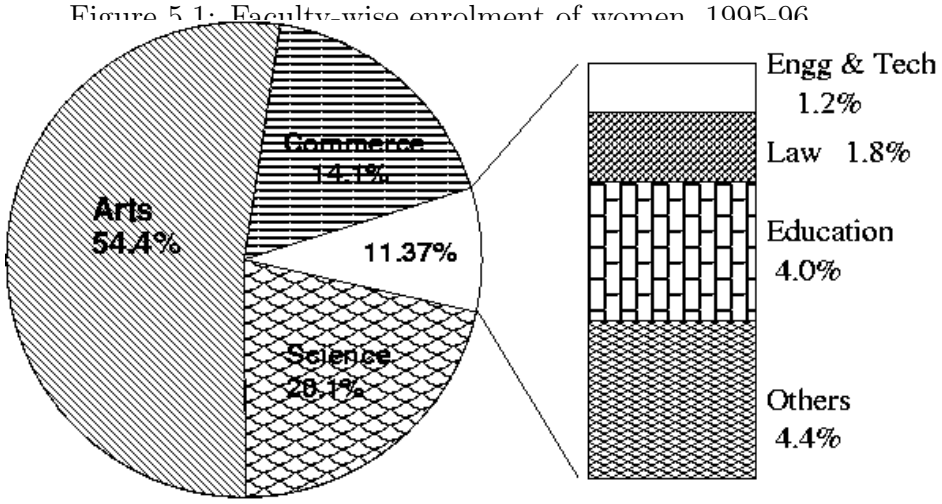


Table 5.5: Population (1991) and enrolment in higher education (1988-89) of students belonging to scheduled castes and tribes.

Groups	**Population**	**Enrolment**	**Enrolment %** Approximate
Total	843,930,861	3,836,978	
SCs	138,273,277	279,720	
STs	67,758,380	69,169	

Scheduled castes and tribes

Scheduled castes and tribes are greatly under-represented in higher education, and policies that attempt to address this issue have evoked strong reactions among the public at large. You will discuss this "hot" issue rationally and in terms of the numbers involved. Table 5.5 shows the number of students enrolled in higher education in 1988-89 who belong to scheduled castes and tribes [46, 47]. Population data for the respective groups in 1991 are also given [18, 7]. Discuss the disparities in higher education across these groups.

1. What percentage of the SC and ST population were enrolled in higher education? What is the corresponding value for the total population?

Table 5.6: Plan expenditure on higher education and technical education.

	Higher Education		**Technical Education**	
Plan	Rs. Crore	% of total	Rs. Crore	% of total
1st	14		20	
2nd	48		49	
3rd	87		125	
Plan break	77		81	
4th	195		106	
5th	205		107	
6th	559		273	
7th	1201		1083	
1990-92	558		823	
8th	1516		2786	

Fill the last column.

2. What disparities do you notice in the percentage of the three populations in higher education? List them.

3. What could be the possible reasons for the disparities?

4. What steps can you suggest to reduce such disparities in higher education? List them individually. Discuss the lists prepared by the whole class. Rank the list of suggestions in their order of effectiveness to reduce the disparities in the shortest possible time.

5.5 Investment

In the last two chapters you have seen the relative share of elementary and secondary education in our country's expenditure on education. You are now ready to compare the expenditures on 4 sectors of education — elementary, secondary, higher education and technical education. Table 5.6 gives the plan expenditure on higher and technical education [21]. Revisit Tables 3.8, 4.2 and Section 3.6 to prepare yourself for a discussion.

1. Refer to Table 3.8 for total expenditure on education and calculate the percentage share of higher and technical education in each plan. Fill the corresponding columns.

2. Plot two line graphs using the same set of axes showing the expenditure on higher and technical education over the plan periods. Make at least three inferences based on the graph.

3. Calculate the growth rate of expenditure in successive plans. Write the data in a separate table.

4. You have calculated the growth rate of total educational expenditure in Section 3.6. How does the pattern of spending on higher and technical education compare with growth in total spending on education?

5. Table 5.7 lists the different plan years and approximate enrolment of students at the elementary and higher education levels at the beginning of some plan years [20, 21]. Estimate the enrolment values for the plan years that have not been given. You could approximate a linear variation. If A_1 is the enrolment in year Y_1 and A_2 in year Y_2, the annual enrolment increase estimated linearly would be

$$\frac{A_2 - A_1}{Y_2 - Y_1}$$

   Five years from Y_1, the enrolment would be,

$$A_1 + (5 \times \frac{A_2 - A_1}{Y_2 - Y_1})$$

   This is called linear interpolation.

6. Note the expenditure in each plan for elementary education from Table 3.8 in Section 3.6 and for higher education from Table 5.6. Calculate the average budgetary allocation per enrolled student at the elementary and higher education levels in the different plan periods. Draw two bar graphs to represent this information. How would you describe the growth in allocation per student at the elementary and higher education levels? Are the patterns similar?

Table 5.7: Estimation of allocation per enrolled student at elementary and higher education levels over the different plan years.

Plan	**Year**	**Elementary education**		**Higher education**	
		Exp. Rs. Crore	**Enrolment Millions**	**Exp. Rs. Crore**	**Enrolment* Millions**
1.	1950-56		22		4
2.	1956-61				
3.	1961-66		42		16
4.	1969-74		70		31
5.	1974-79				
6.	1980-85		94		27
7.	1985-90				
8.	1992-97		133		50

Note: * – Approximate.

5.6 Brain drain

People have always aspired for a better life than the one they have. This is linked to social and economic changes. A wide spectrum of trained people are needed to bring about these economic and social changes. Hence the nation invests in higher education to train the people. On the other hand, highly trained people choose to fulfill their need for a better life more easily by migration. This gives rise to a controversial situation.

Brain drain refers to the more or less permanent migration of highly qualified and talented persons from a less developed country in which it has been trained at considerable expense to an industrial country. This migration of highly trained persons is perceived as a threat to the development efforts, and especially as a waste of human resource development efforts of the developing countries. In this section you will critically examine the issue of brain drain in India.

Table 5.8 gives the annual outflow of Indian male and female students from different faculties of study in the year 1992-93 [16]. Based on this data discuss the issues raised below.

Table 5.8: Annual outflow of Indian male and female students from various faculties in 1992-93.

Subject	**Outflow**		**Outflow %**	
	Male	Female	Male	Female
Arts	100	91		
Science	1209	238		
Commerce, Management, Administration	688	107		
Fine Arts	36	33		
Engineering	2190	190		
Architecture, Designing	53	27		
Technology, Industry	98	17		
Medicine, Pharmacy	342	106		
Agriculture, Forestry	57	9		
Other subjects	773	135		
TOTAL	5546	953		

1. Which 2 areas of study together account for more than half the outflow of students from the country? List the possible explanations for this preferential choice. Discuss in class.

2. The outflow of students in medicine and pharmacy is the fourth highest. Is this what you might expect? Justify in a paragraph.

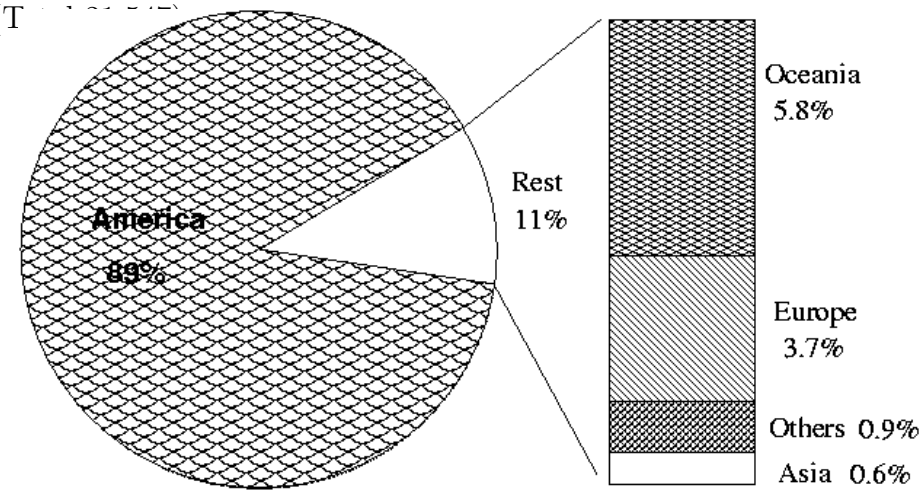
3. You have seen that the Arts faculty attracts the maximum enrolment of students. But the outflow of Arts students is low. List the possible reasons for this. What implications may this have on the trend of students opting for this area of specialisation? Justify.

4. Calculate the percentage outflow of male students in each subject. Fill the corresponding column in Table 5.8. Repeat the calculations for the percentage outflow of female students.

   Draw two pie charts to illustrate the information you have tabulated. Which of these pie charts would the total outflow of students most resemble? Why?

5. Figure 5.2 gives the annual outflow of students to different continents [16]. Describe the information in the pie chart in your own words in

Figure 5.2: Annual outflow of students to different continents in 1992-93. (T



about a paragraph. In what way is this representation different from others you know? What advantages does it have for the given data.

6. Table 5.9 gives the annual outflow of students to different countries in 1992-93 [16]. Represent the total outflow in a format similar to the one in Figure 5.2. Now represent it as 2 pie charts: one for the countries receiving a large share of students and another to represent the remaining countries. Draw two separate pie charts to represent the male and female outflows.

7. Do you expect these pattern to change with time? In what ways and for what possible reasons?

Push and pull factors

Recollect your discussion on the causes of elementary school dropouts. The issue of brain drain can also be analysed in terms of **Push** and **Pull** factors. The distinction between push and pull factors are somewhat tenuous here, in as much as they represent two sides of the same coin.

1. List all the factors that you would consider as "push" factors. These would pertain to the conditions within our country. On similar lines

Table 5.9: Annual outflow of students to different countries, 1992-93.

Continent	**% Outflow**	**Male**	**Female**
U.S.A.	88	4910	816
USSR	3	158	39
Australia	2.7	160	17
U.K.	2.6	131	40
Canada	1	48	13
Others	2.7	139	33

list the "pull" factors. These would be the attractions offered by the foreign country. Discuss the items listed by all your friends in class. Rank them according to their order of importance.

2. Which of these two factors should influence our policies in education, employment and development? In what ways?

3. Besides economic factors, socio-cultural factors also influence migration. Cite some examples of social and cultural factors that facilitate migration.

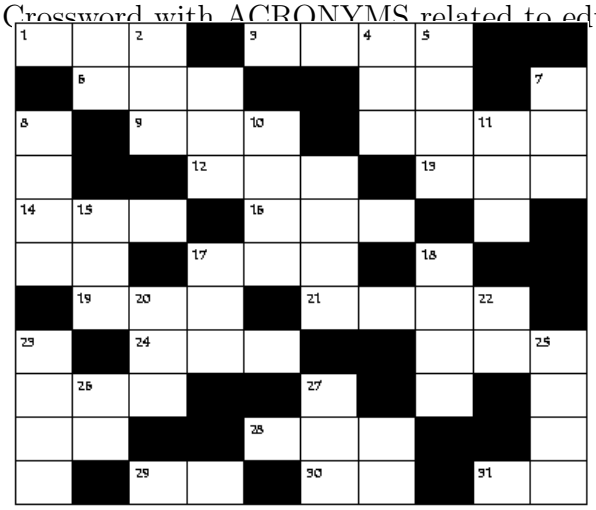
4. Was "peer pressure" listed as a "push" factor? How important is this factor?

5. In what ways do industrial countries gain from the migration of trained persons from developing countries? List them.

6. In what ways do the developing countries lose? List them.

7. Do the developing countries stand to gain in any way? Discuss this in the context of globalizing India?

Figure 5.3: Crossword with ACRONYMS related to education.



Across

1. Indian Constitutional goal
3. A Constitutional body
6. Flexible education
9. An association of institutions
12. Indicator of our productivity
13. Total campaign
14. Yearly growth
16. Controls science and technology
17. Country's policy
19. Teacher trainers in zones
21. Advisory board
24. Vocational training centres
28. Co-ordinates higher education
29. This much is transmitted
30. Equip classrooms on war footing
31. An educational parameter

Down

2. Recent educational goal
4. Related to engineering
5. Primary teacher training
7. Community participation
8. Apex agricultural centre
10. International agency for development
11. A mission
15. Enrolment indicator
17. Exam for eligibility
18. Controls secondary education
20. Technology institute for cream
22. Teaching about surroundings
23. Apex centre for S&T research
25. Apex centre for medicine
26. Teaching older people
27. Voluntary agencies

Chapter 6

Outside the formal system

In ancient India, when students lived in *Ashramas* with their *gurus*, education was related to the life of the pupils. There was no dichotomy between *education* and *work*. You could term it as **Education for life through life.** Even today, you may learn a lot of useful things outside the formal school system. Yet, there are some things which you learn only at school.

The non-formal education system aims at imparting reading, writing and arithmetic skills to children who are either not able to go to school, drop out from school, live far away from schools, or working children who cannot attend schools.

The non-formal education aims at a practical and socially useful learning. The non-formal schools could also cater to illiterate adults, in-service persons, the unemployed and the under-employed.

Although it is considered complementary to the formal education system, the approach is quite different. The programmes of formal education are organised through schools or colleges which are specialised institutions for imparting education. But programmes of non-formal education can be built around almost any social, economic, and cultural institution such as farms, factories, libraries, museums, theatres and so on. It is characterised by diversity of reach and flexibility of time.

6.1 Non-formal and Adult Education

Non-formal centres are run both by Governmental and non-governmental agencies. In 1992, there were 266,000 centres through which about 6,653,000 children in the age group of 6-14 years in the country had benefited.

The National Literacy Mission, established in 1988, has defined for its literacy campaign an "adult" as a person in the age group of 15-35 years. The National Adult Education Policy of 1979 deals with people in the 15-60 years age group in its adult education centres, though the emphasis is on the 15-35 years age group. Adult education programmes serve two purposes — basic literacy (ability to read, write and numerate) and functional literacy (education linked to social class and occupation). By 1993, there were about 455 lakh beneficiaries of the adult education programmes.

- Ten years old, Asha has to take care of her household and her 2 younger siblings while her parents are working at a construction site for a living. In a few years she will be married and will lead a life similar to her own parents. Does she need education? What would you suggest that she be taught? When and how would you go about teaching her?
- Group yourselves into pairs. One of you imagine that you are running a non-formal education centre. Describe a typical day at your Centre with your wards and your helpers. Make it as realistic as you can. The partner should imagine that you are proposing an adult education Centre in your locality. Write down the goals of your Centre, whom it will benefit, what courses you propose to start now, and how you plan to expand in the coming years.

6.2 Adult literacy

Literacy includes being able to read (a letter, a notice, simple sentences), write (a letter, an application, a complaint), and the skill of numeracy (addition, subtraction, multiplication and division of whole and decimal numbers). Table 6.1 shows the variation of literacy rates among the male, female and to-

Table 6.1: Literacy rates (%) among male, female and total population of India from 1951 to 1991.

Year	Total	Male	Female
1951	18.33	17.16	8.86
1961	28.31	40.40	15.34
1971	34.45	45.95	21.97
1981	43.67	56.50	29.85
1991	52.21	64.20	39.19

tal Indian population over the years from 1951 to 1991 [18]. The data should stimulate discussions over the issues raised below.

1. Plot the female, male and total literacy rates on the same graph.

2. Draw a trend line to predict the literacy rates for 2001, 2011 and 2021 AD.

3. Predict the year in which the country will attain total literacy among males. When will the country attain total literacy among females? Now predict the year of attaining total literacy in the population.

4. Which group would limit our attaining total literacy — male or female? What implication does this have for strategies which increase literacy rates?

5. Table 6.2 gives the total, male and female literacy rates in the nation, in urban areas and rural areas in 1981 and 1991 [18, 36].

   Calculate the ratio of male literacy rates to female literacy rates in the nation, rural areas and urban areas in 1981 and 1991. Fill the corresponding columns with these values.

6. Describe the pattern of values. Give possible reasons for this pattern.

7. Calculate the ratio of urban to rural literacy rates among males, females and total population in 1981 and 1991. Fill the corresponding columns. Comment in about 10 lines on the change in the three ratios over the decade 1981-1991.

Table 6.2: Literacy rates in rural and urban areas in India in 1981 and 1991.

Year	**Region**	**Total**	**Male**	**Female**	**M/F**	**U/R**		
		T	**M**	**F**		**T**	**M**	**F**
1981	Rural (R)	36.10	49.70	21.8				
	Urban (U)	67.30	76.80	56.4				
	National	43.67	56.50	29.85				
1991	Rural (R)	44.50	57.80	30.30				
	Urban (U)	73.10	81.00	63.90				
	National	52.21	64.20	39.19				
DGR	Rural (R)				—	—		
	Urban (U)				—	—		
	National				—	—		

8. Find the decadal growth rate of total, male and female literacy rates for the nation and in rural and urban areas. Fill the last rows in Table 6.2.

9. You have calculated several ratios and growths. Using this data argue that the national literacy rate more closely reflects rural literacy levels. Explain why this is so.

10. If we were to attain total literacy in the country what would be the values of the ratios M/F and U/R?

11. Plot bar graphs to show the distribution of literacy by sex (male and female) and area (rural and urban).

12. V.G.Kulkarni, the founder director of the Homi Bhabha Centre for Science Education makes it a point to include this comment in all his relevant addresses: **When you educate a boy, you educate an individual; when you educate a female, you ensure that generations to follow are educated.** Do you agree with this? Justify your stand listing as many points as you can in your favour.

6.2.1 Literacy survey of your locality

How literate is your locality? You will discover for yourself through a survey. Form groups of 5 members each. Survey a chosen locality according to the

Table 6.3: Format for a literacy survey

House No.	**Age group**	**No. of Persons**	**No. of illiterates**	**Reasons**	**Wish to study?**
1	> 15 yrs				
	< 15 yrs				
2	> 15 yrs				
	< 15 yrs				
Total	> 15 yrs			—	
	< 15 yrs			—	

format given in Table 6.3.

1. Each group surveys 20 houses in its chosen locality. You should get the number of persons in each house who are above 15 years (adults), and also the number below 15 years of age (children). Find out how many adults are illiterate, and how many children in the school going age (5-15 years) do not go to school and are hence likely to remain illiterate. Try to probe the reasons for illiteracy or not going to school. Ask how many would like to become literate. Fill all this information for each house in Table 6.3.

2. List all the reasons for adults being illiterate. Do all illiterate adults want to be literate? List the steps that can be taken to make them literate. Why do some people not want to be literate? Discuss the issue in class.

3. List all that can be done by the individual's family, by local schools and colleges, district education officers and the local community to increase literacy in the locality.

6.3 Literacy: a global scene

In this section you get an idea of literacy rates in different parts of the World. You will also see how small changes in literacy rates in countries with a large population reflect as significant changes in the World literacy rates.

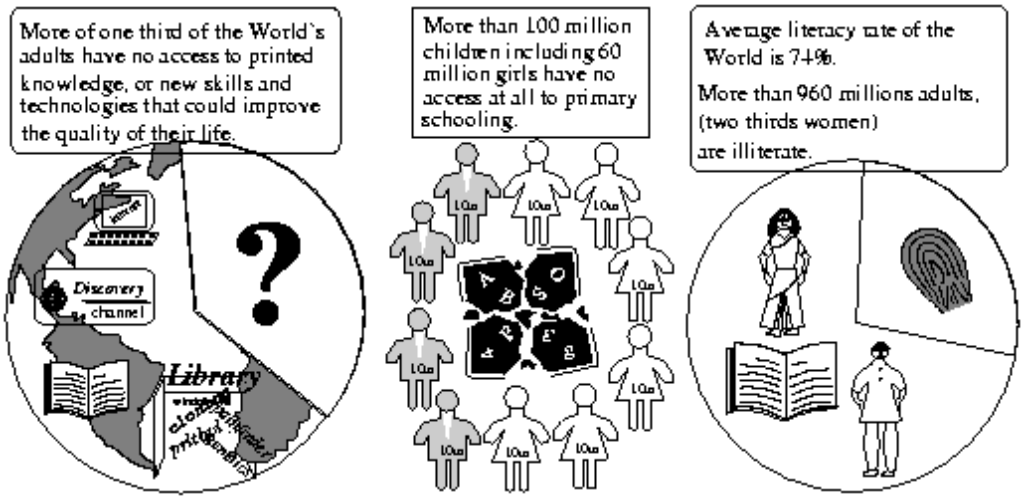


Figure 6.1 is a collage of snippets on the global literacy scenario in 1991. Table 6.4 gives the estimated illiterate population over 15 years of age in the years 1970, 1985, 1990 and 2000 in some of the major regions of the World [48]. Study the figure and the table and discuss the issues raised below.

1. List the countries of the World which contribute most to global illiteracy. Rank them. Which international organisations would be concerned about this problem?

2. What changes in the number of illiterates in the World do you notice over 1970-90? Which regions show an increasing trend in the number of illiterates? Which regions show a decreasing trend?

3. On a map of the World, mark the regions with decreasing number of illiterates (say as green) and the ones showing increasing trends in a different pattern or colour (say red). Which countries have a more accute problem of illiteracy? Does this agree with your ranking in the first activity?

4. The predictions for the year 2000 show an increase in the literacy rates of all countries of the World. Yet the numbers of illiterates do not show a decrease. What does this mean?

Table 6.4: Estimated illiterate population aged 15 years and above, in 1970, 1985, 1990 and 2000 in some of the major regions of the World.

Regions	**Illiterate population in millions**				**Literacy rate** %	
	1970	1985	1990	2000*	1990	2000*
Developing Countries of which	842.3	907.2	916.6	919.7	65.1	71.9
Sub-Saharan Africa	115.0	133.9	138.8	146.8	47.3	59.7
Arab States	49.7	58.6	61.1	65.6	51.3	62.0
Latin America	43.0	44.6	43.9	41.7	84.7	88.5
Eastern Asia	324.1	295.3	278.8	236.5	76.2	82.8
Southern Asia	302.3	374.8	398.1	437.1	46.1	54.1
Industrial Countries	47.8	42.3	31.5	15.7	96.7	98.5
World	890.1	949.5	948.17	935.40	73.5	78.2

Note: * — Projected values for year 2000

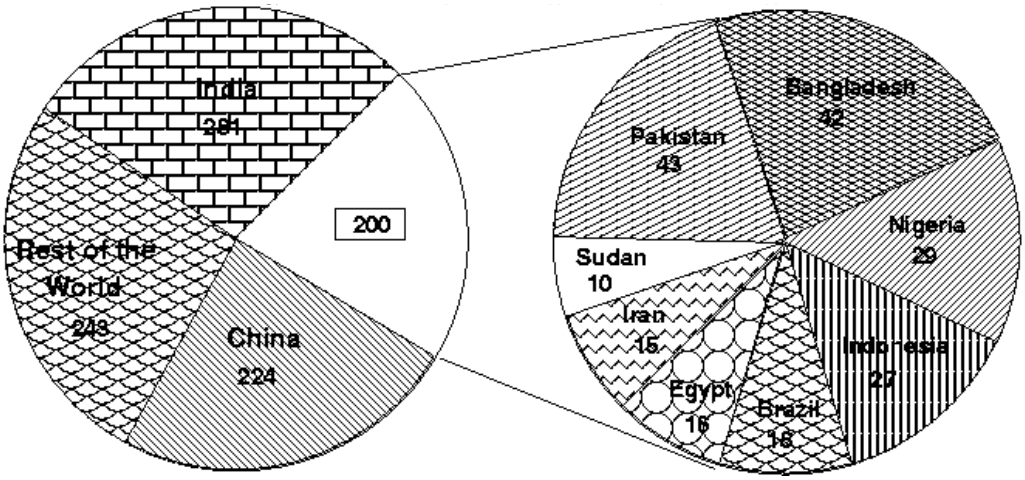
5. Compare and contrast the change in the number of illiterates in Sub-Saharan Africa, Arab States and South Asia with Latin America and East Asia. What could be the reasons for the differences?

6. Estimate the year when the World would have attained total literacy (Literacy rate $\approx 100\%$). Plot a graph of illiterates as a function of years and draw a trend line. Note when the number of illiterates becomes negligibly small.

7. Countries with 10 million and more number of illiterates are listed in the Figure 6.2 [48]. On the basis of the data in the figure, calculate the percentage of the World's illiterates in each of the ten countries. There were a total of 948 million illiterates in the World in 1990.

8. Find the population of each of these countries. You may refer to the book *The Population Problem* or find the data in a *World Development Report* [9]. For each country, calculate the percentage of its population who are illiterates.

9. If there is a decadal decrease of 10 percent and 15 percent respectively, in the illiterates of Pakistan and Bangladesh and no other change, what



would be the number of illiterates in the World in 2000 AD? If you included 10% decadal decrease in India, how many illiterates will the World have in 2000 AD?

6.4 Education at-a-distance

Today we have over 218 Universities and over 9000 colleges for higher education. Only a small percentage of the working and non-working population of the country, however accesses the facilities of higher education under the formal system. Limited places for enrolment, the rigid timings, compulsory attendance, and set curricula are constraints for people in different age groups and occupations who want to avail of higher education.

To fulfill this need, distance education systems with enormous flexibility have been planned to ensure equity and continuing education. Distance education is non-formal alternative not only to school education, but also to higher education. As of 1997, 8 open universities and 2 open schools are already operative. You will discuss through the following activities how best to utilise this facility to improve the human resources in the country.

1. There are two main systems catering to education at-a-distance: cor-

Table 6.5: The 8 open universities in India

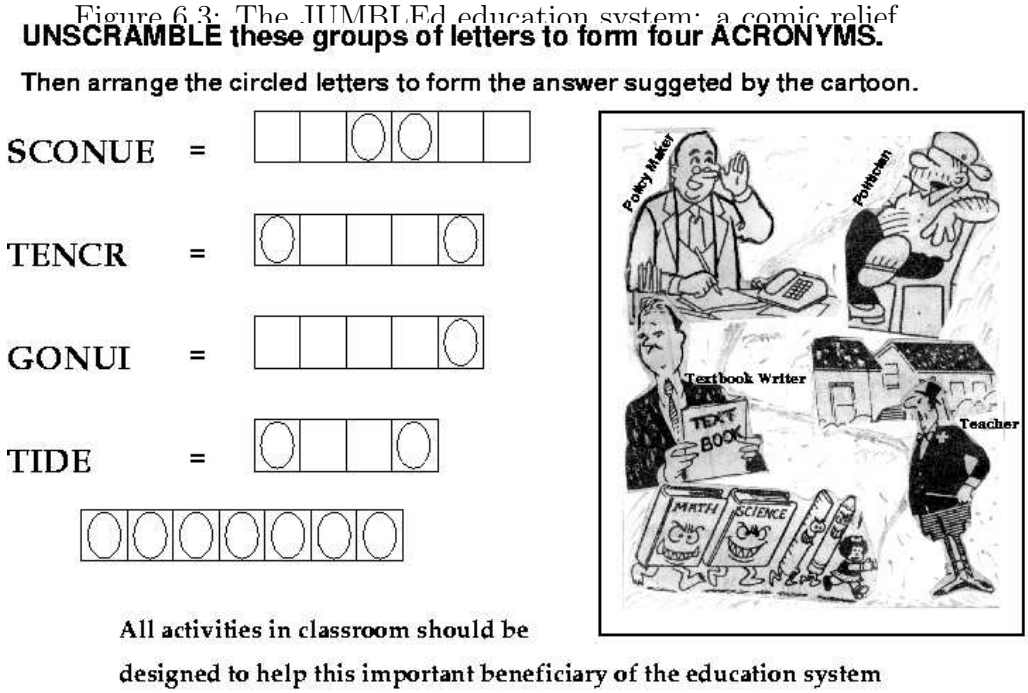
Name	**Location**
Dr. B.R. Ambedkar Open Univ.	Hyderabad, A.P.
Kota Open Univ.	Kota, Rajasthan
Yashwantrao Chavan Maharashtra Open Univ.	Nashik, Maharashtra
Nalanda Open Univ.	Patna, Bihar
Baba Saheb Ambedkar Open Univ.	Ahmedabad, Gujarat
Karnataka State Open Univ.	Mysore, Karnataka
Raja Bhoj Open Univ.	Bhopal, M.P.
Indira Gandhi National Open Univ.	New Delhi

respondence courses, and open schools and Universities. Each of you should find at least one person who has done a course by correspondence. Why did the person opt for a correspondence course? What advantages did this option offer over regular school and University courses? What limitations did it have? Collect the data and discuss your findings in the class.

2. Table 6.5 gives the operational locations of the 8 open Universities in 1997, seven of which operate at the State level. The Indira Gandhi National Open University (IGNOU) operates at the national level. Each of you should find a person who is aware of one of these open Universities. Collect information about the courses they offer. Visit the contact centre of IGNOU nearest to you. Discuss the importance of this system in the class.

3. India's open University system is one of the best in the World. Write a couple of pages imagining an India in which you have easy access to open schools and Universities. Discuss the scenario imagined by everyone. In what ways were these better options?

Figure 6.3: The JUMBLEd education system: a comic relief



Chapter 7

Education and development

Many of you must be convinced by now that education is essential for the development of the individual as well as the society. Some of you may see a vague connection between them, some others may not. Development in turn has an impact on education. For instance, the population size, its composition by age and sex, its growth rate and migration determine the demand for schooling and its evolution over time.

Since human resources constitute the very foundation of the wealth of nations, a detailed analysis of the relationship of education with various indicators of development are essential. The following sections examine such linkages between education and some indicators of development.

7.1 Education and population parameters

You will discuss here the impact of education of women on their mean age at marriage, and infant mortality and fertility rates. Infant mortality rate (IMR) is the number of children out of 1000 who die before reaching the age of 5 years. Fertility rate (FR) refers to the average number of children a woman in a population is most likely to bear during the course of her life.

Table 7.1 shows the values of population parameters like mean age at mar-

Table 7.1: Education level of women, corresponding mean age at marriage (MAM), infant mortality rate (IMR) and fertility rate (FR) in India, 1984.

Levels of Education	**MAM**		**IMR**		**FR**	
	Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
Illiterate	16.47	16.70	124.3	88.5	5.3	4.8
< Primary	17.41	17.89	84.5	67.5	4.4	3.9
< Matric	17.73	17.89	62.1	38.8	3.6	2.9
< Graduate	19.04	19.38	38.6*	13.8*	2.7*	2.2*
> Graduate	20.85	21.23	–	–	–	–

Note : * – Matriculation and above

riage, infant mortality rate and fertility rate, for women with differing levels of education [13]. The data will help you discuss some important issues relating education and population.

1. Plot two graphs showing the effect of education on mean age at marriage separately for rural and urban women. Choose proper X and Y axes and plot both the variations on the same axes. You may choose equidistant points from the origin along the X-axis to indicate levels of education, starting with illiterate at the left-most end. Explain the variation in a paragraph.

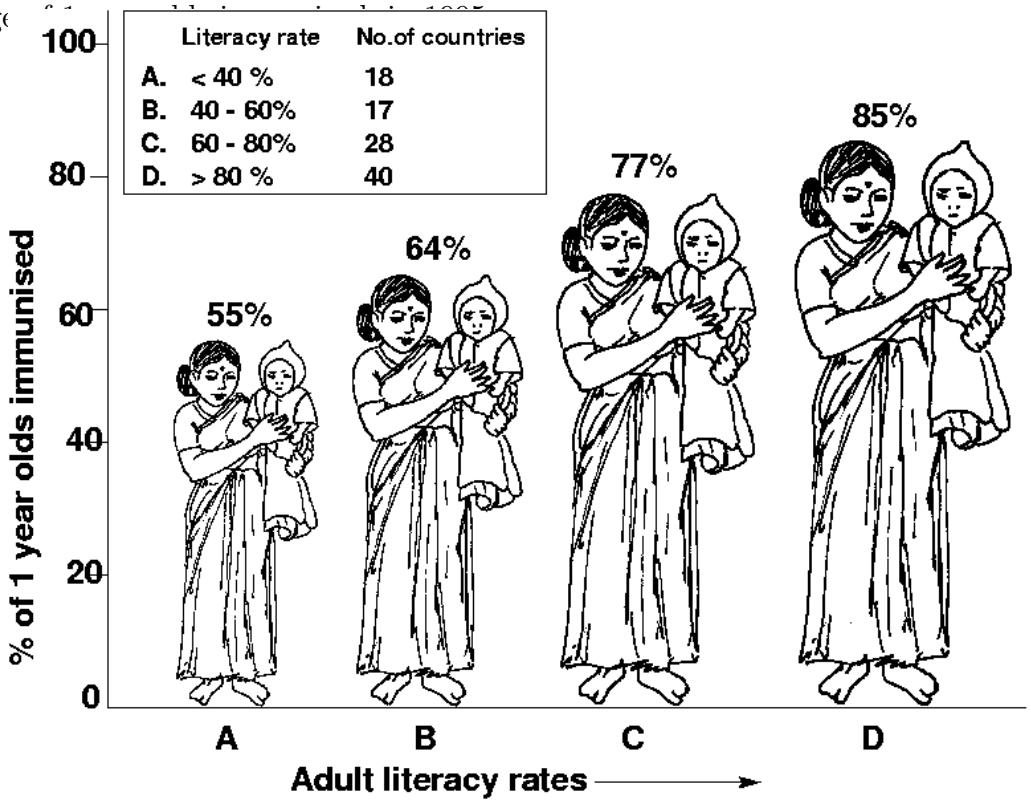
2. You have seen in your plot that educated women tend to marry later. Explain the reasons for this. Does education affect the marriage age of urban and rural women in similar ways?

3. As in the activity above plot the graphs of infant mortality rates as a function of woman's educational level for urban and rural situations. In what ways are the variations here different from the earlier graphs?

4. Figure 7.1 shows that the percentage of one year olds immunized increases with increasing adult literacy rates for various developing countries [37]. Is this information related to the discussion of IMR in the above activity? How?

5. List as many reasons as you can to explain the decrease in deaths of young children with increase in the education of women in a country.

Figure 7.1: Estimated adult literacy rates (15 years and above) and percentage

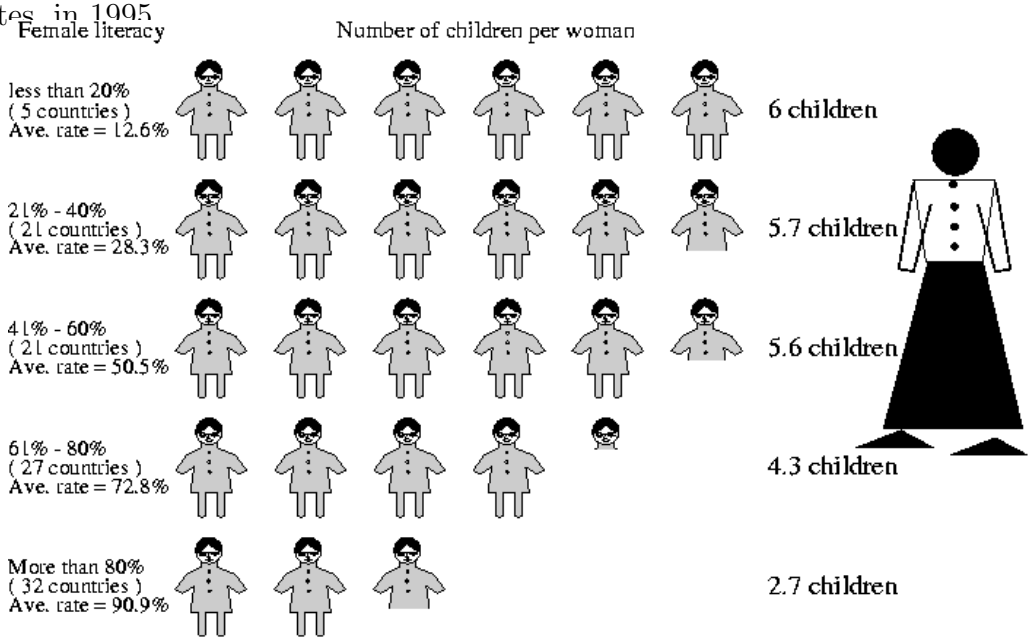


Would you expect the increase in education of men to have an identical effect on IMR? Justify your answer.

6. Plot graphs using the data on fertility rates similar to the ones in the activities above. What effect will decrease in fertility rate have on population growth? If we are to hope for zero net increase in population from one generation to another, what must be the value of fertility rate? Would educating men help in this regard? In what ways?

7. Figure 7.2 shows a picture relating literacy rates in some countries to the average number of children per woman in those countries [37]. How is Figure 7.2 related to your discussion above on fertility rates and female literacy rates? What differences do you see between industrial and developing countries?

Figure 7.2: Estimated female literacy rates (15 years and above) and fertility rates in 1995



8. Do you expect an increase in education of men have a similar effect as the education of women on the mean age of women at marriage? Justify.

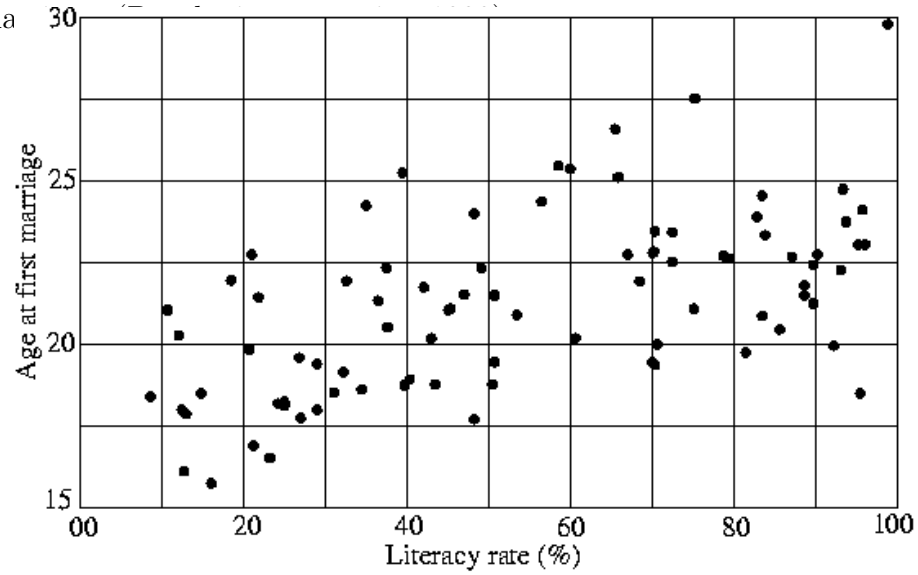
9. Do you expect the effects above to double if both men and women were equally educated? Justify your answer.

10. In Figure 7.3 many points are plotted on a graph [37]. Each point corresponds to one country: its X-value corresponds to female literacy rates in the country while the Y-value is the mean age at (first) marriage of the women in that country. This is called a *scatter plot*. Do you see any relationship at all between the two variables? Explain.

7.1.1 Education and marriage age: a pyramid

You have realised that educated women generally tend to marry later. Here you will carry out a survey to verify this for your locality. You will then

Figure 7.3: Female literacy rates (15 years and above) and their mean age at first ma



plot the data you have collected in the form of a pyramid: an education — age-at-marriage pyramid.

Each of you should survey 10 couples and collect data about their education levels and age at marriage and fill Table 7.2. The data of the whole class is then tabulated in the lower portion of Table 7.2. Use this data to construct the pyramid following the steps given below.

1. On a graph sheet mark the vertical axis for representing education level. Denote the negative x-axis as average age at marriage of males and along the positive x-axis plot the average age at marriage of females. Represent your data in the form of a histogram, with bars standing on the y-axis on either side of it. Does this resemble a pyramid? This activity is similar to the age-sex pyramid you made in the book *The Population Problem.*

2. Does the histogram show a mirror symmetry about the vertical axis (i.e. is it identical on either side of it)? What does your pattern mean in terms of gender differences in the relation?

Table 7.2: Data entry format for survey of education and age at marriage.

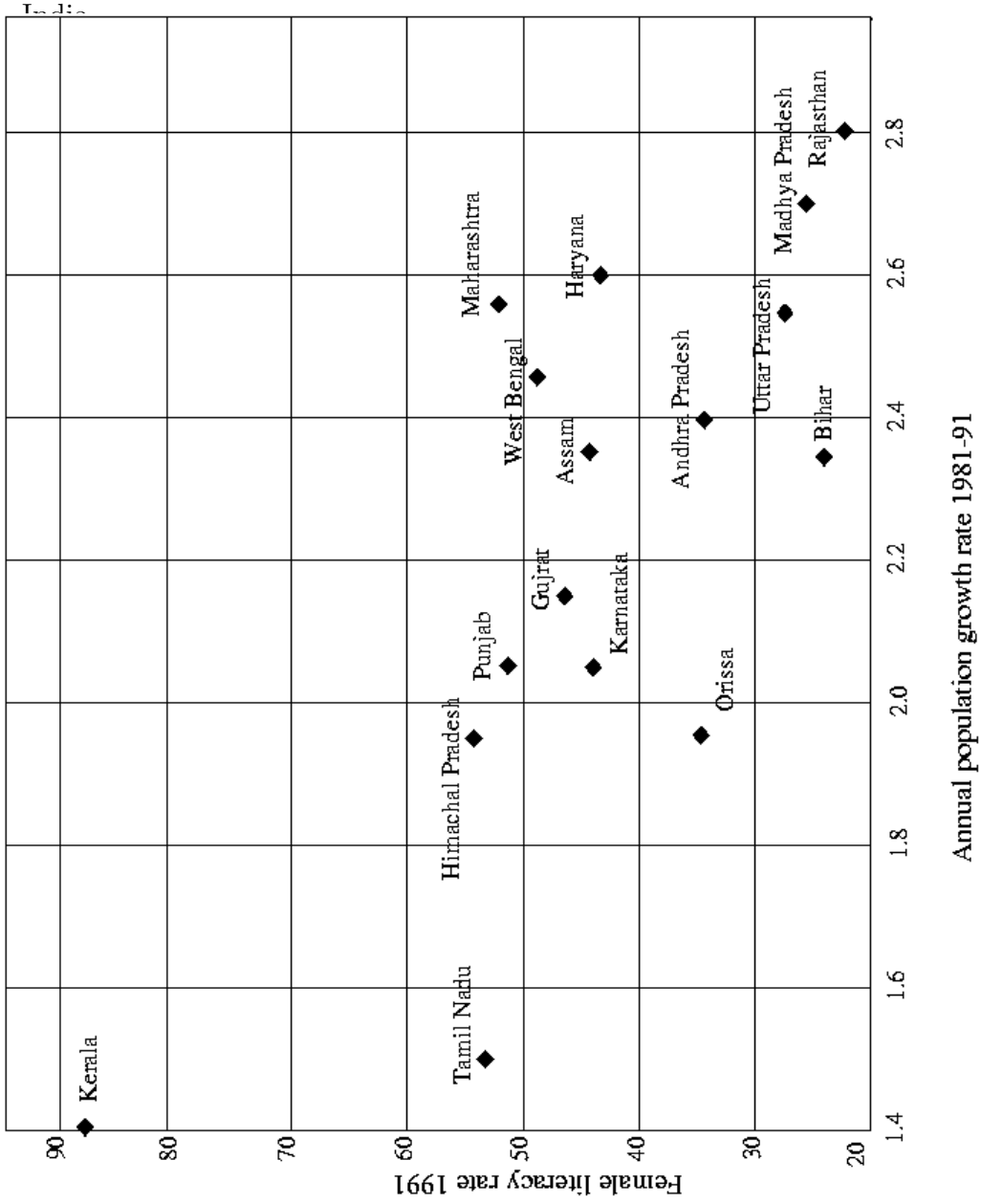
Data No.	**Age at marriage**		**Education level**	
	male	**female**	**male**	**female**
1. 10				
	Average age		**Total number**	
	male	**female**	**male**	**female**
Illiterate				
Below primary				
Primary, below matric				
Matric, below graduation				
Graduation				
Post graduation and above				

7.1.2 Education and population growth

Figure 7.4 shows annual population growth as a function of literacy rate of women for several States of India [37]. You recognize this as a scatter plot. You will analyse the data to see whether there is a correlation between female literacy rates and population growth.

1. Tabulate the data plotted in the graph in a three column table. Note the name of the State (S), literacy rate (L) and the corresponding annual population growth (G) for each State.
2. Calculate the following quantities:
   (a) Sum of L values = SL;
   (b) Sum of squares of L values = Sum of L^2 = SL2;
   (c) Sum of G values = SG;
   (d) Sum of squares of G values = Sum of G^2 = SG2;
   (e) Sum of the product of L and G = Sum of $L \times G$ = SLG;
   (f) Total number of States = N

Figure 7.4: Female literacy and annual population growth in some States of India



3. Use the formula for correlation coefficient **r** given by,

$$r = \frac{(N \times SLG) - (SL \times SG)}{\sqrt{[(N \times SL2) - (SL)^2] \times [N \times SG2 - (SG)^2]}}$$

4. Based on the correlation coefficient you have calculated, explain how education influences population growth.

7.2 Development level and education

Table 7.3 gives selected data on development parameters like male and female literacy rates, infant mortality rates and life expectancy (the number of years an average citizen may be expected to live) for some industrial and developing countries [49].

1. Is there a pattern in the numbers in the different columns in the upper part of the table (Group-1)? Is there a pattern in the lower part (Group-2)? Are the patterns similar? In what ways do they differ? What conclusions would you draw about the variations of the parameters of education and development?

2. Are there countries that deviate from the general pattern you have discovered? Explain.

3. China and India are 2 of the most populated countries of the World. Yet, they seem to follow 2 different patterns (China is in group 1 and India is in group 2). List the possible reasons for this difference.

4. How important do you think the gender difference in literacy rates is to the issue of development and education? Take a stand and justify it in terms of the data you have here, or data that you have collected from elsewhere.

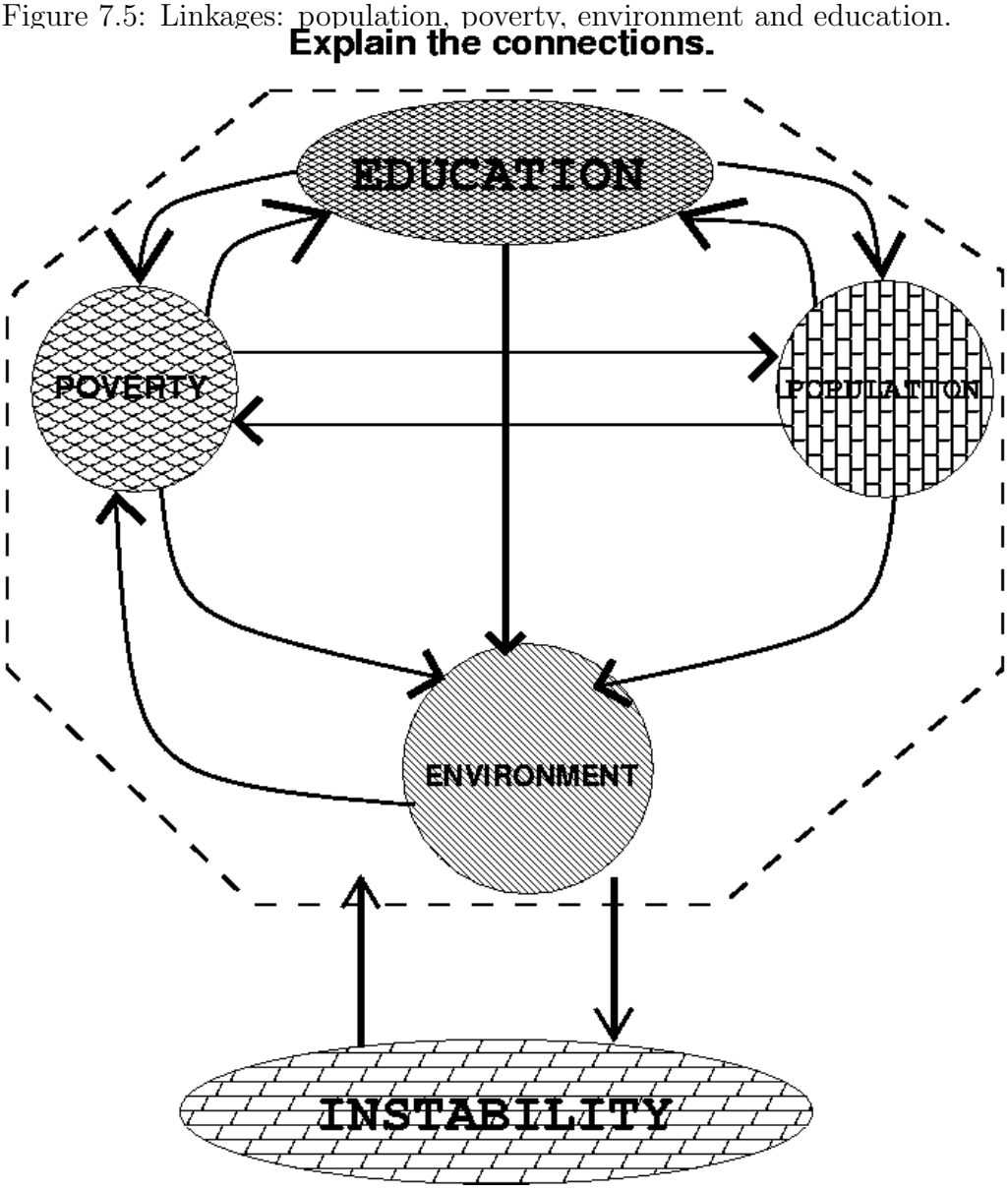
The relationship between education and development is not a one-way relationship. In other words, like most developmental indicators, education

Table 7.3: Literacy rates and some development parameters for some industrial and developing countries of the World.

Countries	**Group 1**			
	Literacy rate		**Infant**	**Life**
	Male	**Female**	**mortality rate**	**Expectancy**
USA	99	99	10	76
Japan	99	99	6	79
France	99	98	9	77
Korea	99	94	9	71
Greece	98	89	9	77
Thailand	96	90	33	70
Argentina	95	95	24	71
Singapore	92	74	7	74
China	84	62	43	71
Group 2				
India	62	34	124	60
Yemen	53	26	177	52
Africa	52	25	179	47
Bhutan	51	25	201	48
Bangladesh	47	22	127	53
Pakistan	47	21	137	59
Afghanisthan	44	14	257	43
Nepal	38	13	128	53

fosters development as much as education itself is influenced by the developmental status of the country. One of the most important parameters affecting the development status of a country seems to be the literacy rates among the women of the country. It is important to keep this in mind in any discussion of the links between education and development.

Figure 7.5: Linkages: population, poverty, environment and education.



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Appendix A

State-wise drop-out rate

Make a pyramid using the data on literacy rates of different groups of people given in the table below and imaginative symbols.

Group	**Literacy rate %**	**Group**	**Literacy rate %**
Urban male	81	Urban female	64
Rural male	58	Rural female	31
ST urban male	67	ST urban female	46
ST rural male	39	ST rural female	16
SC urban male	67	SC urban female	42
SC rural male	46	SC rural female	20

Table A.1 gives the drop-out rate among primary school students (till grade 5) in the States and Union Territories of India in 1990-91 and 1993-94.

Table A.1: Primary level drop-out rates in Indian States, 1990-91, 1993-94.

States	1990-91			1993-94		
	Boys	**Girls**	**Total**	**Boys**	**Girls**	**Total**
Andhra Pradesh	48.55	56.05	51.37	42.48	41.78	42.18
Arunachal Preadesh	60.71	60.78	60.73	60.09	61.09	60.52
Assam	45.97	59.77	52.42	38.65	39.55	39.05
Bihar	63.24	66.88	64.47	61.85	66.20	63.36
Goa	- 8.59	1.79	-3.64	-7.94	3.09	-2.57
Gujrat	38.71	48.84	43.27	42.05	51.39	46.25
Haryana	17.97	28.70	22.66	1.60	6.81	3.93
Himachal Pradesh	33.00	32.84	32.93	24.46	28.16	26.28
Jammu and Kashmir	53.46	41.25	48.48	53.12	42.35	48.66
Karnataka	41.37	51.33	46.12	37.50	44.42	40.78
Kerala	-8.90	-6.87	-7.91	-5.35	-3.05	-4.23
Madhya Pradesh	29.47	38.50	33.16	23.43	34.96	28.36
Maharashtra	29.16	38.87	33.73	24.10	31.63	27.62
Manipur	72.37	73.95	73.11	68.02	68.53	68.26
Meghalaya	26.49	25.94	26.23	29.96	34.43	32.06
Mizoram	51.62	49.07	50.42	56.73	58.54	57.58
Nagaland	31.46	39.66	35.54	37.56	24.13	31.65
Orissa	46.55	45.62	46.17	57.07	52.05	55.06
Punjab	24.09	25.11	24.56	20.69	22.94	21.74
Rajasthan	58.55	66.15	60.90	54.76	63.02	57.44
Sikkim	60.73	52.94	57.31	63.18	61.19	62.27
Tamil Nadu	18.27	22.68	20.31	16.39	18.35	17.30
Tripura	62.02	63.35	62.63	60.57	66.95	63.49
Uttar Pradesh	30.67	42.42	34.82	19.86	20.08	19.94
West Bengal	43.21	56.68	49.16	36.17	45.76	40.43
A & N Islands	0.74	6.83	3.63	9.26	10.34	9.77
Chandigarh	3.95	0.53	1.89	-20.31	-9.04	-14.90
Dadra Nagar Haveli	35.24	53.65	43.28	40.50	55.19	47.00
Daman and Diu	included in Goa			-7.32	-2.97	-5.32
Delhi	21.38	26.23	23.72	19.25	28.83	25.74
Lakshadweep	17.96	27.70	22.69	12.55	18.75	15.51
Pondichary	-5.37	-12.08	-8.48	-7.86	-8.20	-8.02
India	40.10	45.97	42.60	36.07	39.05	37.32

Appendix B

Child labour survey format

Information sheet for survey on child labour

1. Name of the child:
2. (a) Sex:
   (b) Age:
3. Nature of the work:
4. Parents' occupation:
   (a) Father:
   (b) Mother:
5. Number of members in family (including the child):
   (a) Total:
   (b) Brothers:
   (c) Sisters:
6. Birth order of child in family:

7. Reasons for working:
8. Earnings per day/month (approx.):
9. Hours of work per day:
10. Like the work? Yes / No / Sometimes
11. What do you do with your earnings?
12. How many meals do you have in a day?
13. Place of stay: employer's house/ own house/ slum/ street
14. Facilities given by employer (excluding money):
15. Do you use cigarette/ beedi/ tobacco/ pan/ drug/ any other?
16. Do your parents like you?
17. Ambition in life:
18. Want to study? Yes / No
19. Have you ever gone to school? Yes / No;
    (a) If no, why not?
    (b) If yes, upto which class? ——- and why dropped out?
20. If you were given free education, books and all, would you go to school?
21. If you were provided free education and meals, would you go to school?

Signature of the investigator

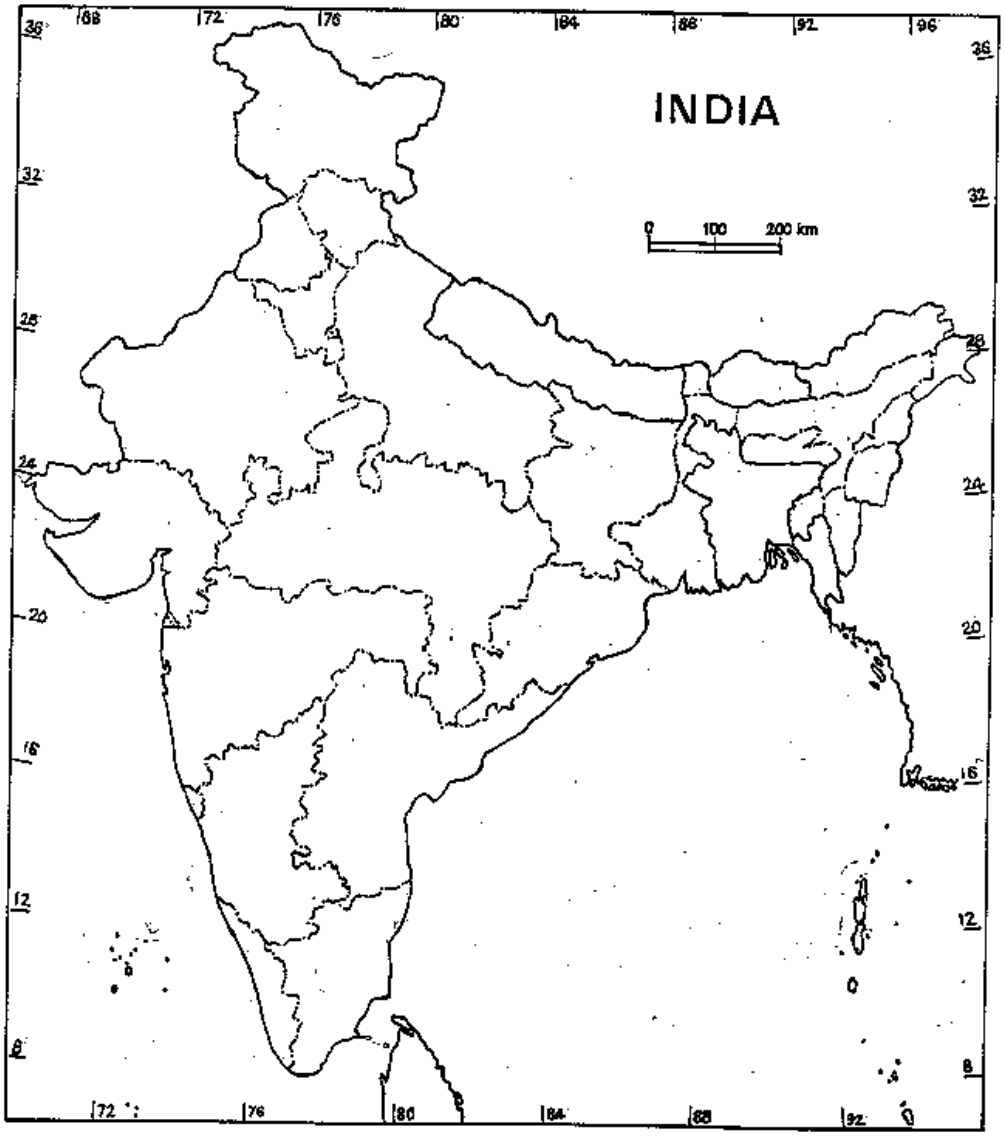
Appendix C

Map of India

You can make as many copies of the map given overleaf as you need for several of the activities in the book.

Some interesting data about extremes in literacy rates in the country is given below. Mark the locations of the places in the table on a map of India.

Category	**Maximum %**		**Minimum %**	
Total popn.	Kottayam (Kerala)	95.7	Jhabua (MP)	19.0
Male popn.	Kottayam (Kerala)	97.5	Jhabua (MP)	26.3
Female popn.	Kottayam (Kerala)	94.0	Bermer (Raj.)	19.0
Urban female	Kottayam (Kerala)	97.7	Rampur (UP)	49.0
Rural female	Kottayam (Kerala)	93.5	Bermer (Raj.)	4.2


INDIA
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