

INDICATORS OF EDUCATIONAL DEVELOPMENT WITH FOCUS ON ELEMENTARY EDUCATION: CONCEPT AND DEFINITIONS

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INTRODUCTION

Diagnosis exercise plays an important role in developing educational plans. It is the diagnosis through which the main problems are identified and areas and focus groups that need attention are known. A variety of information is required to undertake rigorous diagnosis exercise. The data in its original form cannot be used to draw inferences. It needs to be converted in the form of indicators so that meaningful conclusions are drawn. The raw data converted in the indicator form serve as a decision support tool. The National Policy on Education (NPE, 1986) envisaged disaggregated target setting with district as the unit of planning. The District Primary Education Programme and Sarva Shiksha Abhiyan Programme also envisage developing district plans with a focus on participatory planning and disaggregated target settings. Developing meaningful plans need thorough analysis of a variety of indicators at different levels (state/district/block/village/habitation) of planning covering various aspects of universal elementary education.

THE PRESENT MODULE

In this module, indicators are grouped into the following three main areas:

- (a) Coverage of Educational System
- (b) Internal Efficiency of Education System; and
- (c) Quality of Services and their Utilisation.

Indicators on the above aspects answer a variety of questions. System's level of development, accessibility and children taking advantage of educational facilities are some of the questions, which relate to the coverage of an education system. For this purpose, indicators such as entry rate (gross and net), enrolment ratio (gross, net and age-specific), admission rate, attendance rate, out-of-school children and additional

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children required to enrol have been demonstrated by using the actual set of data. The next set of questions relates to the internal efficiency of the education system. Information on the number of children who enter into the system and complete an education cycle, those who drop-out from the system in between and the number of children who reach to the next higher level (transition rate) can be obtained, if indicators of efficiency are computed. For this purpose, methods like Apparent Cohort, Re-constructed Cohort and True Cohort methods have been explained in detail and indicators are computed, analysed and interpreted. The computation procedure of grade-to-grade promotion, drop-out and repetition rates have also been explained by taking the actual set of data. In addition, computation procedure of a variety of other indicators concerning internal efficiency such as cohort survival and drop-out rates, average number of years the system is taking to produce the graduates, wastage ratio, input-output ratio and average stay on account of graduates, repeaters and drop-outs has also been explained. The last set of questions relates to the resources provided to education and how they contribute to the quality of educational services and whether resources are used in the most effective way possible, all of which can be answered efficiently, if indicators for the disaggregated target groups are computed. In the last section, indicators such as time utilisation rate, space utilisation rate and indicator of average audience in a class are discussed.

WHAT IS AN INDICATOR

To understand what is indicator? and other questions of similar nature, let us first define an indicator itself. An indicator is that which points out or directs attention to something (Oxford Dictionary). According to Jonstone (1981), an indicator should be something giving a broad indication of the state of the situation being investigated. Indicator is not an elementary item of information but it is processed information. Indicators are often compared to a 'norm' or a 'standard' (like pupil-teacher ratio) or to a previous score. Indicators reflect the way in which an objective can be achieved as well as to what degree approximately the objective has been achieved at any stage.

The following are the characteristics of a good indicator:

- (b) An indicator should provide useful information to the policy makers
- (c) Its ability to summarize information without distortions
- (d) Its precision and comparability
- (e) Its reliability and frequency of updating
- (f) It allows to relate it with other indicators for global analysis
- (g) It measures how far or how close one is from the objectives
- (h) It helps to identify problematic or unacceptable situation
- (i) It meets policy concerns; and

- (j) It helps to compare its value to a reference value, to a norm/standard or itself, as computed for different periods

By using simple statistical tools such as percentage, rate and ratio and index number, raw data is converted in the indicator form. 'Rate' indicates percentage change in the variables over two different periods of time. It shows the growth or decline in a variable. On the other hand, 'Ratio' shows the relationship between two variables at any particular period of time. Rates and ratios are interchangeable and normally expressed as percentages for easy interpretation whereas 'Percentage' is the mathematical relationship between two variables multiplied by 100. Index numbers are calculated to review the progress in relation to a particular point of time.

Indicators can be developed in a variety of ways. The most common form of indicators is the representative indicator. It involves selection of a single variable to reflect some aspect of an educational system. However, it does not provide any justification for selecting one variable rather than other. Therefore, choosing one variable to act as an indicator for an education system is an impossible task and the most unsatisfactory one also. That is why some indicators are disaggregated in nature. Instead of only one variable to represent a concept, this type of indicator requires definitions of variables for every element or component of the education system which is confusing and difficult to manage. The other variety of indicators is composite indicator that combines a number of variables. The final composite indicator is interpreted as average of all variables.

In our day-to-day life, we come across various indicators which can be classified into three broad categories, namely input, process and output indicators. Various process control machines such as videocassette recorder, automatic milk booths and automatic weighing machines are some of the examples of these indicators. However, in the field of education, the classification of indicators under different categories is not an easy task. Generally, we view education as a system, which receives inputs in the form of new entrants, transforms these inputs through certain internal processes, and finally yields certain outputs in the form of graduates. The output from a given cycle of education is defined as those students who complete the cycle successfully and the input used up in the processes of education are measured in terms of student years. Educational indicators can be classified into indicators of size or quantity, equity, efficiency and quality.

MEASURING THE EDUCATIONAL ACCESS AND COVERAGE

— INDICATORS OF ACCESS

Universal access to schooling facilities is one of the important components of UEE. To know whether the facilities are equally distributed or not, indicators of access are used. Access indicators are also used to know whether schooling facilities are adequately utilised. A number of factors such as population of habitation, distance from the house, mode of travel and time needed to reach schools are considered while analysing accessibility. The current norm is to provide a primary and upper primary school within a distance of one and three kilometres from the habitation respectively. Habitation is treated as the lowest unit of planning where schooling facilities are supposed to be available. So far as the population norm is concerned, habitations having population of 300 and more and 500 and more are entitled to have a primary and upper primary school within a distance of one and three kilometres. The distance and population norms vary from state to state, therefore, state-specific norms should be considered while developing access indicators. Some of the commonly used indicators of access are:

- (b) Percentage of habitations according to population and distance norms accessed to primary schooling facilities;
- (c) Percentage of habitations according to population and distance norms accessed to upper primary schooling facilities; and
- (d) Percentage of habitations served by primary and upper primary schools within habitation, and walking distance.

For example, 84 and 73 per cent of the total habitations (according to population and distance norms) in the country were respectively accessed to primary and upper primary schooling facilities. This otherwise means that only 16 and 27 per cent habitations were not accessed to the schooling facilities at these stages respectively. The indicator in an aggregate form serves only the limited purpose unless the same is made available at the disaggregated levels, such as state, district, block and habitation. A more meaningful indicator of access can be generated, if the same is linked to the rural population. Thus for the other indicator of access one should consider:

- (e) Percentage of rural population having access to primary schooling facilities as per the distance norm; and
- (f) Percentage of rural population having access to upper primary schooling facilities as per the distance norm.

For example, about 95 per cent of the total population is served by the schooling facilities, which means that only 5 per cent population is yet to be provided schooling facilities. Alongwith the availability of schools, indicators on facilities in schools are also used as the indicators of access. Such indicators relate to the physical, teaching and ancillary facilities in schools, some of which are listed below:

1. Percentage of schools having school buildings to total number to schools
2. Percentage of schools according to ownership of school building: no building, rented building, own building
3. Percentage of schools functioning in tents, open space, religious place etc.
4. Percentage of schools according to type of school building: thatched, semi-permanent (kuchha), and pucca
5. Percentage of schools needing new building, major and minor repairs
6. Percentage of schools having boundary walls
7. Percentage of schooling having playgrounds
8. Percentage of schools distributed according to total number of classrooms
9. Percentage of schools distributed according to number of instructional rooms
10. Percentage of schools distributed according to availability of separate room for head master and staff room
11. Percentage of schools having drinking water facilities
12. Percentage of schools having electricity connection
13. Percentage of schools having toilet facility
14. Percentage of schools having separate toilet for girls
15. Percentage of schools having tat-pattis, benches/chairs for students, desks, chairs and table for teachers
16. Percentage of schools having boxes, almirahs, dustbins etc.
17. Percentage of schools covered under the Operation Blackboard scheme
18. Percentage of schools having OB kit and other teaching-learning material such as black board, globe, map, charts, dictionary etc.

The above set of indicators needs to be developed separately for the primary and upper primary level of education and should also be computed at the district and all of its sub-units.

— INDICATORS OF COVERAGE

By measuring the educational coverage, we mean interaction between demand and supply. Demand and supply in education means children of a specific age-group utilising the educational facilities, which is termed as supply. The following indicators of coverage are discussed in this module:

- (b) Admission Rate;
- (c) Enrolment Ratio; and
- (d) Transition Rate.

(i) Admission Rate

The first indicator of coverage, that is, 'admission rate' is also known as the 'entry' or 'intake rate'. Admission rate plays an important role in knowing the coverage of the entry age of the child population (generally age-6) in the system. The rate is calculated in terms of Grade I enrolment and population of age-6 years. When enrolment is analysed, we notice two types of children in Grade I, that is, new entrants and repeaters. But while computing the admission rate, only the present members of the cohort (new entrants in Grade I) are considered. Repeaters are ignored, as they are the members of some previous cohorts. A cohort is simply a group of elements (children) moving together from one grade to another and from one time period to another time period. Admission rate is of interest both to the policy makers and the planners. It plays a significant role in enrolment projections and forms the basis of future enrolment. Admission rate should be computed separately for boys and girls, rural and urban areas and Scheduled Castes and Scheduled Tribes population. The computation procedure is:

$$\text{Apparent Admission Rate} = \frac{\text{Total new entrants in Grade I in year 't'}}{\text{Population of age-6 in year 't'}} \times 100 \quad (1)$$

$$\text{Age-specific Admission Rate} = \frac{\text{New entrants of age '6' in Grade I in year 't'}}{\text{Population of age-6 in year 't'}} \times 100 \quad (2)$$

The apparent admission rate presented above considers total new entrants in Grade I irrespective of the age, which means that children above and below age-6 are also included in the enrolment. This may result into a rate more than hundred in some

cases. That is why the rate is considered as a crude indicator of access and is not expected to present the true picture of the coverage. If total enrolment of Grade I is considered in place of the new entrants, the corresponding rate is known as the gross admission rate, which again is termed crude indicator. Therefore, age-specific admission rate is computed which is considered a better indicator of coverage. The rate is also known as net entry (admission) rate. It considers new entrants of age-6 in Grade I in place of the total new entrants. This rate cannot cross hundred because children below and above age-6 are excluded from the enrolment. The rate has serious policy implications; unless brought to hundred the goal of UPE cannot be achieved. The cohort admission rate is the last in the series, which watch movement of a particular member of a cohort over several consecutive years and account for the members of cohort who successfully enter school sooner or later.

For example, total enrolment of Grade I in 1990-91 was reported 27.06 million, including 1.23 million repeaters of the previous cohort. The population of age-6, officially entitled to enrol in Grade I was 20.98 million. The Gross Admission Rate can be calculated by using the following formula:

$$\begin{aligned}
 \text{G.A.R} &= \frac{\text{Total Grade I enrolment}}{\text{Population of age-6}} \times 100 && (3) \\
 &= \frac{27.06 \text{ million}}{20.98 \text{ million}} \times 100 \\
 &= 128.98 \% .
 \end{aligned}$$

The computation of the apparent admission rate needs total new entrants in Grade I which can be obtained by subtracting the repeaters from the enrolment i.e. 27.06 - 1.23 = 25.83 million. Thus,

$$\begin{aligned}
 \text{Apparent Admission Rate} &= \frac{25.83 \text{ million}}{20.98 \text{ million}} \times 100 \\
 &= 123.10 \%
 \end{aligned}$$

Next we compute the age-specific (net) admission rate which requires new entrants of age-6 in Grade I. If we assume, 19.23 million children in Grade I of age-6, then the Age-specific (Net) Admission Rate is computed as follows:

$$\begin{aligned}
&= \frac{19.23}{20.98} \times 100 \\
&= 91.66 \%
\end{aligned}$$

This indicates that about 92 per cent population of age-6 was enrolled or a little more than 8 per cent children were out of the school in the year 1990-91.

(ii) **Enrolment Ratio: Concept, Definitions and Limitations**

Enrolment Ratio is simply the division of enrolment by population, which presents extent to which the education system is meeting the requirements of the child population. Two questions may crop-up first, enrolment of which level and second, population of what age group. The following enrolment ratios are discussed in this module:

- (A) Over-all enrolment ratio;
- (B) Age-specific enrolment ratio; and
- (C) Level enrolment ratio.

By taking examples, the concept of different enrolment ratios is demonstrated. The merits and limitations of a particular ratio are also discussed which may help to identify the best indicator of the coverage.

(A) **Over-All Enrolment Ratio**

The first indicator of the coverage is the over-all enrolment ratio (OAER), which presents an overall picture or a bird's eye-view of the entire education system, For a school system, consisting of the Grades I to XII, the OAER is simply the division of total enrolment in Grades I-XII to the corresponding school-age population, that is, 6-17 years (equation 4). In the numerator, total enrolment in Grades I-XII is considered irrespective of the age but in the denominator, corresponding school-age population is considered. Because of this, enrolment ratio in a few locations may even cross hundred. This is because of the over-age and under-age children, included in the enrolment of Grades I-XII. One possible reason of this may be because of over-reporting in enrolment. Thus, OAER is not considered an ideal indicator of enrolment; hence, planning exercises need not be based upon this indicator. The other important limitation of the ratio is that level and stage-wise enrolment ratios cannot be obtained. The ratio is recommended to use only when quick estimates are required

and detailed information on enrolment is not available.

$$\text{O.A.E.R} = \frac{E^t_{\text{I - XII}}}{P^t_{\text{6-17}}} \times 100 \quad (4)$$

For example, total enrolment in Grades I-XII and population of age-group 6-17 years in 1986-87 ('t') is given 128.22 million and 170.55 million (estimated) respectively (Table 1). It will give an enrolment ratio of

$$\begin{aligned} &= \frac{128.22}{170.55} \times 100 \\ &= 75.36 \% \end{aligned}$$

Enrolment ratio of 75.36 per cent reveals that more than seventyfive per cent of the total 170.55 million children of the age-group 6-17 years (including the over-age and under-age children) were enrolled in 1986-87 in Grades I-XII.

(B) Age-Specific Enrolment Ratio

The second ratio we discuss below is the age-specific enrolment ratio (ASER). It gives enrolment ratio for a particular age or age group. It is simply the division of enrolment in year 't' in age-group 'a' at all the levels of education in any grade by a population of a particular age 'a' in that year 't'. The limitation of the ASER is in its consideration of the total enrolment irrespective of the grades; hence enrolment in the numerator is not free from error, as it consists of the enrolment in different grades. ASER is still useful to the planners and policy makers, specially when information on coverage and non-enrolled children in a particular age or age group is required.

$$\text{A.S.E.R} = \frac{E_a^t}{P_a^t} \times 100 \quad (5)$$

For example, ASER for age '13' in year 1995 can be computed as follows:

$$\text{A.S.E.R} = \frac{E_{13}^{1995}}{P_{13}^{1995}} \times 100$$

Where $E_{13} = E_{13}^I + E_{13}^{II} + E_{13}^{III} + \dots$ (i.e. enrolment of age-13 in different grades)

Similarly, Age-specific enrolment ratio can be obtained for any other single age or age-group. For example, total enrolment of age-group 6-11 and 11-14 years in 1986-87 was 71.11 and 29.11 million respectively (Table 1) which, if divided by the corresponding age-specific population i.e. 93.70 and 56.88 million, will give

$$\text{A.S.E.R (6-11 Years)} = \frac{71.11}{93.70} \times 100 = 75.89 \% \quad \text{and}$$

$$\text{A.S.E.R (11-14 Years)} = \frac{29.11}{56.88} \times 100 = 51.17 \%$$

This shows that of the hundred children of age-groups 6-11 and 11-14 years, about 75.89 and 51.17 per cent were enrolled but it cannot be known in what grade they are enrolled. In fact, children of age-group 6-11 years are expected to be in Grades I-V and of age-group 11-14 years in Grades VI-VIII. But in reality, this is not so in most of the locations.

(C) Level Enrolment Ratio

The level enrolment ratio is an improved version of the OAER, which gives enrolment ratio level-wise. Two types of ratios, namely 'gross' and 'net' enrolment ratios are available. The gross enrolment ratio (GER) is a division of enrolment at school level 'i' in year 't' by a population in that age group 'a' which officially correspond to that level 'i'.

$$\text{G.E.R} = \frac{E_{i,a}^t}{P_a^t} \times 100 \quad (6)$$

Invariably in the literature, the corresponding age-group at the primary, upper primary and elementary levels are referred as 6-11, 11-14 and 6-14 years as against the actual 6-10 (6+ to 10+), 11-13 (11+ to 13+) and 6-13 (6+ to 13+) years. 6+ to 10+ includes children above age '6' but below age '11' and similar for the other age groups. On the basis of the above formula, GER for the primary and upper primary levels of education in any given year ('t'), say 1987 can be computed as follows:

$$\text{G.E.R. (Primary)} = \frac{E_{\text{I-V}}^{1987}}{P_{6-11}^{1987}} \times 100 = \frac{85.91}{93.70} \times 100 = 91.69\%$$

$$\text{G.E.R. (Middle)} = \frac{E_{\text{VI-VIII}}^{1987}}{P_{11-14}^{1987}} \times 100 = \frac{27.27}{56.88} \times 100 = 47.95\%$$

Again, it is observed that GER too includes over-age and under-age children in enrolment that often results into the enrolment ratio more than hundred. Thus GER should not be used in planning UPE/UEE unless the net amount of children in the respective age-group is considered. Net enrolment ratio (NER) is, an improved version of the GER. The difference between GER and NER is in its consideration of the enrolment (equation 7). In NER, over-age and under-age children are excluded from the enrolment and ratio to the respective age-specific population is then obtained. One limitation of the NER is that it excludes over-age and under-age children from enrolment though they are very much in the system. Despite limitations, however, the ratio seems to be more logical than the other ratios presented above.

$$\text{N.E.R} = \frac{E_{i,a}^t}{P_a^t} \times 100 \quad (7)$$

**Table 1 : Age and Grade Distribution of Enrolment and Population
(1986-87)**

| Grade | AGE-GROUP | | | |
|-----------------|-----------------------|------------------------|-------------------------|-----------|
| | 4 to Below 6 Years | 6 to Below 11 Years | 11 to Below 14 Years | Total |
| (1) | (2) | (3) | (4) | (5) |
| I | 10309502 | 14439597 | 134028 | 24890467 |
| II | 738263 | 17122286 | 381266 | 18254892 |
| III | 16486 | 15685139 | 652049 | 16385969 |
| IV | 1830 | 12716348 | 1289112 | 14085382 |
| V | - | 8221306 | 3897978 | 12296768 |
| I to V | 110066081 | 68184676 | 6354433 | 85913478 |
| VI | - | 2493112 | 7519761 | 10501690 |
| VII | - | 354253 | 7580324 | 8918548 |
| VIII | - | 75931 | 5403436 | 7852098 |
| VI-VIII | - | 2923296 | 20503521 | 27272136 |
| IX | - | - | 1880968 | 6408929 |
| X | - | - | 367193 | 5111057 |
| XI | - | - | - | 2106586 |
| XII | - | - | - | 1402985 |
| I to XII | 110066081 | 71107971 | 29106414 | 128215381 |
| Population | - | 93697824 | 56881290 | - |

Source: Fifth All India Educational Survey, NCERT, New Delhi, 1993.

For example, NER for primary and upper primary level for year 1987 ('t') can be obtained as follows:

$$\text{N.E.R (Primary)} = \frac{E_{I-V, 6-11}^{1987}}{P_{6-11}^{1987}} \times 100 = \frac{68.18}{93.70} \times 100 = 72.76 \%$$

$$\text{N.E.R (U. Primary)} = \frac{E_{VI-VIII, 11-14}^{1987}}{P_{11-14}^{1987}} \times 100 = \frac{20.50}{56.88} \times 100 = 36.04 \%$$

The GER and NER computed above for the primary level comes out to be 91.69 and 72.76 per cent which indicate that about 18.93 per cent children from outside the prescribed age-group i.e. 6-11 years are included in the enrolment in primary classes. Compared to the primary level, the percentage of over-age and under-age children at the upper primary level was low at 11.91 per cent.

ATTENDANCE RATE

Indicators presented above, however, fail to give any idea as to whether children are attending schools. Alternative to the GER and NER, 'attendance rate' is considered a better indicator of the coverage. This can be calculated either on daily, monthly, quarterly or annual basis. Attendance rate is considered one of the important indicators of monitoring. It may be calculated separately for boys and girls. The school-specific attendance rate is used to identify schools that need immediate attention. Monthly attendance rate highlights the possible reasons of low attendance.

Attendance rate is calculated in relation to the number of school working days and children actually attending a class. For example, in a Class of 45 students in a school that functioned for 22 of the 30 days in a month, attendance rate can be calculated in accordance to the actual number of days children attended schools. Some of them might have attended school for all the 22 days while others may not have. First, the maximum possible present days (attendance) is calculated by multiplying the number of school days to the number of students in a class. In this case it would come out (22 x 45), a total of 990 present days. Now actual number of present days (number of days students actually attended a class) is counted in that month by observing the class register. Let us suppose that it comes out to be 600 student present days. The average is calculated simply by dividing 600 by the maximum possible present days (990). This will give an average monthly attendance of 60.61 per cent in a class. By following the same procedure, average attendance in other classes can be obtained either on the daily, monthly, quarterly or annual basis.

Once the average attendance is obtained in all the classes of a school, the same is used to obtain the average attendance for that school. In that case, the first total student present days in a month are obtained by adding the present days in different classes, which is then divided by the maximum possible present days (all classes) in that month. This is obtained by multiplying school working days to the total number of students in different classes in a school. Once the school-specific average attendance rates are calculated, it is used to calculate the block and district levels.

If the attendance rate is calculated by considering all the children in Classes I-V, including the over-age and under-age children, the rate obtained is called 'gross attendance rate'. If the over-age and under-age children are not considered in calculating the rate, the rate obtained is termed as 'net attendance rate'. Similarly, 'age-specific attendance' rate can also be worked out by considering a specific-age children attending schools.

Box 1

| Computation of Out-of-School and Additional Children Need to Enrol (Based on NCERT Data) | |
|---|---------------------------|
| | (In Million) |
| (a) Population of Age-group 6-10 Years | |
| 1993-94 | = 103.54 |
| 2000-01 | = 107.01 |
| (b) Total Enrolment in Grades I-V in year 1993-94 = 97.74 | |
| Refined Enrolment (@ 23.68 %): | |
| = Enrolment in 1993-94 - (0.2368) x Enrolment in 1993-94 | |
| = 97.74 - 23.14 | |
| = 74.60 which means NER = 72.05%, as against GER = 94.40% | |
| (c) Out-of-School Children (1993-94) | |
| = Population of Age-group 6-10 Years - Refined Enrolment | |
| = 103.54 - 74.60 | |
| = 28.94 | |
| (d) Additional Children to be Enrolled (2000-01) | |
| (i) Within the Age-group | = 107.01 - 74.70 = 32.41 |
| (ii) Outside the Age-group | = 32.41 * (0.2368) = 7.63 |
| (iii) Net Additional Children to be Enrolled | = 32.41 + 7.63 = 40.03 |

OUT-OF-SCHOOL CHILDREN

The estimate of over-age and under-age children plays an important role to work out the number of out of school children. The detailed computation procedure is presented in Box 1, which is based on the actual data of the Sixth All India Educational Survey. For obtaining the out-of-school children, enrolment is first refined/adjusted with respect to the estimate of the over-age and under-age children.

The corresponding percentage of the over-age and under-age children is taken-out from the enrolment and the refined enrolment is obtained. The balance of the age-specific population and refined enrolment is termed as the out-of-school children. For demonstration purposes, out-of-school children are estimated at the primary level corresponding to the population of age-group 6-11 years.

The out-of-school children computed indicates a net enrolment ratio of 72.05 per cent as against the gross enrolment ratio of 94.40 per cent. This also indicates that only 72 per cent of the total 103.54 million children of the age-group 6-11 years were enrolled in 1993-94. The out-of-school children can also be used to estimate the additional number of children required to enrol to achieve the goal of universal enrolment. For projecting additional children, projected population of the respective age-group in the target year i.e. 2001 is required. The results reveal that for achieving the goal of universal enrolment about 40 million additional children of the age group 6-11 would be required to enroll by the year 2001. The number of out of school children and additional enrolment should both be computed separately for boys and girls, Scheduled Caste and Scheduled Tribe population and rural and urban areas. This will help in identifying the educationally backward areas where the out-of-school children concentrate.

TRANSITION RATE

The next indicator of coverage is the transition rate, which is based on the 'student flow analysis'. The concept of student flow analysis and computation procedure of a variety of flow rates are discussed first.

(A) Student Flow Analysis

Student flow analysis starts at the point where students enter into an education cycle. The flow of students into, through and between educational cycles is determined by the following factors:

- I : Population of admission rate (generally '6' year);
- II : Student flow into the system: the admission rate;
- III : Student flow through the system: promotion, repetition and drop-out rates; and
- IV : Student flow between systems: the transition rate.

The rates mentioned above are important to understand the education system, which can answer a variety of typical questions, such as, at which grade in the cycle is the repetition or dropout rate highest? who tends to drop-out and repeat more frequently, boys or girls? and what is the total accumulated loss of students through drop-out?. The answer of these questions can be obtained, if the flow rates for different target groups and for each grade are computed. The transition of students between cycles has, of course, a great significance of its own. It is not in the planner's hand that he/she will control flow rates but through policy interventions they can be altered over a period of time.

Since, the concept and definition of admission rate is already explained in the previous section, we start the student flow analysis by assuming that a student has already entered into the system. There are the following three possibilities in which the student will move:

- (b) promoted to the next higher grade;
- (c) repeat there grades; and
- (d) dropout from the system.

It is a convention that enrolment is presented in a rectangle box, which has three directions each of which indicate the flow of students. The diagonal indicates the flow of students who successfully complete a grade and are now promoted to the next higher grade. While down below direction represents the number of children who repeat a grade. The last direction indicates the balance of those who are neither promoted nor repeated and are termed as the dropouts (Figure 1).

Flow Diagram (I)

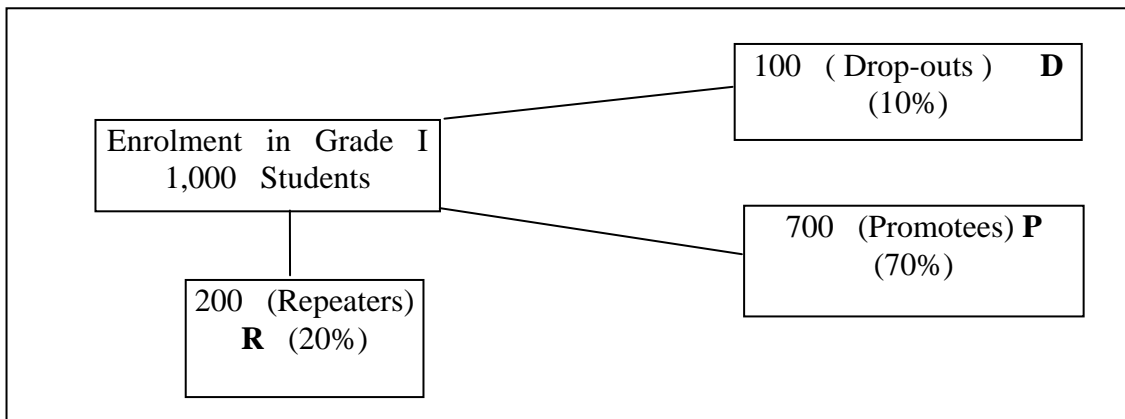


Figure 1

For convenience, the total enrolment in Grade I in the present example is considered 1,000. It may be noted that total of the promotees, repeaters and drop-outs are equivalent to the enrolment in a particular grade. To work out the flow rates, grade-wise enrolment for at least two consecutive (regular) years along with the number of repeaters is required. If information on number of repeaters is not available, the flow analysis is based on 'grade ratio', which is also known as the pass percentage. Grade ratio is simply the division of enrolment in the next grade (say Grade II) to the enrolment in the previous grade (say Grade I) in the previous year.

Grade ratio is termed as a crude indicator of the promotion rate. If number of repeaters is available, the analysis is based on the promotion rate, which is considered more reliable than that based on the grade ratio. The method assumes that transfer from one school to another within or outside the block/district is negligible. In case the number of transfers is significant, it should also be considered in the calculation. The detailed procedure of calculation of flow rates is presented in the Box 2.

(a) Promotion Rate

First, we discuss the promotion rate, which needs to be computed separately for all the grades. The main task is to obtain the number of promotees who are promoted to the next higher grade. Of the total 23,592 thousand children in Grade I in 1989-90, it looks like that about 20,999 thousand children were promoted to the next higher grade i.e. Grade II in 1990-91. But in reality, the number of promotees was 20,401 and not 20,999 thousand because of 598 thousand repeaters who are also included in the Grade II enrolment. Thus, the actual number who were promoted to Grade II in 1990-91 was 20,999 - 598 = 20,401 thousand. In the similar fashion, promotees in the remaining grades are to be worked out. Once the number of promotees is worked out, the next step is to compute the promotion rate in different grades. The promotion rate in a particular grade can be computed as follows:

$$= \frac{\text{Number of students promoted to grade 'g+1' in year 't+1'}}{\text{Total number of students in grade 'g' in year 't'}} \times 100$$

In notations, it is expressed by the following equation:

$$\text{Promotion Rate (} p_g^t \text{)} = \frac{P_{g+1}^{t+1}}{E_g^t} \times 100 \quad (8)$$

BOX 2
Enrolment and Repeaters at the All India Level
1989-90 and 1990-91

(In Thousand)

| Year | GRADES | | | | | | Total | | | | | |
|-----------------------|--------|----------------|------------------|------------------|----------------|----------------|--------|-------|-------|-------|-------|-------|
| | I | II | III | IV | V | I-V | VI | | | | | |
| Enrolment | | | | | | | | | | | | |
| 1989-90 | 23,592 | 22,019 | 17,832 | 15,394 | 13,514 | 92,351 | 11,862 | | | | | |
| 1990-91 | 27,062 | 20,999 | 18,866 | 16,152 | 14,296 | 97,375 | 12,913 | | | | | |
| Repeaters | | | | | | | | | | | | |
| 1989-90 | 1,005 | 606 | 719 | 688 | 668 | 3,686 | 1,109 | | | | | |
| 1990-91 | 1,230 | 598 | 576 | 628 | 571 | 3,603 | 634 | | | | | |
| Flow Diagram | | | | | | | | | | | | |
| Year | I | II | III | IV | V | VI | | | | | | |
| 1989-90 | 1005 | 606 | 719 | 688 | 668 | 664 | 23592 | 22019 | 17832 | 15394 | 13514 | 11862 |
| 1990-91 | 1230 | 598 | 576 | 628 | 571 | 634 | 27062 | 20999 | 18866 | 16152 | 14296 | 12913 |
| | | 1961 | 3131 | 1732 | 1041 | | 20401 | 18290 | 15524 | 13725 | 12279 | |
| Flow Rates (%) | | | | | | | | | | | | |
| | | I to II | II to III | III to IV | IV to V | V to VI | | | | | | |
| Promotion | | 86.47 | 83.06 | 87.06 | 89.16 | 90.86 | | | | | | |
| Repetition | | 5.21 | 2.72 | 3.23 | 4.08 | 4.23 | | | | | | |
| Drop-out | | 8.31 | 14.22 | 9.71 | 6.76 | 4.91 | | | | | | |

Let us now compute the promotion rate for Grade I. Putting values in the equation (8)

from Box 2, we have

$$\begin{aligned}
 \text{P}_{\text{I}}^{1989-90} &= \frac{\text{P}_{\text{II}}^{1990-91}}{\text{E}_{\text{I}}^{1989-90}} \times 100 \\
 &= \frac{20,401}{23,592} \times 100 \\
 &= 86.47 \% .
 \end{aligned}$$

Thus, 86.47 per cent promotion rate in Grade I indicates that the remaining 13.53 per cent children had either dropped-out from the system and/or repeated Grade I the next year. By adopting the same procedure, promotion rate in remaining grades (I to VIII) can also be computed (Box 2).

(b) Repetition Rate

Once the promotion rate is computed, the next indicator that is required to be computed is the grade-to-grade repetition rate. Repetition rate is simply the division of number of repeaters in a grade to the enrolment in the previous year but in the same grade. Box 2 presents the complete analysis of the student flow, which has repeaters for the two consecutive years, namely 1989-90 and 1990-91. Care should be taken to select one out of two. For computing repetition rate in a grade, says Grade I in 1989-90, repeaters of 1990-91 are considered because a repeater can repeat a particular grade only in the next year. In notations, it is presented as follows:

$$= \frac{\text{Number of Repeaters in Grade 'g' in Year 't+1'}}{\text{E}_{\text{g}}^{\text{t}}} \times 100$$

$$\text{or } (r)_{g}^t = \frac{R_{g}^{t+1}}{E_{g}^t} \times 100 \quad (9)$$

Now let us compute repetition rate for one of the grades namely, Grade III

$$\begin{aligned} R_{\text{III}}^{1989-90} &= \frac{R_{\text{III}}^{1990-91}}{E_{\text{III}}^{1989-90}} \times 100 \\ &= \frac{576}{17,832} \times 100 \\ &= 3.23 \% \end{aligned}$$

Thus, the repetition rate in Grade III indicates that of the 17,832 thousand children in 1989-90, only 3 per cent repeated the grade next year. The remaining children may either be promoted to Grade IV or they dropped out from the system before the completion of Grade III. Similarly, repetition rate in any other grade can also be worked out.

(c) Drop-out Rate

One of the important indicators of educational development is the drop out rate, which like other rates should also be computed grade-wise. Before the drop out rate is computed, the first requirement is to obtain the number of drop outs between the grades. In the last two steps, we calculated the number of promotees and repeaters in different grades. In fact, the balance of the enrolment in a particular grade is termed as the drop-outs. Or in other words, of those who are not promoted or have repeated is known as the drop-outs. For example, Grade I enrolment in 1989-90 is 23,592 thousand, of which 20,401 children are promoted to the next higher Grade II and 1,230 thousand children repeated Grade I, which means that the resultant $23,592 - 20,401 - 1,230 = 1,961$ is termed as the drop-outs of Grade I. The number of drop-outs is linked to the enrolment in a particular grade.

$$\text{Drop-out Rate (d)} = \frac{D^t}{E^t} \times 100 \quad (10)$$

$$= \frac{\text{Number of students dropping-out from grade 'g' in year t}}{E^t} \times 100$$

Thus for Grade III, the drop-out rate is

$$\begin{aligned} D_{III}^{1989-90} &= \frac{E_{III}^{1989-90} - (P_{IV}^{1990-91} + R_{III}^{1990-91})}{E_{III}^{1989-90}} \times 100 \\ &= \frac{17,832 - (15,524 + 576)}{17,832} \times 100 \\ &= 9.71 \% \end{aligned}$$

Drop-out rate in Grade III indicates that about 9.71 per cent children in 1989-90 dropped out from the system without completing Grade III; thus contributing a lot of wastage in the system.

It should, however, be noted that addition of promotion, repetition and drop-out rates in a particular grade is always 100 per cent. Knowing two of them means knowing the third one as well.

$$p_g^t + r_g^t + d_g^t = 100 \quad (11)$$

Flow rates presented above play an important role in undertaking the exercise of internal efficiency of the education system. However, educational planners and policy makers are particularly interested in those successful students who proceed to the next higher cycle. In order to trace the flow of students from one cycle to other, ‘transition rate’ is used. The transition of students between cycles has, of course, a great significance of its own. It can be manipulated for the purposes of the educational policy. After a student reaches the final grade i.e. Grade V, or Grade IX, or Grade XII, there are the following four possible ways in which they move (Figure 2):

- (i) a student may repeat the grade;
- (ii) a student may dropout from the system;
- (iii) a student may complete the grade successfully and then leave the school system; and
- (iv) a student may complete the grade successfully and then enrol in the first grade of the next higher cycle.

This can be illustrated diagrammatically as follows:

Flow Diagram (II)

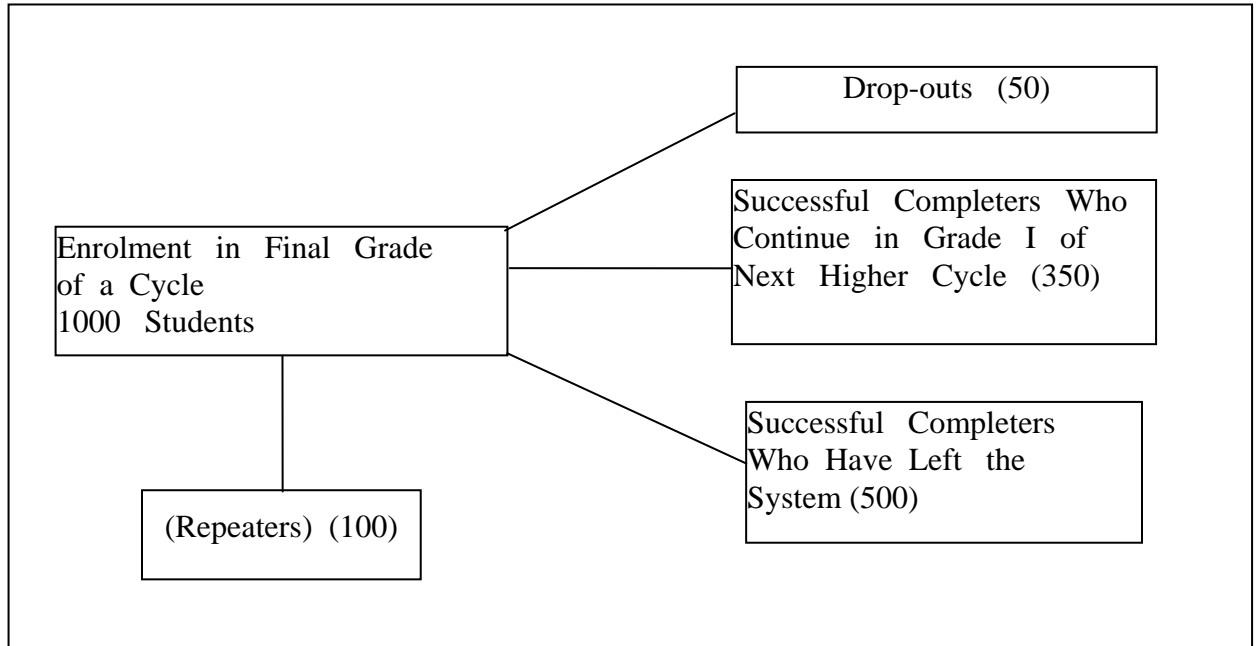


Figure 2

The transition rate is defined as follows:

$$\begin{aligned}
 \text{Transition Rate} &= \frac{\text{New Entrants into Grade VI in Year } 't+1'}{\text{Enrolment in Grade V in Year } 't'} \times 100 \\
 &= \frac{E_{g+1}^{t+1}}{E_g^t} \times 100 \quad (12) \\
 &= \frac{12,279}{13,514} \times 100 \\
 &= 90.86\%.
 \end{aligned}$$

With the limited set of data, it is not possible to exactly know the number of successful completers who continue in Grade I of the next higher cycle. The transition rate, thus computed, is nothing but the promotion rate between the final grade of a cycle and the first grade of the next cycle. The number of drop-outs so calculated consists of both who complete the cycle successfully but have not taken admission in the next cycle and also who dropped out in between without completing the last grade of the first cycle.

INDICATORS OF EFFICIENCY

An attempt has been made in this module to demonstrate how indicators of wastage and internal efficiency of education system are measured. Broadly, the following methods are discussed in detail:

- (a) Apparent cohort method;
- (b) Reconstructed cohort method; and
- (c) True cohort method.

(a) Apparent Cohort Method

The simple but crude method of measuring extent of educational wastage is known as 'apparent cohort method'. The method requires either the cross-sectional (year-grade) or time-series data on the grade-wise enrolment. If the cross-sectional grade data is used, the percentage of enrolment in all other grades to the enrolment in Grade I, which is considered cohort, is measured and termed and treated as the evidence of wastage. Table 2 reveals that wastage in the system was to the tune of 24.57 per cent as only 75.43 per cent children were retained in the system up to the Grade VIII. This also reveals that the incidence of wastage on the part of girls is higher than on the part of boys.

However, the indicator presented above could only be treated as the crude estimate of wastage as the apparent cohort method has a few limitations. The most significant limitation is that percentages in different grades are obtained by taking Grade I as the base, but in reality they are not the members of the same cohort. Practically, they come from the different cohorts entered into the education cycle some two, three, four and five years ago. The other important limitation is that in Grades II, III, IV and V, there may be a few fresh entrants and repeaters of the previous cohorts, which are now repeating but are not the members of the present cohort. Therefore, time-series enrolment in different grades is used in place of the cross-sectional data to measure the extent of the wastage.

The apparent cohort method using the time-series data on grade-wise enrolment assumes enrolment in Grade I in the base year as the cohort and determines the relationship through the diagonal analysis between the cohort enrolments in the successive grades in the successive years. However, the major limitation of the apparent cohort method in using the time-series data is that it does not take into account the element of the repetition.

As is evident from the system that enrolment in each higher grade consists of the new entrants coming from outside, termed as migrants or first-time comers, those who have been promoted from the previous grade and those who are repeating the same grade but in the next year. The method under study ignores first-time comers and migrants, so also the repeaters. Further, the method assumes a direct relationship between enrolments in the higher grade to the enrolment in the previous grade, as bulk of the children comes from the previous grade. The difference between higher-grade enrolment and previous grade enrolment is treated as being dropped-out from the system but in the higher grade, repeaters are also included. In addition, all those termed as the drop-outs may not actually be so, as they might have joined other schools or a few of them may have even died. Thus, ignoring repeaters in the analysis

of measurement of wastage is not expected to present a true picture.

Table 2
Apparent Cohort Method : All India: 1987-88

(In Percentage)

| Sex/Grade | Primary Level | | | | | Middle Level | | |
|-----------|---------------|-------|-------|-------|-------|--------------|-------|-------|
| | I | II | III | IV | V | VI | VII | VIII |
| Boys | 100.00 | 89.18 | 72.73 | 63.62 | 57.34 | 100.00 | 85.94 | 77.69 |
| Girls | 100.00 | 83.30 | 68.86 | 57.59 | 48.78 | 100.00 | 84.74 | 71.40 |
| Total | 100.00 | 86.69 | 71.09 | 61.06 | 53.71 | 100.00 | 85.50 | 75.42 |

Note: Enrolments in Grades II to VIII is divided by the enrolment in Grade I to obtain percentages in the different grades.

As mentioned above, to compute wastage, time-series data on enrolment is required. For example, for computing the wastage for cohort 1979-80, Grade I enrolment is required. To watch movement of those who have taken admission in Grade I in 1979-80, enrolment in the successive grades in the subsequent years is required. Thus, Grade II enrolment in 1980-81, Grade II in 1981-82 etc. is required, so that the percentages to the base year enrolment in Grade I is obtained for Grade II and onwards which is treated as the retention. Table 3 reveals that of 100 students who had taken admission in Grade I in 1979-80, only 52 could reach Grade V in 1983-84 and only 37 to Grade VIII in 1986-87 which shows that about 48 and 63 per cent children dropped out from the system before reaching Grade V and Grade VIII respectively.

Table 3
Wastage at Primary and Middle Levels of Education: All-India
Cohort: 1979-80

(In Percentage)

| | GRADES | | | | | | | |
|-------|----------------|-----------------|------------------|-----------------|----------------|-----------------|------------------|-------------------|
| | I (1979-80) | II (1980-81) | III (1981-82) | IV (1982-83) | V (1983-84) | VI (1984-85) | VII (1985-86) | VIII (1986-87) |
| Boys | 100 | 73 | 68 | 60 | 55 | 51 | 45 | 41 |
| Girls | 100 | 71 | 62 | 54 | 47 | 41 | 37 | 31 |
| Total | 100 | 72 | 66 | 58 | 52 | 47 | 42 | 37 |

Note: Enrolment in Grade II to VIII in different years is divided by the enrolment in Grade I in 1979-80 to obtain percentages in different grades.

(b) Reconstructed Cohort Method

Based on the methodology presented in the previous method, repeaters are taken out from the enrolment and then ratio to Grade I enrolment is computed. Table 4 presents the extent of wastage and retention when time-series grade enrolment along with the repeaters is considered.

Table 4
Retention and Wastage Rates
All-India Level Cohort (1984-85)

(In Percentage)

| | Enrolment Grade-I (Million) | Retention Rate | | | | |
|-------|-----------------------------------|----------------|-----------------|------------------|-----------------|-----------------|
| | | I (1984-85) | II (1985-86) | III (1986-87) | IV (1987-88) | V (1988- 89) |
| Boys | 14.08 | 100 | 76 | 70 | 56 | 54 (46)* |
| Girls | 9.84 | 100 | 77 | 69 | 51 | 49 (51) |
| Total | 23.92 | 100 | 77 | 69 | 54 | 52 (48) |

Note: * Wastage rate

The Table reveals that of 100 children enrolled in Grade I in 1984-85, only 77 reached Grade II compared to 69, 54 and 52 to Grade III, Grade IV and Grade V respectively, which means about 23 per cent children dropped out before reaching Grade II and 31, 46 and 48 per cent before reaching Grade III, IV and V in that order. It is also revealed that girls tend to drop out more than boys as only 49 girls out of 100 could reach to Grade V compared to 54 boys.

It is noticed that the diagonal analysis of grade-wise enrolment along with number of repeaters could only present the amount of wastage or retention but it fails to give any idea about the promotion, repetition and drop-out rates for all the grades. The method also assumes that the difference between the in-migrants and out-migrants is negligible and the children who are not in the higher grades coming from the previous grade are termed as the dropped-out children. Some of these limitations can be handled efficiently if the analysis is based on the 'true cohort method' presented below.

(c) True Cohort Method

The first question that may crop up is what do we understand by the word efficiency. The origin of the efficiency lies in economics but it has relevance in every sphere of life. In simple terms, efficiency can be defined as an optimal relationship between the input and the output. An activity is said to perform efficiently if a given quantity of output is obtained with the minimum inputs or a given quantity of input yields the maximum outputs. Thus, by the efficiency we mean to get maximum output with minimum inputs or with a minimum input, the maximum output is obtained. The best system is one which has both the input and output exactly the same, which is known as a perfect efficient system. But what then is the input and output in an education system? Let us suppose that a student has taken admission in a particular grade and he/she remains in the system for at least one complete year. A lot of expenditure on account of the cost of teachers, room, furniture and equipments is incurred on those who stayed in the system which can be converted into the per student cost and is termed as one student year. On the other hand, every successful completer of a particular cycle is termed as the output, which is also known as the 'graduate'.

Though we have two types of the efficiency, namely internal and external efficiency but in the present module only the internal efficiency of the education system is discussed. We may have a system, which is internally efficient but externally inefficient or vice-versa. We may have a system, which has no drop-out, low repetition and high output but the output that is produced is not acceptable to the society and the economy.

The concept and definition of a variety of indicators of wastage and efficiency, hence, needs to be presented based on the hypothetical (theoretical) cohort of 1,000 pupils who enter the beginning of the stage as followed up in the subsequent years, till they reach the final grade of the stage. More specifically, the method is based on the following assumptions.

It assumes:

- (b) that the existing rates of promotion, repetition and drop-out in different grades would continue throughout the evolution of the cohort. Thus, the flow rates computed above for cohort 1989-90 (Box 2) have been assumed to remain constant;

- (c) that a student would not be allowed to continue in the system after he/she has repeated for three times, thereafter, he/she will either leave the system or would be promoted to the next higher grade; and
- (d) that no student other than the original 1,000 would be allowed to enter the cycle in between the system.

Based on the above assumptions, the computation procedure of the following indicators is demonstrated in detail (Box 3):

- (i) Input/output ratio
- (ii) Input per graduate
- (iii) Wastage ratio
- (iv) Proportion of total wastage spent on the account of drop-outs and repeaters
- (v) Average duration of study on account of the graduate and drop-outs; and
- (vi) Cohort survival and drop-out rates.

(i) Input/Output Ratio

The evolution of the cohort (Box 3) reveals that total number of student years invested was 4,212 as against 380 those who dropped-out from the system. Thus, those who have not dropped-out i.e. $1,000 - 380 = 620$ are termed as the outputs that have completed the cycle successfully and are known as the graduates of the cohort 1990. Based on the numbers, let us first compute the input/output ratio with the help of the following formula:

$$\begin{aligned}
 \text{Input/Output Ratio} &= \frac{\text{Number of graduates} \times 5}{\text{Total student years invested}} && (13) \\
 &= \frac{620 \times 5}{4,212} \\
 &= 0.7360.
 \end{aligned}$$

The above ratio indicates that the system is efficient to the extent of only 74 per cent and there is a scope of further improvement, the wastage being of the tune of about 26 per cent. It may be recalled that we started the analysis with a hypothetical cohort of 1,000 students, which means the system should produce 1,000 graduates in five years. This will give an input/output ratio of one which is termed as an ideal ratio. But in reality, most of the systems have an input/output ratio well above one. The ideal input/output ratio is defined as follows:

$$\begin{aligned} \text{Ideal Input/Output Ratio} &= \frac{1,000 \text{ original members of the cohort}}{1,000 \text{ successful completers}} && (14) \\ &= 1. \end{aligned}$$

The graduates are expected to take five years. Therefore, the ideal ratio in terms of years would be five.

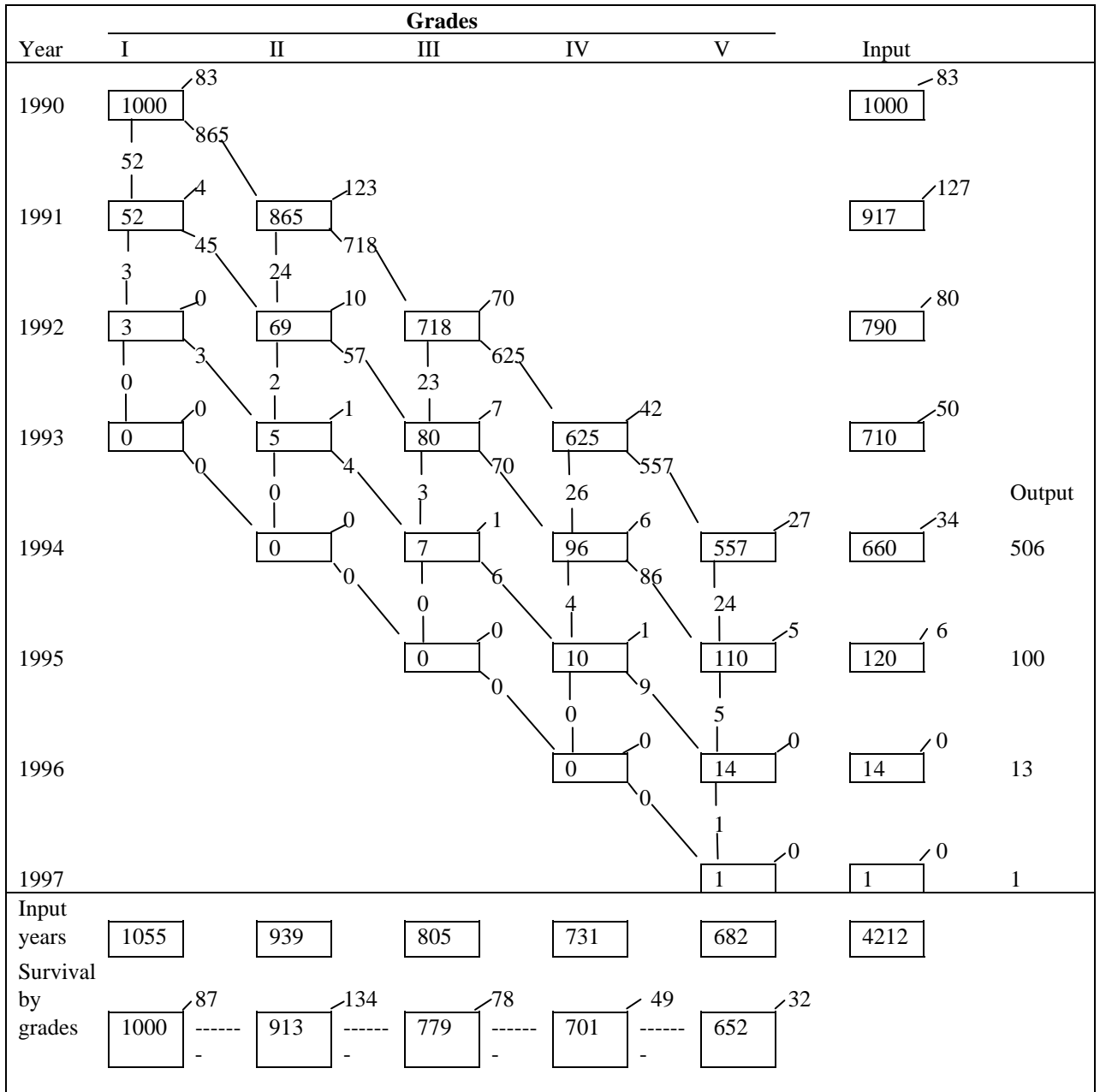
(ii) Input per Graduate

Let us now compute the actual input/output ratio, which should be linked to the number of student years invested, and number of those who successfully complete an education cycle. One of the important indicators, which reflect on the wastage and efficiency of the education system, is the input per graduate, which means the average number of years that the system took to produce a graduate. Ideally a student should take five years to complete the primary cycle and three years to upper primary cycle but the situation in reality is not so.

$$\begin{aligned} \text{Input per Graduate} &= \frac{\text{Total student years invested}}{\text{Number of graduates}} && (15) \\ &= \frac{4,212}{620} \\ &= 6.79 \text{ years.} \end{aligned}$$

An input/output ratio of 6.79 indicates that the system is taking about 1.79 years more than the required five years which shows a wastage of about 26 per cent $(1.79/6.79 \times 100)$, which is similar to the one presented above.

Box 3
Reconstructed Cohort Method:
Flow of Students Cohort (1990)



(iii) Wastage Ratio

Let us now compute one of the other important indicators of the wastage, namely the 'wastage ratio'. The ratio of the actual input/output ratio to the ideal input/output ratio is termed as the wastage ratio which always lies between 1 and ∞ . In an ideal situation where the system has the maximum efficiency, the ratio is one; otherwise more than one indicates the extent of inefficiency and wastage in the system. The ratio is computed as follows:

$$\begin{aligned}
 \text{Wastage Ratio} &= \frac{\text{Actual input/output ratio}}{\text{Ideal input/output ratio}} & (16) \\
 (w) & & \\
 &= \frac{6.79}{5} \\
 &= 1.36 \quad (1 \leq w \leq \infty).
 \end{aligned}$$

The wastage ratio computed above reveals that it is well above the ideal ratio i.e. one. The ratio also indicates that there is a scope of improvement in the system, which can be handled efficiently if the complete information on the wastage on account of the drop-outs and repeaters is available. Further, if the ratio is computed for different target groups, it would help to identify where it is high and alarming. This can be checked through policy interventions and by improving the efficiency.

(iv) Wastage on Account of Repeaters and Drop-outs

To work out wastage on account of repeaters and drop-outs, let us first analyse the evolution of the cohort over a period of time. It is evident that of the total investment of 4,212 student years, graduates have consumed only 3,100 student years i.e. (620 x 5). Thus, the balance of 1,112 student years has gone waste, which may be due to either repeaters or drop-outs. In other words, 1,112 excess student years than required were used to produce 620 graduates. Let us first examine the break-up of 620 graduates:

$$620 = 506 (5) + 100 (6) + 13 (7) + 1 (8)$$

The above equation reveals that of the total 620 graduates, only 506 students have taken exactly five years compared to 100 students who have taken six years, 13 students seven years and 1 student eight years; thus, 100; 13; and 1 students have respectively taken 1, 2 and 3 years more than ideally required to become a primary

graduate, which is termed as the wastage on part of the repeaters. Thus,

$100 \times 1 + 13 \times 2 + 1 \times 3 = 129$ student years were wasted. Similarly wastage on account of the drop-outs can also be worked out as follows:

$$83 \times 1 + 127 \times 2 + 80 \times 3 + 50 \times 4 + 34 \times 5 + 6 \times 6 + 0 \times 7 + 0 \times 8 = 983$$

Thus, the wastage on account of the repeaters and drop-outs comes out to be equal to the total wastage i.e. 1,112 which can be used to compute wastage on account of the repeaters and drop-outs as follows:

Wastage on Account of

$$\text{Repeaters} = \frac{129}{1,112} \times 100 = 11.60\%$$

$$\text{Drop-outs} = \frac{983}{1,112} \times 100 = 88.40\%$$

(v) Average Duration of Stay: Graduates, Drop-out and Cohort

The next indicator of efficiency is the ‘average duration of stay’ in the system, which can be computed separately for the graduates, drop-outs and also for the entire cohort as a whole. The detailed computational procedure is presented below.

Graduates

$$= \frac{506 \times 5 + 100 \times 6 + 13 \times 7 + 1 \times 8}{620}$$

$$= 5.19 \text{ Years}$$

Drop-outs

$$= \frac{83 \times 1 + 127 \times 2 + 80 \times 3 + 50 \times 4 + 34 \times 5 + 6 \times 6 + 0 \times 7}{380}$$

$$= 2.59 \text{ Years}$$

Cohort

$$\begin{aligned} &= \frac{1000 \times 1 + 917 \times 2 + 790 \times 3 + 710 \times 4 + 660 \times 5 + 120 \times 6 + 14 \times 7 + 1 \times 8}{4,212} \\ &= 2.89 \text{ Years.} \end{aligned}$$

It may be noted that 620; 380; and 4,212 are the number of graduates, drop-outs and total student years invested during the entire evolution of the hypothetical cohort of 1,000 students who entered into the system in the year 1990. The average stay in the system indicates that on an average a dropped-out student stayed for at least 2.59 years that is slightly lower than the average stay for the entire cohort. Hence, drop-outs have contributed a lot to the wastage, which is also evident from the wastage on account of the drop-outs presented above.

(vi) Cohort Survival and Drop-out Rates

The last indicator of efficiency based on the hypothetical cohort method is cohort survival and drop-out rates. The number of survivals and drop-outs up to a particular grade can easily be obtained from the evolution of the hypothetical cohort presented in Box 3. The last two rows indicate that only 913 students remained in the system up to Grade II which is obtained by subtracting the number of drop-outs who left the system before reaching Grade II from the initial 1,000 students in the Grade I, thus, giving cohort survival and drop-out rate, 8.70 per cent ($87/1,000 \times 100$) and 91.30 per cent ($913/1,000 \times 100$) respectively. Similarly, rates for the remaining grades can also be obtained. The cohort survival and drop-out rates tell us in which grade the drop-out rate is the highest. The exercise can be repeated for different target groups.

One of the limitations of the indicators, based on the reconstructed cohort method, is that they do not take into account the quality of the output that the system is producing. The method takes cognizance of only the number of students who successfully complete an education cycle ignoring the learners' attainment. The method also assumes that all the members of the cohort have identical facilities in the schools, which may not always be true. The method may not be appropriate to use for comparing the efficiency of schools situated in the rural and urban areas and the government and private schools. The socio-economic background of the students, if incorporated in the method, would help in knowing whether the efficiency varies from one income group to another and educational level of the parents. The method takes into account the number of drop-outs and repeaters as the possible causes of an

inefficient system but ignores all other factors. In the light of these considerations, the method needs further refinements.

INDICATORS OF QUALITY OF EDUCATION

The indicators of coverage and efficiency fail to give any idea about children completing an educational level and also the level of their educational attainment. Educational attainment is measured in terms of learners' achievement. Learners' achievement is also considered one of the important indicators of quality of education. In India, data on learners' achievement is not available on regular basis, as the same do not form part of the regular collection of statistics. However, the same is made available occasionally on sample basis in a few DPEP states. Therefore, in addition to the indicators presented above, the following set of additional indicators should also be generated which are termed as 'output' indicators.

- (b) **Completion rate:** Children completing an educational level as a percentage of initial enrolment in the first grade of that level four years back.
- (c) **Gross completion ratio:** Total number of students completing an educational level (including repeaters and over-age and under-age children, say Grade V) as a percentage to single-age population (total, say age '11'), which is supposed to complete that level.
- (d) **Net completion ratio:** Students completing an educational level (say Grade V) of a particular single-age population (say age '11) as a percentage to total single-age population, which is supposed to complete that level.
- (e) **Graduation rate:** Students who complete an educational level and fulfil graduation requirements (achievement tests) as a percentage of total number of completers. The rate, if calculated in relation to the original cohort is termed, as cohort graduation rate, which can either be gross or net in nature.

INDICATORS OF INVESTMENT ON EDUCATION

Some of the frequently used indicators of investment on education are:

Unit Cost: Cost per pupil is generally calculated in terms of the total cost and enrolment. However, the same can also be calculated in terms of: (i) pupil attending

school (ii) graduates; and (iii) corresponding age-specific population. This is defined as follows:

- (b) Per pupil cost at primary level: total cost (recurring costs plus fixed costs) of primary education in a year is divided by the total enrolment in primary classes (I-V) in the same year;
- (c) Per pupil cost at upper primary level: total cost (recurring costs plus fixed costs) of upper primary education in a year is divided by the total enrolment in upper primary classes (VI-VIII) in the same year;
- (d) Per pupil cost at elementary level: total cost (recurring costs plus fixed costs) of elementary education in a year is divided by the total enrolment in elementary classes (I-VIII) in the same year; and
- (e) Per capita expenditure on education: total cost on education in a year is divided by the total population in the same year.

The other commonly used indicators are:

- (f) Percentage expenditure on primary education: divide expenditure on primary education in a year by the total expenditure on all levels of education in the same year and multiply by 100;
- (g) Percentage expenditure on upper primary education: divide expenditure on upper primary education in a year by the total expenditure on all levels of education in the same year and multiply by 100;
- (h) Percentage expenditure on elementary education: divide expenditure on elementary education in a year by the total expenditure on all levels of education in the same year and multiply by 100;
- (i) Expenditure on primary education as percentage of gross national product (GNP): divide current expenditure on primary education in a given year by the GNP for the same year and multiply by 100;
- (j) Expenditure on upper primary education as percentage of gross national product (GNP): divide present expenditure on upper primary education in a given year by the GNP for the same year and multiply by 100;
- (k) Expenditure on elementary education as percentage of gross national product (GNP): divide current expenditure on elementary education in a given year by the GNP for the same year and multiply by 100;

- (l) Expenditure on primary education per pupil as a percentage of GNP per capita: divide per pupil present expenditure on primary education in a given year by the GNP per capita for the same year and multiply by 100;
- (m) Expenditure on upper primary education per pupil as a percentage of GNP per capita: divide per pupil present expenditure on upper primary education in a given year by the GNP per capita for the same year and multiply by 100;
- (n) Expenditure on elementary education per pupil as a percentage of GNP per capita: divide per pupil present expenditure on elementary education in a given year by the GNP per capita for the same year and multiply by 100;
- (o) Percentage expenditure on civil works, management, access and retention and research and innovation activities in a year to the total expenditure on primary and upper primary levels of education in the same year;
- (p) Percentage expenditure on account of salaries of teachers: divide expenditure on salaries of teachers in a year to the total expenditure in the same year and multiply by 100;
- (q) Percentage expenditure on account of salaries of non-teaching staff: divide expenditure on salaries of non-teaching staff in a year to the total expenditure in the same year and multiply by 100;
- (r) Per school expenditure by management (government/local body/private); and
- (s) Per student expenditure by type (independent/integrated) and management of school (aided/unaided).

INDICATORS OF FACILITIES

A few indicators of quality of facilities and utilisation are presented here. However, it may not be an easy task to develop the indicators of quality of facilities because of the lack of precise definition of the quality of education, which is generally judged in terms of the learner's achievement. The next important question, one may ask, is about factors which influence quality of education in general, and learner's achievement, in particular. Studies conducted in the past identified a number of factors some of which can be grouped under the following two broad headings:

- (a) School buildings related indicators;
- (b) Equipments; and
- (c) Indicators relating to staffing conditions

(a) School Buildings and Equipments

As mentioned above, the first stage of planning is the diagnosis of the existing situation, which also includes school buildings and equipments, which enables to answer a variety of questions. The first important objective is to assess the availability of school buildings and also the quality of available buildings, which plays an important role for identifying the priority areas, so that renovation and extension of buildings are taken up. The analysis of equipments will help to identify disadvantaged areas and will also help to assess the true capacity of a school so that schools which are under-utilised or conversely over-loaded can be identified. Once the facilities are identified, the next important question is about their utilisation. So far as the utilisation of the premises in a primary school is concerned, the simple indicators such as percentage of schools which work double shifts and rooms which are used by double shifts be computed. In case of a upper primary school, 'time utilisation rate' is computed by using the equation (17).

$$\begin{aligned} \text{Time Utilisation Rate} &= \frac{\text{Number of periods actually used}}{\text{Number of periods for which use is}} \times 100 & (17) \\ \text{(TUR)} & \text{theoretically possible} \\ &= \frac{50}{100} \times 100 \\ &= 50 \%. \end{aligned}$$

If the time utilisation rate for a school comes out to be 50 per cent, which means that, theoretically, the school is in a position to allow 50 per cent additional enrolment even without improving the existing number of rooms. But, in practice, this may or may not possible, because of the contingencies of time-table, the utilisation rate may not go beyond 90 per cent. One of the serious limitations of this indicator is that it fails to give any indication of how far room-space is occupied. For this purpose, 'space utilisation rate' (equation 18) is used which relates average students who utilise room to its maximum capacity.

$$\text{SUR} = \frac{\text{Average number of students per room}}{\text{Room capacity}} \times 100 \quad (18)$$

For example, ten rooms are built up in a school to accommodate about 1,200 students, but in reality, the rooms on an average are occupied by only 600 students, which means that SUR comes out to be only 50 per cent i.e. $(600/1200 \times 100)$. The next important question is for how much time the rooms are being utilised by these 50 per cent students for which the ‘over-all utilisation rate’ (equation 19) needs to be computed. Thus, for the above data, the over-all utilisation rate comes out to be:

$$\begin{aligned} \text{Over-all Utilisation Rate} &= \text{TUR} \times \text{SUR} && (19) \\ \text{OUR} &= \frac{50}{100} \times \frac{600}{1200} \times 100 \\ &= 25 \%. \end{aligned}$$

This rate should be used to assess the utilisation of school premises, which is based on both time and space utilisation, hence, should be improved to the extent possible to decide the adequacy of the premises.

Needless to mention that the indicators presented above can be used only for the micro level analysis.

(b) Equipments

The next set of indicators presented relates to the equipments and their utilisation. Generally, equipments cover furniture, teaching aids and educational supplies. Indicators of equipments of the premises are computed either school-wise or classroom-wise which depends upon the nature of the variable. Percentage of schools having electricity, drinking water and toilet facilities, playground and staff quarters are some of the basic indicators of facilities, which can be computed for a block and district. But for the facilities within the schools, percentage of classrooms with pupils’ desks and teachers’ chairs and tables can be considered. Percentage of classrooms having blackboard may be considered an indicator of teaching equipment, so also the percentage of teachers having access to maps, charts and globes. Percentage of children having textbooks, slates, exercise books and pencils are some of the indicators relating to the pupil supplies. Similarly, percentage of children in a school receiving mid-day meals, free textbooks and uniforms are the indicators of beneficiaries under a particular scheme.

(c) Staffing Conditions

Teacher plays an important role in the functioning of school and imparting education. Therefore, information on a number of variables such as teachers' qualifications, length of service, training, and subject need to be analysed. However, these factors themselves do not guarantee the quality of a teacher, as it depends upon a number of other factors predominantly concerning working environment and type of school in which the teacher works. Simple percentage distribution of teachers according to their education, sex etc. can be computed in this regard. The next area under which information needs to be collected is the work-load of teachers for which pupil-teacher ratio and class-size are calculated which are used to know the average audience. Class-size is calculated by dividing the total enrolment in a school to the total number of classes in that school. But the number of pupils being taught varies according to the subject and teaching method, hence, class-size may not always present a true picture. Average audience indicator is a better indicator than the class-size, which considers the average enrolment of the group being taught by one teacher (equation 20). However, the indicator is recommended to compute at the institutional level only.

$$\text{Average Audience} = \frac{\text{Number of weekly class periods} \times \text{number of pupils}}{\text{Number of weekly periods taken by teachers}} \quad (20)$$

It may be noted that in the numerator, the number of weekly class periods is considered and not the weekly hours, as the same vary from 40 to 60 minutes a period.

$$\text{Pupil-Teacher Ratio (I)} = \frac{\text{Total enrolment}}{\text{Total teachers}} \quad (21)$$

$$\text{Pupil-Teacher Ratio (II)} = \frac{\text{Total enrolment}}{\text{Classes}} \times \frac{\text{Classes}}{\text{Total teachers}} \quad (22)$$

The other simple indicator of the utilisation of teachers is the 'pupil-teacher ratio' (equation 21), that is simply the division of the total enrolment to total number of teachers. In a more refined way, the ratio can also be computed by relating enrolment per class to the number of classes per teacher. But in case of the primary education, the teacher usually occupied with same class or classes, in that situation, the indicator presented in equation 22 will simply be the pupil-teacher ratio (equation

21). A detailed analysis of the number of teachers in an institution according to the subjects is used to know whether the existing number of teachers is adequate or inadequate.

GENDER-PARITY INDEX

The most widely used indicator of parity is the 'gender parity index' through which the empowerment of women in the society is known. The index can be developed for most of the indicators (enrolment ratio, literacy rate, repetition rate, coefficient of efficiency etc.) to know the participation of women in an educational activity. For example, to calculate literacy gender-parity index, the female literacy rate is divided by the male literacy rate. Parity index equal to one indicates that the female literacy and the male literacy rates are equal. An index below one indicates that the literacy rate of females is lower than their counterparts. On the other hand, a value exceeding one indicates that the female literacy rates are higher than the male literacy rates. Because of the mortality, it is better to compute the index by age groups. The parity index can also be computed between rural and urban areas. For measuring the regional disparity, the use of coefficient of equality, the Sophers index of disparity, coefficient of variation and Gini coefficient is recommended.

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