Module 2: Preparing for Policy Implementation

2.2 Data and Information for Education Policy:
Main aspects and indicators to be analyzed in education

This reading material is reproduced for training purpose based on National Education Sector Development Plan: A result-based planning handbook.

Details of the reading material can be accessed at http://unesdoc.unesco.org/images/0014/001447/144783e.pdf.
Main aspects and indicators to be analyzed in education

In a sector analysis, the education system is analysed in different angles or aspects, which include, but are not limited to:

- Macro-economic and social frameworks of the country
- Status of student flows
- Quality of education
- External efficiency
- Costs and financing of education
- Managerial and institutional aspects.

The following paragraphs describe the main features of these aspects as well as the principal indicators commonly used to diagnose and “characterise” the education sector.

1. Macro-economic and social frameworks

The characteristics of a country can be studied mainly by carrying out, but not limited to, analyses of demographic (general and school-related) data, the macro-economic and budgetary context, the socio-cultural environment and the political and institutional structures and frameworks.

Demography
This involves analyzing the demographic aspects of at least the last two years and the probable changes in the coming years (notably the period of programming of the plan), not only in the total population of the country, but also in the school-age population. It is necessary to have the demographic data by specific age and by gender, in particular for the school-age population at pre-school, primary, and secondary levels. It is also necessary to analyze the characteristics which can affect the organization and the operation of the education system, as for example, the job and human resources market, rural exodus, migration, HIV/AIDS, etc.

Macro-economic and budgetary framework
This is about analyzing the past trends and the possible developments of national productivity (GDP, GNP), domestic revenues, and the share of education in total public expenditure. Countries dependent on external financing should examine the present situation and the probable evolution of external resources, such as debt and debt servicing, grants and loans for the education sector, as well as direct technical assistance. In practice, many of these countries carry out this analysis with help of donor and lending agencies in the context of mid-term expenditure framework (MTEF) processes, sector investment programmes (SIPs), SWAps, or more recently Education for All Fast Track Initiative (FTI).

Here, it is important to do a careful and detailed analysis of the interventions of external bilateral and multilateral agencies which are carried out in the form of projects, direct financing of national budget or in the framework of programmes called HIPC, PRSP, etc. On the basis of macro-economic data and information provided by agencies dealing with central planning and finance, education ministries will analyse some of the following macro-economic and budgetary indicators:
- Public expenditure on education as percentage of gross national product (%GNP): Total public expenditure on education (current and capital) expressed as a percentage of the Gross National Product (GNP) in a given financial year. It is calculated by dividing total public expenditure on education in a given financial year by the GNP of the country for the corresponding year. (Interpretation: In principle a high percentage of GNP devoted to public expenditure on education denotes a high level of attention given to investment in education by the government; and vice versa.)

- Public expenditure on education as percentage of total government expenditure (%PXE): Total public expenditure on education (current and capital) expressed as a percentage of total government expenditure in a given financial year. It is calculated by dividing total public expenditure on education incurred by all government agencies/departments in a given financial year by the total government expenditure for the same financial year. (Interpretation: A higher percentage of government expenditure on education shows a high government policy priority for education relative to the perceived value of other public investments, including defence and security, health care, social security for unemployment and elderly, and other social or economic sectors.)

- Percentage distribution of public current expenditure on education by level (%PCXE): Public current expenditure for each level of education, expressed as a percentage of total public current expenditure on education. It is calculated by dividing public current expenditure devoted to each level of education by the total public current expenditure on education. (Interpretation: Relatively high percentage of current expenditure devoted to a specific level of education denotes the priority given to that level in national educational policy and resource allocation. When interpreting this indicator, one may also take into account the corresponding distribution of enrolment by level and then assess the relative current expenditure per student.)

- Public current expenditure per pupil (student) as % of GNP per capita (%PCXE/GNP per capita): Public current expenditure per pupil (or student) at each level of education, expressed as a percentage of GNP per capita in a given financial year. It is calculated by dividing per pupil public current expenditure on each level of education in a given year by the GNP per capita for the
same year. (Interpretation: A high percentage figure for this indicator denotes a high share of per capita income being spent on each pupil/student in a specified level of education. It represents a measure of the financial cost per pupil/student in relation to average per capita income.)

- Public current expenditure on education as percentage of total public expenditure on education (%PCXE): Public current expenditure on education expressed as a percentage of total public expenditure on education (current and capital) in a given financial year. It is calculated by dividing public current expenditure on education in a given financial year by the total public expenditure on education for the same financial year. (Interpretation: A high percentage of public current expenditure on education reflects the need to devote a large share of public funding to maintain the education system operations, taking into account current and projected changes in enrolment, in the salary levels of educational personnel and in other operational costs. The difference between this percentage and 100 reflects the proportion of public expenditure on education devoted to capital expenditure.)

\[
%PCXE_t = \frac{PCXE_t}{TPXE_t}
\]

Where:
\( PCXE_t \) = Percentage public current expenditure on education in financial year \( t \).
\( TPXE_t \) = Total public expenditure in financial year \( t \).

Socio-cultural analysis
This is the section which is often forgotten or sometimes avoided in a sector analysis. This concerns in particular: the demographic composition, the sociological and religious structure, the country’s cultural traditions which can have an impact on the social demand for education, the schooling and the school performance of minorities, and of girls/boys, etc.

Box 2 presents an example of the socio-cultural aspects that were examined for the Education Sector Analysis in a country. This socio-cultural analysis shed light on the historical, social and political backgrounds of the country’s education system that have affected the national education system in the past and that should be taken into account when designing policies and strategies for the future of the educational development in this country.

Politico-institutional analysis
The aspects of institutional, political and territorial organization are likely to have an impact on the education services of a country. It involves the analysis of the functioning mode of the State and local/public authorities (centralized or decentralized systems, etc), but also the reforms in view and
their likely consequences for the education system. The role and responsibilities of the different planning and management authorities should be analyzed in order to show their strengths and weaknesses and identify the paths to follow to remedy possible management problems in the education sector.

With regard to the institutional analysis of the education sector, Section F of this Annexe describes the managerial and institutional aspects that need to be examined in a sector analysis.

2. Status of student flows

- Access and participation at each level of education
- Internal efficiency
- Disparities in education

**Access and participation**

This section of the education sector analysis analyses education coverage by level and type of education according to the structure of the education system (at all levels and across all types of education), including the provision of education by public, semi-public, private or community schools, etc. Analysis is carried out of present trends building on an examination of past tendencies.

One can present the evolution of the numbers of students and intake rates, net and gross enrolment ratios by level, and analyze the distribution and evolution of school enrolments in different types of schools. The analysis of the transition to different levels of education (to general, technical and professional education at secondary and higher levels, for example) could be conducted from the perspective of the possible rationalization of the education system according to the job market and trends in economic development.

The analysis of access to and participation in education should be carried out in terms of supply and demand. This means finding out if access and schooling are more limited by incomplete supply, by deficient demand, or by these two factors at once. For example, children may not have access to education because there are no schools in their village or there is not enough space at school, or they may not wish to go to school for different reasons. This investigation will allow the forward identification of appropriate strategies to increase schooling, by enlarging the school supply, by stirring up social demand for education or by improving the school environment and the relevance of schooling to some sub-groups of population. To achieve this, it is necessary to organize household surveys and to use their findings fully, in order to identify the real causes and possible corrective measures.

Below are presented some main indicators that are used to measure access to and participation in education.

**Access to education** can be defined as the extent to which the “school-age” population is able to access the first grade of a particular level or cycle of education. The most commonly used indicators to measure this aspect of the education sector are: (i) the apparent intake rate; (ii) the net intake rate; (iii) the transition rate; and (iv) the registration rate.
• Apparent intake rate (AIR): Total number of new entrants in the first grade of primary education, regardless of age, expressed as a percentage of the population at the official primary school-entrance age. It can be calculated by dividing the number of new entrants in grade 1, irrespective of age, by the population of official school-entrance age.

Formula: \[ AIR^t = \frac{N^t}{P_a^t} \]

Where:
\( AIR^t \) = Apparent Intake Rate in school-year \( t \)
\( N^t \) = Number of new entrants in the first grade of primary education, in school-year \( t \)
\( P_a^t \) = Population of official primary school entrance-age \( a \), in school-year \( t \).

• Net intake rate (NIR): New entrants in the first grade of primary education who are of the official primary school-entrance age, expressed as a percentage of the population of the same age. It can be calculated by dividing the number of children of official primary school-entrance age who enter the first grade of primary education by the population of the same age.

Formula: \[ NIR^t = \frac{N_{a}^t}{P_a^t} \]

Where:
\( NIR^t \) = Net Intake Rate in school-year \( t \)
\( N_{a}^t \) = Number of children of official primary school-entrance age \( a \) who enter the first grade of primary education, in school-year \( t \)
\( P_a^t \) = Population of official primary school-entrance age \( a \), in school-year \( t \).

• Transition rate (TR): The number of pupils (or students) admitted to the first grade of a higher level of education in a given year, expressed as a percentage of the number of pupils (or students) enrolled in the final grade of the lower level of education in the previous year. It can be calculated by dividing the number of new entrants in the first grade of the specified higher cycle or level of education by the number of pupils who were enrolled in the final grade of the preceding cycle or level of education in the previous school year.

Formula:
\[ TR_{h,h+1}^t = \frac{E_{h+1,1}^{t+1} - R_{h+1,1}^{t+1}}{E_{h,n}^t} \]

Where:
\( TR_{h,h+1}^t \) = Transition rate (from cycle or level of education \( h \) to \( h+1 \) in school year \( t \))
\( E_{h+1,1}^{t+1} \) = number of pupils enrolled in the first grade at level of education \( h+1 \) in school-year \( t+1 \)
\( R_{h+1,1}^{t+1} \) = number of pupils repeating the first grade at level of education \( h+1 \) in school-year \( t+1 \)
\( E_{h,n}^t \) = number of pupils enrolled in final grade \( n \) at level of education \( h \) in school year \( t \).

• Registration rate (RR): The number of students admitted to the first grade of a cycle or level of education.
Participation in education can be defined as the extent to which the “school-age” population is able to pursue its studies as far as possible, ideally to the completion of the level concerned. The most commonly used indicators to measure this aspect of the education sector are: (i) gross enrolment ratio; (ii) net enrolment ratio; (iii) age-specific enrolment ratio.

- Gross enrolment ratio (GER): Total enrolment in a specific level of education, regardless of age, expressed as a percentage of the eligible official school-age population corresponding to the same level of education in a given school-year. It is calculated by dividing the number of pupils (or students) enrolled in a given level of education regardless of age by the population of the age-group which officially corresponds to the given level of education. (Interpretation: A high GER generally indicates a high degree of participation, whether the pupils belong to the official age-group or not. A GER value of 100 percent indicates that a country is, in principle, able to accommodate all of its school-age population, but it does not indicate the proportion already enrolled. The achievement of a GER of 100 percent is therefore a necessary but not sufficient condition for enrolling all eligible children in school. When the GER exceeds 90 percent for a particular level of education, the aggregate number of places for pupils is approaching the number required for universal access of the official age-group. However, this is a meaningful interpretation only if one can expect the under-aged and over-aged enrolments to decline in the future in order to free places for pupils from the

Formula:

\[ \text{GER}_h^t = \frac{E_h^t}{P_{h,a}^t} \]

Where:

- \( \text{GER}_h^t \) = Gross Enrolment Ratio at level of education \( h \) in school-year \( t \)
- \( E_h^t \) = Enrolment at the level of education \( h \) in school-year \( t \)
- \( P_{h,a}^t \) = Population in age-group \( a \) which officially corresponds to the level of education \( h \) in school-year \( t \)

\[ RR_{h,h+1}^{t} = \frac{I_{h+1,1}^{t}}{G_{h,n}^{t-1}} \]

Where:

- \( RR_{h,h+1}^{t} \) = Registration rate (from a cycle or level of education \( h \) to another \( h+1 \) at a school year \( t \))
- \( I_{h+1,1}^{t} \) = Number of new entrants to Grade 1 of the cycle or level of education \( h+1 \) at a school year \( t \)
- \( G_{h,n}^{t-1} \) = Number of graduates from the last grade \( n \) of a cycle or level of education \( h \) at a school year \( t-1 \)
expected age-group.)

- Net enrolment ratio (NER): enrolment of the official age-group for a given level of education expressed as a percentage of the corresponding population. It is calculated by dividing the number of pupils enrolled who are of the official age-group for a given level of education by the population for the same age-group. (Interpretation: A high NER denotes a high degree of participation of the official school-age population. The theoretical maximum value is 100%. Increasing ratios can be considered as reflecting improving participation at the specified level of education. When the NER is compared with the GER the difference between the two ratios highlights the incidence of under-aged and over-aged enrolment. If the NER is below 100%, then this provides a measure of the proportion of children not enrolled at the specified level of education. However, since some of these children/youth could be enrolled at other levels of education, this difference should in no way be considered as indicating the percentage of students not enrolled. A more precise complementary indicator is the age-specific enrolment ratio (ASER) which shows the participation of the population of a particular age in education.)

- Age-specific enrolment ratio (ASER): Percentage of the population of a specific age enrolled, irrespective of the level of education. It is calculated by dividing the number of pupils (or students) of a specific age enrolled in educational institutions at all levels of education by the population of the same age. (Interpretation: A high ASER denotes a high degree of educational participation of the population of the particular age. The theoretical maximum value is 100%. Increasing ratios can be considered as reflecting improving participation of the particular age. If the ASER is below 100%, then the difference provides a measure of the proportion of the population of the particular age who are not enrolled.)

**Internal efficiency**

The internal efficiency of an education system basically measures the number of years it takes a child to complete a particular cycle or level of education, e.g. primary, secondary, etc.
The basic indicators required to measure the internal efficiency of an education system are calculated on the basis of the flow rates (promotion, repetition and drop-out). To obtain these indicators, one needs to have the enrolment statistics of at least the two most recent successive years or better, the past ten years. The repetition and drop-out rates will make it possible to measure the system’s efficiency as well as the potential efficiency gains that free up resources. The indicators of the survival, retention and completion rates are calculated on the basis of the flow rates.

It is important to analyze the reasons underlining these indicators. It sometimes happens, for example, that the high drop-out rate in a given grade results from the simple fact that many schools, being incomplete, do not provide teaching at this specific grade. The completion rate, which can also be an indicator of participation, makes it possible to measure the internal efficiency in countries where the rate of loss (linked to drop-outs and repetitions) is high.

The flow indicators are: (i) promotion rate; (ii) repetition rate; and (iii) dropout rate. Formulas:

- Promotion rate \( p_i \): the proportion of pupils enrolled in a given grade in a given school-year who will at the beginning of the following school-year, be enrolled in the next higher grade. There are two possible ways of calculating this indicator, depending on the availability of data on the number of promotoes by grade. If such data are available, “Formula 1” can be used, in which case, the number of promotoes by grade in school-year \( t+1 \) is divided by the number of pupils enrolled in the corresponding grade in school-year \( t \). Otherwise, “Formula 2” is used when data on the number of promotoes by grade are not available; the number of repeaters by grade in school-year \( t+1 \) are subtracted from the number of pupils enrolled in the corresponding school-year and the difference is then divided by the number of pupils enrolled in the corresponding grade in school-year \( t \).

\[
p_i = \frac{P_{i+1}^{t+1}}{E_i^t} \quad \text{or} \quad p_i = \frac{E_{i+1}^{t+1} - R_{i+1}^{t+1}}{E_i^t}
\]

Where:
- \( p_i \) = Promotion Rate at grade \( i \) in school-year \( t \)
- \( P_{i+1}^{t+1} \) = number of pupils promoted to grade \( i+1 \) in school-year \( t+1 \)
- \( E_{i+1}^{t+1} \) = number of pupils enrolled in grade \( i+1 \) in school-year \( t+1 \)
- \( R_{i+1}^{t+1} \) = number of pupils repeating grade \( i+1 \) in school-year \( t+1 \)
- \( E_i^t \) = number of pupils enrolled in grade \( i \), in school-year \( t \).

- Repetition rate \( r_i \): the proportion of pupils from a cohort enrolled in a given grade in a given school-year who are studying in the same grade in the following school-year. It is calculated by dividing the number of repeaters in a given grade in school-year \( t+1 \) by the number of pupils from the same cohort enrolled in the same grade in the previous school-year \( t \).

\[
r_i = \frac{R_i^{t+1}}{E_i^t}
\]

Where:
- \( r_i \) = Repetition Rate at grade \( i \) in school-year \( t \)
- \( R_i^{t+1} \) = number of pupils repeating grade \( i \), in school-year \( t+1 \)
- \( E_i^t \) = number of pupils enrolled in grade \( i \), in school-year \( t \).

1 The completion rate evaluates the percentage of pupils completing a study cycle in relation to the corresponding age population.
• Dropout rate (d): it is the proportion of pupils leaving school without completing a given grade in a given school-year expressed as a percentage of those who were enrolled in the same grade at the beginning of that grade at the beginning of the same school-year. There are two possible ways of calculating this indicator, depending on the availability of data on the number of drop-outs by grade. If such data are available, “Formula 1” can be used, in which case, the number of drop-outs by grade in school-year t is divided by the number of pupils enrolled in the corresponding grade in school-year t. Otherwise, “Formula 2” is used when data on the number of dropouts are not available; the number of repeaters and promotees by grade in school-year t+1 are deducted from the number of pupils enrolled in the corresponding school-year and the difference is then divided by the number of pupils enrolled in the corresponding grade in school-year t.

Formulas:

\[ \frac{D_i}{E_i} \] or \[ \frac{E_i - (R_i^t + P_i^t)}{E_i} \]

Where:

\[ d_i^t = \text{Dropout Rate at grade } i \text{ in school-year } t \]

\[ D_i^t = \text{Number of dropouts at grade } i \text{ in school-year } t \]

\[ E_i^t = (R_i^{t+1} + P_i^{t+1}) = \text{number of pupils dropping out from grade } i \text{ in school-year } t \]

Cohort analysis using flow diagrams is useful to calculate other indicators of internal efficiency. A school cohort is a group of pupils who join the first grade of a given cycle or level of education in the same year and subsequently experience the events of promotion, repetition or dropout. Cohort analysis traces the flow of a group of pupils who enter the first grade in the same year and progress through an entire cycle or level of education. In particular, it can help calculate wastages due to dropout or repetition, survival rates and the coefficient of efficiency. Annex 4 gives an example of the reconstructed cohort analysis method, whereby one can calculate average durations of studies, system wastages, coefficient of efficiency, etc.

• Years-input per graduate (YIG): The estimated average number of pupil-years spent by pupils (or students) from a given cohort who graduate from a given cycle or level of education, taking into account the pupil-years wasted due to drop-out and repetition (N.B. One school-year spent in a grade by a pupil is equal to one pupil-year.) It is calculated by dividing the total number of pupil-years spent by a pupil-cohort (graduates plus drop-outs) in the specified level of education by the sum of successive batches of graduates belonging to the same cohort.

Formula:

\[ YIG_g = \frac{\sum_{j=1}^{k} G_{g,j} \ast j + \sum_{j=1}^{k} D_{g,j} \ast j}{\sum_{j=1}^{k} G_{g,j}} \]

Where

\[ YIG_g = \text{Years input per graduate (for graduates belonging to cohort } g) \]

\[ G_{g,j} = \text{Graduates from cohort } g \text{ after } j \text{ years of study } g,j \]

\[ D_{g,j} = \text{drop-outs from cohort } g \text{ after } j \text{ years of study } \]

k denotes the number of repetitions allowed; n the prescribed normal duration of study for a cycle or level of education; g the pupil-cohort;
• Average duration of studies per graduate (ADSG): The estimated average number of years taken by graduates to graduate from a given school cohort in a cycle or level of education. It is calculated by dividing the sum of the products of the number of graduates by the number of n years spent in a given school cohort in a cycle or level of education by the number of graduates in the corresponding school cohort and cycle or level of education. The result is expressed in numbers of years. N.B. one year spent in a grade by a pupil is equal to one pupil-year.

Formula:
\[ ADSG = \frac{\sum_{i=n}^{n+k} G_i * i}{\sum_{i=n}^{n+k} G_i} \]

Where:
- \( G_n \) = Graduates after n years of study
- \( G_{n+1} \) = Graduates after n+1 years of study
- \( G_{n+k} \) = Graduates after n+k years of study
- \( G = \sum_{i=n}^{n+k} G_i \) = Total number of graduates

and \( i \) the number of years of study.

• Average duration of studies per dropout (ADSD): The estimated average number of years that those, who dropout from a given school cohort in a particular level of education, stayed at school before dropping out. To calculate it, divide the total number of years (pupil-years) during which drop-outs from a given school cohort and in a level or cycle of education stayed in a school before leaving, by the number of dropouts in the corresponding school cohort and level or cycle of education. The result is expressed in numbers of years. N.B. one year spent in a grade by a pupil is equal to one pupil-year.

Formula:
\[ ADSD = \frac{\sum_{i=n}^{n+k} D_i * i}{\sum_{i=n}^{n+k} D_i} \]

Where:
- \( D_i \) = Dropouts after i years of study
- \( D_{n+k} \) = Dropouts after n+k years of study
- \( D = \sum_{i=n}^{n+k} D_i \) = Total number of dropouts

• Average duration of studies for the cohort (ADSC): The estimated average number of years required for a pupil/student to graduate from a given school cohort in a cycle or level of education. It is calculated by dividing the sum of the total number of pupil-years taken to graduate by pupils from a given school cohort and in a level or cycle of education and the total pupil-years during which drop-outs stayed in school before leaving by the sum of the number of graduates and drop-outs in the corresponding school cohort and level or cycle of education. The result is expressed in numbers of years. N.B. one year spent in a grade by a pupil is equal to one pupil-year.

Formula:
\[ ADSC = \frac{ADSG * G + ADSD * D}{1000} \]

Where:
- ADSG= Average duration of studies per graduate
- ADSD= Average duration of studies per dropout

See above.

• Proportion of total wastage spent on dropout (PTWSD): the proportion of total number of pupil/years wasted due to drop out from school from a given cohort in a cycle or level of education. It is calculated by dividing the total number of pupil-years
wasted by pupils who drop out from a given school cohort in a level or cycle by the sum of the total number of pupil-years wasted by both the former and the pupils who repeat grades in the corresponding school and level or cycle of education (i.e. the excess of pupil-years wasted on the repetition and drop-outs) and multiply the result by 100. N.B. one year spent in a grade by a pupil is equal to one pupil-year.

- Proportion of total wastage spent on repetition (PTWSR): The proportion of the total number of pupil-years wasted due to repetition within a given cohort in a level of education. It is calculated by deducting the PTWSD from 100. The result is expressed as a percentage. N.B. one year spent in a grade by a pupil is equal to one pupil-year.

- Survival rates by grade (SR): percentage of a cohort of pupils (or students) enrolled in the first grade of a given level or cycle of education in a given school-year who are expected to reach successive grades. They are calculated by dividing the total number of pupils belonging to a school-cohort who reached each successive grade of the specified level of education by the number of pupils in the school-cohort, i.e. those originally enrolled in the first grade of primary education.

- Coefficient of efficiency: The ideal (optimal) number of pupil-years required (i.e. in the absence of repetition and drop-out) to produce a number of graduates from a given school-cohort for a cycle or level of education, expressed as a percentage of the actual number of pupil-years spent to produce the same number of graduates. Input-output ratio, which is the reciprocal of the coefficient of efficiency, is often used as an alternative. (N.B. One school-year spent in a grade by a pupil is counted as one pupil-year.) It can be calculated

\[
CE_g = \frac{\sum_{j=n}^{n+k} G_{g,j}^i * j + \sum_{j=1}^{n+k} D_{g,j}^i * j}{\sum_{j=n}^{n+k} G_{g,j}^i * n}
\]

Where:

\[
CE_g = \text{Coefficient of Efficiency for a pupil-cohort } g
\]
by dividing the ideal number of pupil-years required to produce a number of graduates from a given school-cohort for the specified level of education, by the actual number of pupil-years spent to produce the same number of graduates.

Another indicator that can be used to assess the internal efficiency is the completion rate.

- Gross completion rate: the total number of students completing (or graduating from) the final year of primary or secondary education, regardless of age, expressed as a percentage of the population of the official primary or secondary graduation age. It is calculated by dividing the number of students completing (or graduating from) the final year of primary or secondary education by the population of the official graduation age.

Formula:

\[ GCR_h^t = \frac{C_h^t}{P_{h,a}} \]

Where:

- \( C_h^t \) = number of students completing (or graduating from) the final year of primary or secondary education \( h \) in school-year \( t \)
- \( P_{h,a} \) = Population at the official graduation age \( a \) which officially corresponds to the level of primary or secondary education \( h \) in school-year \( t \)

In fact, in the absence of information on graduates, the completion rate is often proxied by the following formula (here applied to the primary case):

\[ GCR_{\text{(primary)}} = \frac{\text{No. of students in the last primary grade – repeating students}}{\text{Population of the official age group for the last primary grade}} \]

Disparities

This means analyzing the educational coverage and services by gender (girls/boys), by administrative area (region, districts, etc.), by population density (urban/rural) or by socio-cultural groupings (social strata, ethnic or linguistic minority groups, etc.). In education as in other sectors, the trees may hide the forest: an enrolment rate of 70 per cent in the rural areas may accompany a figure of less than 30 per cent in a deserted region; a national average student/teacher ratio of 40 may, in reality, vary between 10 and 150 by region. This analysis of disparities is necessary not only for ethical reasons, but above all, to ensure the delivery of adapted and efficient education services for the effective schooling of different population groups. For example, it makes it possible to act on both the supply and demand sides depending on the contexts. It also enables differential resource mobilization as required by
different population groups (e.g. to accommodate different opportunity costs for rural populations, the training of teachers in specific techniques, etc.). School statistics and household surveys can be used to carry out such analyses.

One can use the indicators described above in disaggregating by gender and other groupings in order to measure the magnitude of disparities.

3. Quality of education

The quality in education is difficult to assess not least because of the variety of definitions and understandings of educational quality by different stakeholders. In principle, quality should deal with educational outputs and outcomes (e.g. learning achievement, the acquisition of basic life skills, citizenship, etc.) rather than inputs. A commonly used indicator could be the results of the examination. However, because such educational outcomes are difficult to measure, planners and managers have tended to rely on the quantity and the quality of educational inputs (resources) to assess educational quality. Three broad categories of educational inputs are: (i) education personnel; (ii) instructional methods and materials; and (iii) educational facilities

Education personnel

Salaries represent the most important part of recurrent education expenditure. In many contexts, they represent as much as 95 per cent or more of the recurrent education budget. On the other hand, teachers are the principal factor in educational provision. This implies that teachers’ attributes need to be analysed carefully. One ought to examine, for example, the number of teachers available, the requirement of teachers in the light of the national or subnational norms and standards, pupils/teacher ratios, the level of teachers' qualification and their training needs, and pedagogical and administrative supervision. Teacher salaries by category or by level of qualification need to be analysed in close coordination with other ministries or institutions concerned. Sometimes, the analysis of different categories of non-teaching personnel turns out to be crucial in improving the quality and the efficiency of education services.

Some teacher-related indicators that can be analysed at this stage include:

- Pupil-teacher ratio (PTR): Average number of pupils (students) per teacher at a specific level of education in a given school-year. For the purpose of examining system-wide pupil-teacher ratios, teachers are defined as persons whose professional activity involves the facilitation of learning and the acquisition of attitudes and skills that are stipulated in a formal curriculum by students enrolled in a formal educational institution. The PTR is calculated by dividing the total number of pupils enrolled at the specified level of education by the number of teachers at the same level. (Interpretation: A high teacher pupil-ratio suggests that each teacher has to be responsible for a large number of pupils. In other words, the higher the pupil/teacher ratio, the lower is the relative access of pupils to teachers. It is generally assumed that a low pupil-teacher ratio signifies smaller classes, which enables

Formula:

\[ PTR_h = \frac{E_h}{T_h} \]

Where:

- \( PTR_h \) = Pupil-teacher ratio at level of education h in school-year t
- \( E_h \) = Total number of pupils or (students) at level of education h in school-year t
- \( T_h \) = Total number of teachers at level of education h in school-year t.
the teacher to pay more attention to individual students, which may in the long run result in better pupil performance.)

- The number of teachers available in the system and new teachers to be recruited: One ought to undertake a careful analysis of the availability and requirement of educational personnel, preferably by category. Very often, it starts with calculating (or counting) the number of teachers actually available (or working) in the system and extrapolating the number of students per teacher (pupils/teacher ratio) or the number of students per class (class sizes). These indicators could be compared with the national or subnational standards in terms of PTR or class size. There are two ways of calculating the full-time equivalent teacher requirements: the first is the ‘method based on the pupil-teacher ratio’ and the second is the ‘method based on the number of pupils by class and hours taught by teachers’. The first method is used when calculating the teacher requirements at the primary education level and the second is applied for calculating these requirements at the education levels of “subject teaching”, i.e. secondary education, higher learning, etc.

Method based on the pupil-teacher ratio:

$$TR' = \frac{E'}{R'},$$

$$R' = R^0 + t \times cr$$

Where:

- $TR'$ = number required of full-time equivalent teachers required
- $E'$ = total projected number of students
- $R'$ = pupil-teacher ratio
- $R^0$ = initial pupil-teacher ratio
- $cr$ = constant annual rate change of pupil-teacher ratio

Method based on the number of pupils by class and hours taught by teachers:

Formula:

$$TR' = \frac{E' \times H'}{C' \times L'}$$

$$C' = C^0 + t \times cc$$

Where:

- $TR'$ and $E'$ are defined above.
- $H'$ = average number of weekly hours per student
- $C'$ = average number of students per class
- $L'$ = average number of weekly hours per full-time teacher
- $cc$ = constant annual rate change of average number of students per class

Teachers’ emoluments as a percentage of public current expenditure on education (%TX): Public expenditure devoted to teachers’ emoluments is expressed as a percentage of total public current expenditure on education. It is calculated by dividing public current expenditure devoted to teachers’ emoluments in a given financial year by the total public current expenditure on education.

Formal:

$$%TX_t = \frac{TX_t}{PCXE_t}$$

Where:

- $%TX_t$ = Percentage of public current expenditure on education devoted to teachers’
education for the same financial year. (Interpretation: A higher percentage of public current expenditure devoted to teachers’ emoluments denotes the preponderance of spending on teachers' compensation to the detriment spending on administration, teaching materials, scholarships, etc. The way in which educational spending is allocated between these different purposes i.e. teachers' salaries and the condition of education facilities (e.g. expenditure on teaching materials, etc) can affect the quality of education.)

Educational facilities
This is about school space and equipment. In countries that have reached high levels of education, this represents marginal investment. However, in countries that have significantly low enrolment ratios, this is one of the most important budgetary categories. Sometimes 80 per cent of external financial resources are spent on the construction of new buildings. This implies the need for a thorough and careful analysis of the costs and standards of construction, the conditions of educational facilities (blackboards, desks, latrines, water, etc.), as well as the space-time use of classrooms according to levels and types of education. Some indicators that can help measure the space-time use of educational facilities are:

- Pupil-classroom ratio (PCR): The ratio of the number of pupils (students) to the number of classrooms. It is calculated by dividing the number of pupils (students) at a level or cycle of education by the number of classrooms in the corresponding level or cycle of education. (Interpretation: Low PCR may be conducive to proper teaching/learning conditions but can be less cost-effective. High PCR generally indicates high classroom utilisation rate but not necessarily high learning outcomes. However all the other factors which affect the teaching/learning process should also be considered in the interpretation of this indicator. Although it is generally agreed that “overcrowded” classes are detrimental to pupil/student achievement, the advantages of small classes are not necessarily obvious. Hence especially at lower levels of education, in order to increase both access and participation rates, given the scarcity of resources, more care should be taken when formulating educational policies solely on P/CR without due regard to the implications of cost-saving policies on the quality of education.)

  \[ PCR_h^t = \frac{E_h^t}{C_h^t} \]

  \( PCR_h^t \) = Pupil-classroom ratio at level of education h in school-year t

  \( E_h^t \) = Total number of pupils or (students) at level of education h in school-year t

  \( C_h^t \) = Total number of classrooms at level of education h in school-year t

- Classroom space utilisation rate (CSUR): Formula: 

This reading material is adapted for training purpose based on National Education Sector Plan: A result-based planning handbook. Details of the reading material can be accessed at http://unesdoc.unesco.org/images/0014/001447/144783e.pdf
Percentage of the area of standard floor space occupied by pupils/students in a classroom. It is calculated by dividing the area of floor space of a classroom actually used by pupils/students at a level or cycle of education by the standard floor space which is planned for utilisation by pupils/students in the corresponding level or cycle of education. (Interpretation: Ideally this indicator should approach as close as 100%. Indication on space utilisation of classrooms without any information on the time during which classrooms are occupied can be useless for cost effectiveness, educational decision-making purposes.)

Classroom time utilisation rate (CTUR): Proportion of hours classrooms are used or occupied for teaching/learning purposes within the total number of standard hours of utilisation. It is calculated by dividing the number of hours during which classrooms are actually utilised for teaching and learning at a level or cycle of education by the standard numbers of hours classrooms are planned to be used in the corresponding level or cycle of education. (Interpretation: Ideally this indicator should approach as close as 100%. Indication on time utilisation of classrooms without any information on the number of pupils involved can be useless for cost effectiveness and educational decision making. In addition the optimum time utilisation of classrooms can depend enormously on the ways classes are organised and especially at higher levels of education where the set-up time between classes can seriously affect classroom time utilisation rate.)

Classroom utilization rate (CUR): The product of the classroom’s space and time utilisation rates. It is calculated by multiplying the CTUR (Classroom Space Utilisation Rate) by the CSUR (Classroom Time Utilisation Rate). (Interpretation: Ideally this indicator should approach as close as 100%. When analysing this indicator for educational planning, proper care should be taken in isolating the relative weights of the respective influence of time and space on its magnitude. Since developing countries are faced with scarce resources, idle capacities usually occurs as result of lack of information on both classrooms’ time and space
utilisation. Hence the development of this indicator should be encouraged in line with a rationalised classroom utilisation management system in order to enhance the rates of access and participation, especially in developing countries.)

- Classroom requirements (TCR): Based on the analyses of the projected enrolments and classroom utilization standards, it is possible to calculate future requirements for new constructions by level or cycle of education. This indicator is indispensable when preparing sector plans or programmes/projects related to classroom constructions. It is calculated, especially for primary education level, by dividing the total number of students by the average number of students per classroom. As for the secondary and higher levels of education, classroom requirements are calculated by taking into account the number of (weekly or monthly) learning hours and laboratory-usage hours as well.

Formula: \[ TCR_t^d = \frac{E_t^d}{ASC_t^d} \]

\[ NC_t^d = \left\lfloor \frac{E_t^d - (1 - a) \cdot E_{t-1}^d}{ASC_t^d} \right\rfloor \]

\[ ASC_t^d = ASC_0^d + t \cdot cc \]

where:
- \( E_t^d \) = Total projected number of students, year t and level of education d
- \( TCR_t^d \) = total classrooms required, year t and level of education d
- \( ASC_t^d \) = Average number of students per classrooms year t, level of education d
- \( NC_t^d \) = new classrooms required, year t, level of education d
- \( a \) = replacement rate of buildings; \( cc \) = constant annual rate of change of average of students per classrooms; \( 0 \) = initial year

**Instructional methods and educational outputs**

This is about evaluating the status (or the availability) and the relevance of school programmes, pedagogical methods (as for example, the types of pupil groupings in multigrade classes, double shifts, etc., and also the size of classes), and of instructional material (textbooks, teacher's guides and other equipment). In certain countries, the change or the reform of pedagogical means and methods is considered as a major strategy for the improvement of pupil flow rates (increase in access to and participation in education).

Many of the above aspects of quality can be quantified, but do not tell much about students’ achievements and knowledge. For instance, curricula might be poorly designed and textbooks irrelevant in their content; school inspectors may only be charged with administrative data collection; teaching methods might be inadequate, etc. Furthermore, there are also non-school factors (such as the socio-economic background of the pupils and their health and nutrition status) which are of critical importance and affect performance and attention in classes.

Depending on the resources available to this end, specific research studies should be carried out as has been done in some countries in order to:

- Assess the actual learning achievement of students, taking into account their individual characteristics and the various educational inputs (learning environment, educational facilities, teachers’ qualifications, pedagogical supervision, etc.) as well as non-school factors
(geographical zone of schools, parents’ social and economic backgrounds, distance to schools, etc.);

- Identify policy options to improve student performance in light of the nature and weight of the different factors influencing the teaching and learning by students.

4. External effectiveness

This is about the performance of graduates of a certain level of education in active social and economic life, meaning, the social and economic benefits that individuals and/or society can draw from the investments made in education. Depending on the contexts and the countries, the analysis of the characteristics of school-leavers (graduates of a given educational cycle), of their professional integration in the job market (tracer studies of school graduates) can prove essential in the definition of educational reforms.

This means analyzing to what extent the education sector is organized in ensuring a basic education for all the citizens of the country as well as the general, technical and professional training at secondary and higher education levels, in tune with the changing demands of society and the economy. On the basis of the evaluation of the current distribution and regulation of student flows, possible options may be identified to improve the efficiency and effectiveness of the system in response to social demands and the job market.

5. Educational costs and finance

Costs of education

Total costs of education (Recurrent and capital): This means expenditure by type, by function and by level of education. Expenditures are in general analyzed in terms of recurrent or capital expenditures.

Formula:

\[ C'_d = RC'_d + I'_d \]

Where:

- \( t \) = year
- \( d \) = level of education
- \( C'_d \) = Total costs
- \( RC'_d \) = Total recurrent costs
- \( I'_d \) = Investment

Recurrent costs: Recurrent costs (expenditures) are subdivided into salaries (teaching personnel and non-teaching personnel) and other recurrent expenditures (textbooks, teacher guides, other educational materials). Sometimes, expenditures are made in cash or in kind. The analysis of unit costs, notably on salaries and school buildings, is important and necessary. On the basis of total expenditures and enrolments, one can calculate unit costs (costs per pupil) by school level, by type (general or technical education) or by status (public, semi-public or private).

Formula:

\[ RC'_d = CT'_d + CM'_d + CA'_d + CO'_d \]

\[ CT'_d = \sum_{i=1}^{n} \sum_{j=1}^{k} T_{dij} * w_{dij} \]

\[ CM'_d = E'_d * CMPS_d \]

\[ CA'_d = E'_d * CAPS_d \]

\[ CO'_d = E'_d * COSPS_d \]

where:

- \( CT'_d \) = Teacher costs
Increasingly, organizations analyze costs per pupil or salaries per teacher as multiples of GDP per capita to make comparisons not only between the levels and types of education in the country, but also to make regional and international comparisons. Considering the importance of salary expenditures, these are analyzed in a detailed way in relation to the salaries of other professions of similar qualifications in the country, and salaries of teachers in comparable countries. These unit costs are compared with the bulk of salaries in the light of class sizes and the student/teacher ratios (or the weekly teaching hours for teachers and the weekly learning hours for pupils, especially at post-primary levels). This analysis will make it possible for each country to adopt appropriate policies in increasing or maintaining salary levels by taking measures in quality improvement in education and in the status of teachers.

Capital cost: The analysis of the cost of school buildings is another important field, in particular in countries where enrolment ratios are low. Given that much capital expenditure comes from external finance in some countries, the pressure exerted by technical and financial agencies mounts with regard to building costs, which vary tremendously from country to country and even within a country itself, depending on the options retained. The beneficiary countries can justify high unit costs for the construction of classrooms, which requires a careful analysis of the procedures, expenditures and methods of construction.

Educational finance
This involves the analysis of the financing of education by the State and local authorities (national education budget and other public budgets), of the financing by families (in kind or by cash) in public as well as in private education, of the financing by other national agents (industries, religious denominations, parents’ associations, etc.) or by external agencies (which could be grants or loans at multilateral, bilateral, or NGO level), and for recurrent or capital expenditures.

At the national level, there exist several ministerial departments in charge of education and training. It happens that decentralized authorities receive non-allocated credits from the State. It is therefore important to devote sufficient time to obtain the data on consolidated public expenditure for all education and training activities. It is necessary to define the budgets voted and the real expenditure.

It is important to analyze the non-governmental budgets, be they national (local groups, parent associations, enterprises, etc.) or foreign (multilateral, bilateral or non-governmental grants and/or loans). The non-governmental national budgetary data can be obtained during household surveys or from other providers of education and training. Experience also shows that it is not easy to obtain the budgetary data of external agencies, given the (i) multiplicity of concerned partners; (ii) the absence of

\[ I_d = CBPS \times [E_d - (1-a) \times E_{d-1}] \]

where:
- \( CBPS_d \) = per pupil building cost
- \( E_d \) = Enrolment
- \( a \) = replacement rate of buildings

\[ CM'_d = \text{Costs of materials} \]
\[ CA'_d = \text{Administrative costs} \]
\[ CO'_d = \text{Other costs} \]
\[ T_{dij} = \text{Teachers by categories(i) and steps(j)} \]
\[ w_{dij} = \text{salaries by categories and steps} \]
\[ CMPS_d = \text{per pupil cost for materials} \]
\[ CAPS_d = \text{per pupil administrative cost} \]
\[ COPS_d = \text{per pupil other costs} \]
accounts and the diversity of budgetary categories; (iii) the different programming and disbursement cycles of agencies.

6. Managerial and institutional aspects

This is the question of relating the normative aspects of the system to the institutional and organizational management practices of the sector with a view to identifying strengths and weaknesses in order to bring about improvements. The management aspects could be examined according to the traditional duality of the educational organization: (i) the planning and administrative function which consists of programming and distributing resources (budgets, personnel, buildings, instructional materials, etc.) among the levels of education, regions and/or schools, (ii) the pedagogical function which contributes to the actual management and transformation of these resources into end-products (graduates, learning achievements, individual and social benefits).

In its planning and administrative function, it reverts to examining how the decisions were taken and implemented in the programming and distribution of resources and what criteria were used in the exercise of distributing resources amongst different levels and education establishments. Examination of various management tools (information systems, programming tools, feasibility studies, monitoring-evaluation, etc.) could provide information on the efficiency and coherence of these functions.

In its pedagogical function, it is about relating the inputs available to the actual outputs and outcomes (number of students trained and their school achievements). It is true that the same inputs do not necessarily produce the same products in education because of other factors like family origin and pupils’ dispositions. But it is generally known that teachers (and their style of teaching), instructional materials and school space have an obvious impact on pupils’ achievement. The question, therefore, is to examine how these different resources have been mobilized and used in a rational and proactive way in a given environment. Different techniques and methods of analysis are used for this purpose.

These managerial and institutional aspects can be analyzed as part of the sector analysis or by means of a specific audit or institutional analysis.