WASTAGE: A CONCEPTUAL OVERVIEW
DEFINITIONS, CATEGORIES, CONCEPTS AND METHODOLOGIES

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(1) Definitions

'Wastage' was defined by the Hartog Committee (1929, pp.45-47) as 'the premature withdrawal of children from school at any stage before the completion of the primary course', while 'stagnation' was defined to mean 'the retention in a lower class of a child for a period of more than one year'. As regards stagnation, there is hardly any disagreement between the connotation given by the Committee and that subsequently followed by the research workers. However, the definition of 'wastage' as given by the Committee has raised certain controversies even though it is accepted operationally in almost all the studies. The main point at issue is whether or not all pupils who dropout before passing the last grade of a stage of education should be included in the definition of wastage. This issue forms the basis for two definitions discussed below.

First Definition: This flows from the argument that wastage should be related to the objectives of education prescribed for the stage under investigation (Vedaprakasha, 1964, p.133). Attainment of permanent literacy is
considered to be the main objective of primary education (Grade I - IV or V) and any child who drops out or is withdrawn from school before spending sufficient time (at least 120 days) in grade IV or V or before actually passing it, constitutes a case of wastage. Studies conducted in the area, Provincial Board of Primary Education (1941) and Gadgil and Dandekar (1955) have shown that as a minimum four years of schooling is necessary for every child to ensure the retention of permanent literacy in his later life.

Second Definition: This is based on the concept of 'incremental gains' in learning outcomes. The supporters of this definition argue that the 'year' instead of the 'stage' should be taken as the temporal unit of inquiry because every year of schooling adds to the partial attainment of the objectives laid down for the stage under investigation. This definition was used by Chickermane (1962, pp.20-21) and also by the authors of the Poona Study (Directorate of Education, 1960, p.13) and the 24 Parganas Study (Choudhary, 1965, p.6) for computational purposes. In the latter two studies, the concept of 'educational credits' or 'benefits' was used instead of 'incremental gains' in learning outcomes. Both the concepts, however, convey the same meaning.
Educational wastage is an economic term defined as 'the total number of pupil-years spent by repeaters and dropouts (Loxley, 1987, p.63). A repeater is a pupil who, in a given school year, remains in the same grade as in the previous year, while dropouts are those who leave school before the end of the final year of an educational cycle in which they are enrolled. As a summary measure, wastage ignores both the benefits afforded the repeater by spending an extra year in school and the benefits accruing to the dropout before leaving school. Total wastage, then, merely reflects the drag of repetition and dropout on the flow of promotions within an educational system.

Of the two components, repetition is thought to be more wasteful because repeaters (a) stay in school longer than normal duration thereby reducing the intake capacity, (b) cause the loss of investments in educational services and increase unit costs, and (c) contribute to dropout while having a regression effect on equity in the educational system. Inequalities arise because failure to be promoted at a normal pace is greatest for rural inhabitants and those of low socioeconomic standing (Haddad, 1979).

Schreiber (1962, p.510) portrays 'a dropout as a child just passed his Sixteenth birthday who has an
average or slightly below average intelligence and is more likely to be a boy than a girl. He is not achieving according to his potential, he is not reaching at grade level, and academically he is the lowest quarter of his class.

Mukherjee (1962, p.178 and p.181) define the terms wastage and stagnation as follows:

**Wastage:** The successful completion of instruction of Standard IV or V is generally considered to be the minimum condition for attaining permanent literacy. The withdrawal of children prior to their passing Standard IV or V would come to their way in attaining permanent literacy and therefore it would constitute 'wastage'.

**Stagnation:** Allied very closely to the problem of wastage is the problem of stagnation. It means retention of a child in a particular class for more than one year. Every child who has to repeat instruction in a class for more than one year constitute stagnation.

Kamat and Deshmukh (1963, p.13 and p.43) define the terms 'Wastage' and 'Stagnation' as applied to college education.

**Wastage:** By 'wastage' we mean all those students who joined college in the first year class, but for some reason or the other could not or did not pursue college
college education to obtain the first degree in arts, science or a professional course.

Stagnation: By stagnation we cover the cases of those students who complete the prescribed course, but only after a delayed progress; they take a longer time to complete the course than the prescribed minimum period.

According to Longstreth, Shaney and Rice (1964, pp.228-236), 'Educational wastage' is considered to arise in two kinds of situations namely, one, when a student who is enrolled in a particular grade at school and has spent a year in it is made to remain in the same grade for a further year repeating the work and two, when a student ceases attendance by dropping out school without completing a defined school course and without enrolling in any other school to complete it. The first situation is generally referred to as 'grade repetition' or 'non-promotional', the second is referred to as early (or premature) school leaving or the school dropout problem.

By 'Wastage' mean (Ahuja and Ahuja, 1976, p.17), 'the premature withdrawal of children from school at any stage before the completion of the course', while stagnation means 'the retention of a child in a class for a period of more than one year'.
According to Yadav (1988, p.91) the most common view of 'wastage' implied 'premature withdrawal of a child from school before completing the last grade of the stage of education in which he is studying'.

The term 'Educational Wastage' (Jayasurya, 1971, p.131) is considered to arise mainly in two kinds of situations namely (i) when a student who is enrolled in a school ceases attendance by dropping out of school without completing a defined school course and without enrolling in any other school to complete it and (ii) when a student who is enrolled in a particular grade at school and has spent a year in it, is made to remain in the same grade for a further year repeating the work. The first situation is generally referred to as early or premature school leaving or the school dropout problem and the second is referred to as grade repetition or non promotion.

(2) **Categories of the Phenomenon**

Comprehension of the diverse data concerning dropouts requires specifications of three types (Voss, Wendling and Elliot (1966, pp.363-367): (i) the involuntary dropouts (ii) the retarded dropouts and (iii) the capable dropouts.

(i) **Involuntary dropouts**: those individuals who leave school as a consequence of some personal crisis such as
illness, accidents etc., regardless of the specific reason. The involuntary dropout leave school because of external circumstances over which they have no control.

(ii) Retarded dropouts: those who do not capable of doing the necessary work required for promotion to higher grades and eventual graduation.

(iii) Capable dropouts: those students who have the requisite ability to do passing or even superior work in high school, but who may or may not be making satisfactory academic progress.

Of the various types of dropouts, it is the capable dropouts that is considered a contemporary social problem because his abilities and potentialities are not realised and thus constitute a social waste. Involuntary dropouts, who have adequate ability, comprise a relatively small percentage of these dropouts.

Many of the apparent contradictions in the findings concerning dropouts can be resolved by distinguishing between 'early' and 'late dropouts'. Students with limited ability generally leave school early; capable dropouts tend to remain in school longer. Two types of dropouts (Longstreth, Shaney and Rice, 1964, pp.228-230) can be distinguished as, (i) voluntary dropout and
(ii) Involuntary dropout. A student was classified as a 'voluntary dropout', if the withdrawal of that student from the school is instigated by the student with no formal action by the school. If a school instigated the action, that student was classified as an 'Involuntary dropout'.

(3) Concepts used

The Research Unit attached to the Directorate of Education, Maharashtra State (1960) conducted an investigation into wastage and stagnation in primary schools (Class I - IV) in the Poona District. The main objectives of the study was not to reach conclusions but to evolve concepts on which further studies could be undertaken. The investigator introduced a number of new concepts. The first of these is that of utilized school years. Under ideal conditions, the total number of school years utilized by a cohort of 1000 students would be 4000 (1000 x 4). Distinction was also made between actual utilization and effective utilization. The latter means the number of years of school life which have been profitably utilized. For instance, if a student completes Class I, he may be said to have completed one effective year of school life and so on. If a student has to pass Class I after three years, he would have actually utilized three school years but his effective
utilization is only one school year. On this basis, the effective school years of the 1000 students investigated in this study were calculated and they were found to be 2008 only as against 3,043 school years of actual utilization. The effectiveness of the school system measured by the formula,

\[
\text{Effectiveness of School System} = \frac{\text{Effective School Years}}{\text{Actual School years}} \times 1
\]

i.e., 66 per cent. The difference between 100 and 66 i.e., 34 would denote the extent of stagnation.

Desai and Desai (1957, p.3 and p.20) spelt out three different concepts of wastage in their investigation of wastage in Secondary education in Gujarat as follows.

(1) The Apparent Waste: constitutes all those cases of pupils who do not pass the final examination of the uppermost grade of the stage within the given number of years of the stage after entering the bottom grade. Thus the apparent waste includes both dropouts and stagnation cases.

(2) The clear waste: constitutes only dropouts before the successful completion of the stage.

(3) The Real Waste: is calculated giving credit to the dropouts for the number of years they profitably spent
in the school. Thus if a stage is constituted of seven years and if a pupil leaves school after passing two grades, he gets a credit of 2/7 and the wastage constituted by him is 1 - 2/7 = 5/7.

The occurrence of wastage and stagnation amongst university students has been investigated by the M.S. University of Baroda (Bhanot, 1962). The investigation introduced the following concepts.

(a) **Optimum years**: Assuming that every student makes normal and regular progress from year to year and also passes out at the end of four years the optimum years for completing a four-year degree course by 100 students would be 100 x 4 or 400.

(b) **Actually used years, profitably used years and Academic Credits**

If a student spends one complete year in a class and also passes the examination held at the end of the year he is said to have one 'profitably used year' to his credit but in case he fails in the annual examination or decides for some reason 'to take a drop' then the year in question would not show profit as he would have stagnated during that year. If such a student continues study in the same class and passes examination of that class after another year then he would have 'actually used' two years for the course but profitably
used only one year. Alternatively, he may be regarded to have gained one academic year in a period of two years when the matter is considered from the point of examination successively passed only.

The above concepts were used to define the following indices.

(i) Index of Attainment = $100 \left( \frac{\text{Profitably used years}}{\text{Actually used years}} \right)$

(ii) Index of Stagnation = $100 \left( 1 - \frac{\text{Total optimum years}}{\text{Actually used years}} \right)$

(iii) Sensitive Index of Wastage: This lies between the following two ratios.

(a) $100 \left( 1 - \frac{\text{Total Academic Credits}}{\text{Total Initially Enrolled}} \right)$

(b) $100 \left( 1 - \text{Cumulative Total number of students who underwent each successive years of the course} \right)$

The stagnation index takes several factors into account simultaneously. For example, the number first entering the class, the number remaining in the class after each successive year of the course, the number of trials taken by each student for passing the relevant periodical examinations; the total time spent by the class as a whole to complete the course, in question. It is also statistically comparable between one year and another, between one faculty and another and even between one university and another whenever similar indices are available for different universities. The
sensitive Index of Wastage is also fully comparable.

(4) **Methodologies for measuring Wastage**

A number of methodologies have been evolved over the years for measuring the extent of educational wastage. These are largely based on the specific definition of the concept as accepted by the research scholars and also on the data available in different countries.

A review of methodologies devised so far for measuring educational wastage which have been rightly classified by UNESCO (1970) into three categories namely, (i) apparent cohort method (ii) reconstructed cohort method and (iii) true cohort method.

(a) **Apparent Cohort Method**: This method uses either cross-sectional year-grade data or a time series data on grade-wise enrolment. While using cross-sectional data, enrolment in grade I in a given year is considered as a Cohort. Enrolment in all other grades in the same year is compared with that in Grade I and diminution from one grade to another is regarded as evidence of dropout. Two different types of approaches are generally adopted in this method. The first approach (Sapra, 1966, pp.10-16) involves calculation of attrition rate which is the ratio of the difference between the enrolment in each grade above the first, in each year and that
in the previous grade in the previous year to the total enrolment in Grade I in the base year. Cumulative attrition rate represents wastage of the system symbolised by I_e, can be obtained by subtracting \( w \) from 1.

\[ I_e = (1 - w) \]

The second approach which has been suggested by Chesswas (1969, pp.18-19) involves the calculation of progression rate, graduation rate and enrolment output ratio. Progression rate is the ratio of the enrolment in a grade in a given year to the enrolment in the previous grade in the previous year. Graduation rate is the ratio of the number of graduates after the final grade of the stage/course under study to the enrolment in the same grade in the same year. Enrolment output ratio which is an indicator of the internal efficiency of the educational system, is the ratio of the number of graduates after the final grade to the corresponding enrolment in Grade I.

(b) Reconstructed Cohort Method

The method uses successive year grade data on enrolment and repeaters which are given in a full cycle of cohort. From these data, the number of promotees \( P \) are first derived for each grade level by subtracting the given number of repeaters \( r \) from the total number of pupils on \( E \) in the grade \( P = E - r \).
When the number of promotees and repeaters for each grade are known, the number of dropouts (d) becomes the residual factor and can be derived by subtracting the sum of promotees and repeaters (P + r) from the total enrolment (E) in the grade.

The two other important indices used in the method for measuring educational wastage, which need special mention are 'the unit cost of wastage' (in non-monetary terms) and the 'input-output ratio'. The unit cost of wastage for a cohort is the ratio of the number of graduates produced to the total number of pupil-years spent by the cohort before completing or leaving the stage/course. In other words, it gives 'pupil-years spent per successful completer'. The input-output ratio is the total number of pupil years invested in a cohort expressed as a ratio of the minimum number of pupil years invested in a cohort expressed as a ratio of the minimum number of pupil years required by those pupils who completed the stage or course. This is obtained by dividing 'pupil-years spent per successful completer' by the duration of the stage or course.

(c) True Cohort Method

Under this method, the career of a single group of pupils who enter the beginning grade of the stage/course of education under enquiry in a given year is followed up
in subsequent years till they graduate from the final grade. This requires longitudinal studies so that it can be seen how many leave school and at what points, how many migrate to other schools of the same type or of other combines how many repeat grades and with what frequency, how many die, how many get accelerated promotions, how many region school after dropping out and how long all those ultimately complete the course successfully take to do so.

A few studies, Gadgil and Dandekar (1955), Directorate of Education (1960) and Choudhary (1965) that have employed this method in India have a backward look in the sense that they cover past period. The studies are of local importance.

Some of the investigation in India, using the true Cohort data, have applied the following formula to compute the index of stagnation (Is)

\[ Is = 1 - \frac{\text{Total optimum years}}{\text{Actually used years}} \]

The expression total optimum years denotes the total number of years required for a cohort to complete the prescribed stage/course of education on the assumption that every pupil will make normal and regular progress from year to year. The actually used years are calculated by counting every year spent in school by
every pupil in the cohort (Vedaprakasha, 1964, p.133).

Some of the investigators of India using the true cohort data have applied the formula given below to measure the effectiveness or internal efficiency (Ie) of a school system.

\[ Ie = \frac{\text{Effective School Years}}{\text{Actual School Years}} \]

According to the above formula, when the Index of Internal efficiency becomes known, the Index of Wastage (IW) can be easily derived by subtracting the value of Internal efficiency index from 1.

\[ IW = 1 - Ie \]

Although the true cohort method is considered to be the most scientific, it has not been possible to apply it on a wide scale for obvious reasons. The Technical seminar on Educational Wastage and School Dropouts convened by UNESCO (1966, p.19) recommended that overlapping longitudinal studies should be devised, using the true cohort data.

(5) Measurement of Wastage

Kamat (1968, pp.5-12) has given a method of measuring wastage in a course of education. The method requires case study of each student. In this method, the information pertaining to enrolment, repetition,
years taken for completion of schooling and dropouts of each student is required. The author has also given the method for describing the progress in a course of education. For this method, he has given sequence for promotion, repetition and dropout. To calculate the progress of ten years course, 1000 repetition sequences are to be considered. In another paper, Kamat (1968, pp.25-34) has proposed a scholastic model for describing the progress of a student undergoing a given course of education. However, while giving the model, the author has not explained what inputs should be used and how to form the initial stochastic matrix.

Hellwig (1972) has given the wastage prediction method by two types of flow analysis. In the first method, the author has used current promotion rate, repetition rate and dropout rate for the flow of the cohort. In the second method, the author has suggested the use of these rates by grade and by the year for the flow of the Cohort. From the first method the cohort experiences cannot be explained and in the second method repeater's behaviour does not change with other cohorts. Also the first method underestimates the wastage whereas the second method overestimate the wastage. Therefore, this method seems to be of little use for prediction purpose.
Haddad (1979, p. 4) and UNESCO (1980, pp. 14-16) present various formulas for computing educational wastage. To quantify an international index of wastage poses many obstacles, but one method conveniently measures school output by the number of 'pupil-years' attributable to all primary schoolers where a student who spends one year at school is said to have spent one pupil-year. Educational wastage is defined in this unit as the total number of pupil-years spent by repeaters and dropouts and can be converted into a percentage of the total number of pupil-years accruing to a student cohort. For example, if a student drops out after grade three having repeated two and three once each, calculations would show the pupil to have spent five pupil-years: two as a repeater and three as a dropout.

There is no one best way to measure wastage because within school systems some repetition may be due to individuals transferring from rural to urban schools (this could lead to undercounting promotion and repetition rates and thereby overestimating dropout in rural areas). Sometimes pupils pass a year-end examination but repeat a grade again due to a lack of capacity in the next grade. In some multilingual societies, repeating the first grade may be a prerequisite for pupils to master the language of instruction which is different from their
local dialect (e.g., Quechua, Aymara, and Guarani versus Spanish in Latin America). Finally, high rates of repetition in the final grade of primary education may be due to pupils trying to obtain favourable results needed to qualify for admission to secondary school.

In all, caution is needed when comparing educational wastage across nations because educational systems are not alike structurally, promotion policies and achievement norms differ, and dissimilarities arise in data estimates where, for example, overreporting the number of initial enrollees will ultimately exaggerate the number of students who turn up as dropouts.

Stagnation has generally been measured by counting the number of failures during different years from the same cohort of pupils (Sapra, 1967, pp.22-24). The formula used for computing the index of stagnation is as follows:

\[
\text{Index of Stagnation} = 100 \left( 1 - \frac{\text{Total optimum years}}{\text{Actually used years}} \right)
\]

The expression 'optimum years' is used to complete the prescribed course on the assumption that every child will make normal and regular progress from year to year. The 'actually used years' are, however, calculated by counting every year spent in school by every child in the cohort.
(6) **Methods of Identifying the Causes**

Studies conducted so far have employed different methods to identify the causes of wastage which can be classified as under:

(i) Direct Method
(ii) Indirect Method
(iii) Hypotheses Testing Method.

Each of these methods is discussed below:

(i) **Direct Method**: Under this method, the dropouts and their parents are interviewed by the investigators to ascertain the causes of dropping out or premature withdrawal from school. The main drawback of this method is that it does not ensure true causes being told by the respondents and that the causes are all coloured by the respondents' perception.

(ii) **Indirect Method**: The causes of dropping out or premature withdrawal from school under this method are ascertained either by interviewing the dropouts by friends, neighbours, teachers and members of local community, etc., or by administering check-list of possible causes, requesting the respondents to tick mark those which are applicable to each case being investigated. The responses obtained through this method are by no means more objective than those obtained through the first method. This method involving the teachers only was used in the
Satara Study (Dandekar, 1955), while the 24-Parganas study (Choudhary, 1965) adopted this approach involving the teachers and the local community leaders.

(iii) **Hypotheses Testing Method**

Chickermane (1962) tried to assess the influence of home circumstances on wastage in primary education. Although he did not formulate any hypotheses as such, he attempted to find out the differences between 'educated' and 'not educated' on four dimensions viz., financial condition of parents/guardians towards education, involvement of children in domestic work and educational status of the family.

(7) **Methods of Determining the Relative Importance of the causes**

In the studies conducted so far in this country, three methods have been used to determine the relative importance of the causes of wastage and stagnation (Sapra, 1967, pp.26-28). These are discussed below:

(i) **Frequency Distribution Method**

This is the most commonly used method and has been adopted in almost all the studies. The frequencies for each of the causes as stated by the dropouts, their parents, teachers, peers, the local community leaders etc., are worked out. Simple frequencies are converted into
percentage frequencies which are arranged in the descending order. The percentage frequencies are ranked and the ranks thus obtained reflect the relative significance of each cause.

(ii) **Opinion poll method:** The method aims at eliciting the opinion of parents, teachers and educationists on the relative importance of the causes of dropping out from school on a five-point scale (Most important, very important, less important and least important). The causes are given in the form of statements in an opinionnaire. To quantify the responses, the scale values of 5, 4, 3, 2, 1, corresponding to most important, very important, less important and least important are relatively assigned to each of the statements. The average ratings for each of the three groups, separately are worked out by dividing the composite score by 'N' (No. of cases in each group). These ratings are ranked for further analysis to establish the relative importance of the causes of dropping out as perceived by parents, teachers and educationists.

(iii) **Statistical Method:** Chickermane. (1962, pp.135-139) attempted to find out the relationship between wastage in primary education and home circumstances by means of four-fold correlation tables. The distributions were arranged in dichotomies. Phi-coefficients were calculated from the correlation table; chi-squares were calculated
from phi-coefficients and values of maximal phi-coefficients were also computed. In the first instance, the relationship between the independent variables (four features of home circumstances - financial conditions of parents/guardians, attitude of parents/guardians towards education, involvement of children in domestic work and educational status of the family) and the criterion variable, the phenomenon of wastage was established by the significance of phi-coefficients, which was examined by the value of chi-squares in each of the correlation tables. The relative importance of each of the variables in causing wastage in primary education was established by examining the magnitude of phi-coefficients and also by the ratio of its variance to the total variance of the maximal phi-coefficients.