UNIT 2 EDUCATION AS INVESTMENT

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2.0 INTRODUCTION

In the last Unit, we dealt with the fundamental concepts in the study of economics of education, including the concept of investment. We defined investment as the deployment of physical and financial resources that have alternative productive uses in any activity. The benefits of such activities will accrue to the individual and to society over a period of time. The benefits of investment take the form of production of goods and services which, in effect, are treated as incomes. The use of resources for the development of education is essentially an investment, the benefits of which accrue to society for a relatively longer period of time. Therefore, education, in all countries, is regarded to a large extent as a social responsibility. The task of making provision for adequate and relevant education to suit different types and levels of learners is, therefore, largely assumed by the Government everywhere. Obviously, a great deal of caution has to be exercised in respect of planning and management of physical and financial resources devoted to education.

The present Unit, broadly speaking, deals with issues related to educational investment. We talk of issues concerning the decision making for development of human resources and increase in earning, the production function in education and educational wastage, effect of the latter on the
investment function of education, and productive utilisation of resources for education.

2.1 OBJECTIVES

After going through this Unit, you should be able to:

- describe the decision making processes in education;
- outline the theory of human capital and its relationship with economic development;
- identify and describe the ways and means of promoting the formation of human capital;
- explain the external efficiency of investments in education and training, especially its impact on productivity and earnings of educated people;
- describe the production function in education;
- describe such aspects of education system as wastage which impinge upon internal efficiency of investments in education; and
- describe proper utilisation of resources for educational purposes.

2.2 DECISION MAKING

Let us start with the process of making decisions for educational investment. In order to play a justifiable role in expediting the process of educational development, the Government and its constituent bodies have to take a number of sound decisions, of course, taking into account the human resources requirements of different economic and social sectors of the country. A wide spectrum of issues which always receive the attention of educational planners and decision makers encompass such areas as:

- public and private uses of current resources;

- public expenditure on social welfare programmes including those relating to the promotion of economic growth and the necessary provision for such services as education, health, housing and national defence;

- estimation of budgetary requirements of different sectors of education, like primary, secondary, vocational, higher, general and technical education, etc.; and

- determination of the combination of a set of inputs like teachers, laboratory, library, size of the classroom and other necessary equipment, keeping in view of course the desired quality of educational output.

The decisions in respect of all these, however, require detailed information pertaining to:

i) the identification of factors which have a significant bearing on the process of educational development, and the extent to which each factor exerts its influence in determining the course of the above process; and

ii) the alternative costs or losses which a society will have to incur if the appropriate decision is not taken to initiate action for the promotion of education.
Obviously, such information, as noted above, which is gathered through different means from individuals as well as institutions, forms the basis for taking decisions in respect of planning, managing and financing of the education system. As you have seen in Unit 1, education has both consumption and investment aspects, the benefits of which accrue both to individuals and to society. Therefore, investment decisions with regard to the nature, types and levels of education as well as the extent of sharing the costs of the related educational provisions are accordingly taken by both the individual and society. Broadly, the process of decision making can be classified under three categories:

i) decisions made by individuals with regard to buying or obtaining education of different kinds and levels;

ii) decisions made by institutions regarding the sale or supply of education; and

iii) collective decisions taken in the case of conflict of interests or objectives between individuals and institutions or society.

In the following sub-sections we have discussed the different perceptions which influence and guide the decision making processes with regard to acquisition of knowledge, training and technical know-how.

2.2.1 Individual decisions

The investment decisions taken by individuals for buying their dependants' education constitute individual decisions. Individual decision making varies from person to person and from situation to situation, because the decisions are based on the individual's perception of the social and economic gains. These gains are expected to accrue to the family as a whole, after the dependant(s) receive a particular type and level of education. For instance, if a family faces a situation in which it can either finance all the children up to an identical level of schooling or provide financial sustenance to some children for higher levels of schooling, the investment decision of the head of the family in either of the above situations would be influenced by expected gains from the alternative investment. Likewise, individual decisions in education may pertain to the type and level of education, choice of institution and other related aspects which are expected to yield somewhat higher returns from the various alternative investment choices available to individuals, especially in areas characterising purely economic activities. Obviously, for making individual decisions, it is imperative to explore all the alternative opportunities so that sound decisions can be taken for achieving the best possible results. It can thus be said that the individual investors in education seek to maximise the economic returns so that the life time earnings could be increased.

2.2.2 Institutional decisions

All investment decisions taken by either individuals, private enterprises, public institutions or the State, with respect to the creation of necessary facilities for providing education to all those who are eligible and seek it, are termed as institutional decisions. Such decisions are generally subject to societal judgement and even control in one form or another.
The distinction between institutional and individual decisions about investment in education is that the former pertain to those decisions for which there are private or public agents to provide education, and the latter denote those made by or for individuals for procuring their own or their dependents’ education. There is, thus, a difference in the main categories of investments made by the institutions and individuals.

- A large chunk of investment by an institution is accounted for by such items as payments of salaries to teaching and non-teaching staff, and infrastructure facilities like buildings, equipment, library, etc.
- Investment by individuals are made in the form of payment of fees, maintenance expenditure, and the opportunity costs or foregone earnings.

Such a distinction in the pattern of investment arises because individual decisions are influenced by considerations of private benefit whereas institutional decisions have to take into consideration the total impact of the decision on society and economy as a whole.

2.2.3 Collective decisions

Unlike the individual and institutional decisions that you studied in the two sub-sections above, the social approaches to investment in education are dominated by considerations like the social and economic welfare of society. Societal judgement on investment decisions in education takes into consideration the entire investment made by individuals and private and public institutions. These societal decisions are, therefore, reflected in the policies and programmes of the Government for educational development. At times, situations do arise in which the choices made by individuals and/or institutions come into direct conflict with each other and, therefore, indicate divergent trends in human activities. These trends may satisfy the wants of the individuals and institutions concerned but the overall expected gains for the society may be somewhat lower. In such a situation, it becomes imperative to rectify the diverse and heterogeneous nature of choices of investments by way of a strong societal intervention so that the overall social gains of investments in education are maximised without unduly affecting the individual and/or institutional options for purchasing education.

In this context, the collective choice refers to societal investment decisions which are aimed at optimising the social rate of returns derived from investments in education. Such an objective of optimisation is realised by way of aggregating individual as well as institutional preferences, and reconciling the two different dimensions of individual and societal interests and judgements through a sound method is the process of decision making about investment in education.
Check Your Progress 1

Distinguish between individual and institutional decision making with regard to investment in education. Answer in about 12 lines.

Notes: a) Space is giving below for writing your answer.
     b) Compare your answer with the one given at the end of the Unit.

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2.3 DEVELOPMENT OF HUMAN RESOURCES

The major aim of educational investment is the development of human resources or human capital. Almost every society makes a vigorous effort for human resource development which constitutes the ultimate basis for generating the wealth of nations. Capital and natural resources are the passive factors of production, whereas human beings are the active agents who accumulate capital, exploit natural resources, and build social, economic and political organisations with a view to promoting national development. Obviously, if a country is unable to develop the skills and knowledge of its people and to utilise them effectively in various socio-economic activities, it would be unable to develop anything else. It is the development of the human resources of a nation, not its capital nor even its material resources alone, that ultimately determines the character and pace of economic and social development vitally necessary for enhancing the quality of the life of the people.

Let us first distinguish human capital from physical capital.
2.3.1 Human capital vs. physical capital

As you have seen in Unit 1, the term ‘investment’ refers to the expenditure on creation of capital assets which enable a country to produce a stream of goods and services (or income) in the future. On the other hand, the assets which generate income in the future are called capital. Traditionally, economic analyses of investments have tended to concentrate on physical capital, namely machinery, equipment or buildings which have productive capacity. Until the early sixties, there was, however, no worthwhile attempt to examine the economic aspect of education and training which is conducive for increasing the productive capacity of the manpower resources which has a direct relationship with that of the physical capital. Today, there is consensus among the economists and the educationists that the effective use of physical capital in itself is dependent upon the quality of human capital. If there is under-investment in human capital, especially in the form of educational and health services, the rate at which additional physical capital can the productively utilised will be limited.

The market value of human capital, unlike that of physical capital, cannot be observed, largely owing to the lack of homogeneity in the human force. However, knowledge and skills embedded in human capital depreciate after a certain age. ‘Depreciation’ is defined as the negative change in capital value especially due to wear and tear. In the case of human capital, it depends upon the age of a person while in the case of physical capital it is the chronology of time that causes it. In other words, depreciation of human capital occurs as a result of increased probabilities of death and gradual deterioration of mental and physical capacities with increase in age. However, in certain other cases like white collar jobs (i.e., office jobs), there may be ‘appreciation’ of human capital with age. Further, human capital, like physical capital, also has ‘obsolescence’, i.e., it becomes out of date over a period of time. This is so because the usefulness of the stock of knowledge and skills changes from time to time.

Human capital, like physical capital, requires regular efforts to keep up the required level of knowledge and maintenance of physical vigour and mental calibre. For instance, medical care and health services are concerned with the repair and maintenance of human capital. Unlike physical capital, it deteriorates during the periods of idleness and unemployment which impair the skills and knowledge already acquired. Acquisition of knowledge, like possession of physical property, requires adequate investment of physical and financial resources, time and effort. The expenditure on education, health and other welfare programmes help not only in improving the quality of human resource but also in enhancing productivity.

Human capital has many peculiarities which distinguish it from physical capital. Some of the important distinguishing features are as follows:

i) No two units of human capital are homogeneous.

ii) Human capital (the factor) and the individual (the agent) who employs it are not repairable; in the case of physical capital it is always so.

iii) Human capital requires a longer gestation period as compared to physical capital. The term gestation period refers to the time gap between the start and the completion of training for a person. In the
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In the case of physical capital, it refers to the start of investment in the building or installation of a production unit and the period taken to complete the work of installation so that production can be started.

iv) With the lapse of time and on-the-job experience, human capital adds to the built-in potential of human stock.

t the depreciation of human capital is difficult to determine as it rests on many factors including the factor of heredity.

vi) Occupational and spatial mobility of human capital is influenced by socio-economic factors, besides purely commercial considerations.

vii) Productivity of human capital is the function of the efficiency of the individual as well as the resourcefulness of the firm and the country where he/she is employed.

viii) Development of human capital is the pre-condition of the optimal utilisation of improved technological and physical inputs, and their relationship is of a complementary nature.

ix) Expenditure on human beings is non-transferable, its consumption and investment components are inseparable, and it changes the economic as well as the non-economic attributes of the individual concerned (Patel, 1969).

It is obvious from the foregoing distinguishing features of human capital that it has many social advantages over physical capital. However, there are difficulties in quantifying the social indicators of change and measuring the qualitative aspects of social development in which the role of the human factor is so crucial. Therefore, it is not easy to formulate a model approach whereby human capital could be expected to discharge its assigned role like its counterpart, i.e., physical capital. This constitutes a major weakness in the theory of human capital vis-a-vis the physical capital theory, especially in the context of its role in stimulating economic and social development.

2.3.2 Human capital: dimensions and determinants

(i) Dimensions of human capital

Human beings invest in themselves to acquire more education and training, and better health conditions which, in essence, form human capital, which has both quantitative and qualitative dimensions.

a) **By quantitative dimension** we mean the number of people performing a particular task, the proportion of people who enter into the labour force or into gainful employment, and the number of hours devoted to completing a particular task.

b) **On the other hand, the qualitative dimension** of human capital involves the acquisition of a variety of skills, extent of knowledge, abilities and other desirable attributes that affect human capabilities of undertaking productive work as well as handling it efficiently with a view to maximising the outputs.
(ii) **Determinants of human capital**

Of the various factors that determine the human capital, the following are the most important:

*a) Education*

Imparting the knowledge of various types and levels like elementary, secondary and higher knowledge — which are, by and large, formally organised — is one of the most significant determinants of human capital. Upgrading of standards by way of ensuring the effectiveness of the teaching and learning process and modernisation of curricula at all stages of education, and maintaining positive links between education and the world of work, have a significant bearing on the quality of human capital. This, however, requires that due emphasis be laid on science, environment and value-oriented education, which are the basic elements of the quality of human capital.

*b) Health service*

The nature and the extent of availability of health services have both quantity and quality implications for human capital. Improvement in the standard of health of people has a direct link with population growth. Modernised health services improve life expectancy, reduce infant mortality and the incidence of diseases. All these factors improve the possibility of sustaining physical vigour and longevity of the labour force, and they are positively related to high life long earnings. Moreover, health services enhance the quality of human resources by enabling them to acquire better knowledge and benefits from the new know-how which, in turn, enhances not only the prospects of earnings but also the quality of life enjoyed by them.

*c) On-the-job training*

Almost every employer makes necessary arrangements to provide in-service training to employees as it helps the trainees to become acquainted with the efficient methods of production based on new knowledge. For instance, in-service teacher training oriented towards innovative programmes in the thrust areas, such as education of the first generation learners — specially learners from the poor and deprived sections of the community helps in expediting the process of educational development. Likewise, vocational and environmental education, and group specific non-formal education oriented towards skill formation, etc., contribute to the productivity of human capital. The costs of on-the-job training are recovered or neutralised by improved productivity gains due to the techniques of production newly acquired by the work force.

*d) Non-formal education*

Non-formal education, which is normally aimed at school dropouts, who cannot attend full-time schools, also contributes to the formation of human capital. Industrial workers, farm labourers and other self-employed artisans and craft persons are generally the target groups under non-formal education programmes.
e) **Extension programmes**

Study programmes are organised by various institutions, firms and organisations. They include extension programmes in agriculture and allied sectors. Such programmes are intended to improve the performance of the labour force, who are already on the job in different sectors of the economy, by way of transmitting new knowledge and skills to them.

f) **Housing, urban development, water supply and sanitation**

In fulfilling the pre-requisite condition for sound human capital, housing ranks next only to food and clothing in importance. A minimum standard of housing is obviously essential for a healthy and civilised existence. Moreover, factors like urban development, water supply and sanitation also affect the development of human capital and the quality of the life of people.

g) **Modernisation of technical education**

Modernisation of and removal of obsolescence in technical education programmes and timely facilities help in developing infrastructure for manpower training in emerging areas which, in turn, improve the quality of the human capital.

h) **Migration of workers**

Migration of individuals and families to other geographical areas help them exploit the new opportunities and equip themselves to adjust to the new environment which, in effect, enhances the ability of human beings to gainfully exploit the economic opportunities available.

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**Check Your Progress 2**

List and describe in about 8 lines the dimensions of human capital.

**Notes:**

a) Space is given below for writing your answer.

b) Compare your answer with the one given at the end of the Unit.

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2.3.3 **Education as human capital**

Of all natural creatures, it is only human beings who have the ability and capacity to generate, disseminate and preserve knowledge and technical expertise. The acquisition and possession of knowledge by them through the educational processes turns them into human capital, which has a strong and
positive correlation with the ability of human beings to use knowledge as effective means to satisfy their varied needs and wants.

Let us examine how education itself may be considered human capital that further contributes to improved productivity.

i) First, education and training influence the ability of the labour force to perform their jobs in a better way owing to improvement in manual skills and rational methods of handling different types of jobs.

ii) Secondly, inculcation of scientific temper and values improves the allocative ability which, in essence, refers to the worker's ability to choose the most appropriate among the possible alternatives to reach the set objective. Such an ability presupposes judgement, cognitive ability as well as technical know-how.

iii) Thirdly, the educational process alone can enhance the innovative ability of human beings, which is crucial for raising productivity and increasing the level of earnings. Though it is difficult to establish a relationship between the level of schooling and innovative ability, it is certain that for innovations a great deal of cognitive ability and knowledge is essential, which is acquired mainly through the process of formal and non-formal education.

The above-mentioned three points suggest that an educated person embodies better human capital than an uneducated one. Can you, at this stage, think of the attributes of human capital? Some of the distinctive attributes of this capital are given below.

i) An individual's stock of human capital cannot be sold, nor can it be given to someone else. It goes with the individual wherever he or she may go. If an individual were to migrate to another country, the government cannot confiscate that person's human capital.

ii) To take advantage of the human capital, an individual must employ it in person.

iii) The duration of the value of an individual's human capital cannot exceed his or her life span.

iv) In acquiring human capital the individual must invest some of his or her time along with other resources.

v) It is productive to invest in human capital at a young age, because the value of time is less than it is when the individual grows older.

Human capital depreciates over time as does physical capital. Some aspects of human capital become obsolete in a short time because of changing circumstances, while others have a long life even if the circumstances change (Schultz, 1963). Therefore, human capital must be updated and upgraded from time to time. With the advancement of knowledge, an individual must renovate his/her human capital. For example, new technologies have to be studied and new advances in medicine have to be studied by doctors.

Obviously, education and training of people affect positively most of these attributes of human capital. This facts leads us to know more about how human capital is formed—education is human capital!
2.3.4 Formation of human capital

The term 'human capital formation' refers to the level and extent of acquisition of new knowledge, technical know-how, skills and experience by the workforce. Such human capital formation is important because the productive capacity of a country depends not only on its endowment of industrial plants, machine tools and natural resources, but also on the level and types of education and training embodied in its labour force. The human capital formation is, therefore, an essential but not a sufficient condition for accelerating the pace of development as skilled labour force, entrepreneurs, managers and administrators are needed for the development of institutions as well as for directing critically the needed manpower into productive channels. For instance, a machine by itself can do nothing, but when handled by a technician it becomes productive, and when handled by a better technician, it becomes more productive. Thus, without the formation of better and still better human capital, it is not possible to promote and sustain a high rate of economic growth.

The human capital formation is a time consuming and continuous process. To train a person, for instance, as an engineer, doctor or teacher, requires a period of one and a half to two decades. And this process is influenced by various important factors ranging from the availability of adequate food and health facilities to on-the-job training, through formally organised education at the elementary, secondary and higher levels, study programmes for adults, extension programmes, etc.

There are certain factors which slow down the process of human capital formation. Poverty, defined as deprivation of basic material needs for survival, is the major bottleneck which hampers this process. Although all people have a creative spark that is inborn in them, poverty and the consequent poor health, tension, anxiety, worry, etc., can sap that creativity and, thus, impinge upon the learning abilities. Poverty does not permit people to get nutritious food, education, recreation, etc., and therefore, imposes restrictions on the human capital formation. Also added to this limitation are wide-spread illiteracy, low education, status of workers, etc., that dampen the level of the human capital formation. And if the investments in human capital are lop-sided, unscientific notions and social factors like superstition, social taboos, caste system, unchecked population, etc., continue to hamper this process further. Every country, therefore, plans its educational, health and other social services in such a way that they become conducive to expediting the process of human capital formation.

2.3.5 Human capital formation: quantitative indicators

Human capital constitutes the most important of all the resources, and with skilful management and scientific planning, it can go a long way in taking a country from a lower to a higher stage of development or from poverty to prosperity. In order to realise the socio-economic objectives, a number of quantitative indicators are evolved which assist in the task of assessing and evaluating the nature and degree of human capital development. These indicators generally fall into two broad categories (Harbison and Myers, 1964):
Education as Investment

i) those which measure a country's stock of human capital; and

ii) those which measure the gross or net additions to the stock or, more precisely, the rate of growth in human capital over a specified period.

The stock of human capital indicates the level of the human resource development which has been achieved by a country; and the rate of the human capital formation indicates the extent of periodic improvements in such capital. Let us discuss these two indicators in some detail.

Some of the important indicators of the stock of human capital are as follows.

a) The first indicator is the level of educational attainment, i.e., the gross number of persons in the total population who have completed successive levels of education, like primary, secondary and higher education. Of these levels of education, the last two are important in indicating the stock of high-level human resources.

b) The second indicator is the number of persons in relation to the population or labour force, who are in high level occupations. These refer especially to the numbers in selected strategic occupational groups such as scientists, engineers, managers, teachers, doctors, technicians, nurses, etc.

Some of the important indicators for measuring the additions to or improvements in the human capital stock are as follows.

a) The first indicator is the number of pupils enrolled at the primary level education as a percentage of the estimated population, say between the age of 5 to 14, who are supposed to attend school.

b) The second indicator includes the pupils enrolled at the secondary level of education as a percentage of the estimated population aged 15 to 19 inclusive, adjusted for the required length of schooling.

c) The third is the enrolment in higher levels of education for the age group 20 years and above.

d) The fourth is the proportion of students enrolled in scientific and technical faculties in a given year.

e) The fifth indicator is the proportion of students enrolled in faculties of humanities, fine arts and law in the same year.

A more comprehensive account of the indicators is provided in section 1.5 of Block 2.
Describe in about 12 lines how education contributes to human capital.

**Notes:**
a) Space is given below for the writing your answer.

b) Compare your answer with the one given at the end of the Unit.

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### 2.4 EDUCATION AND EARNING

Earning, which is an indicator justifying investment, is closely related to education due to the fact that educated workers earn higher wages or salaries than those who are illiterate or unskilled or have lower educational qualifications. The relationship between education and earnings is important from the point of view of distribution of income and wealth among a cross-section of people. In countries with feudal characteristics, where inequality in income is generally very high, it is very difficult to ensure the even distribution of income by way of transferring resources from the haves to the have-nots due to the policy constraints arising from socio-political considerations. In such situations, equalisation of educational opportunities (which we touched upon in Unit 1) helps the poor and deprived sections of society to improve the levels of their educational standards, skill and training, thereby increasing the prospects of employability, higher earnings, etc. Education is thus used as a major instrument to ensure the even distribution of the benefits of development among different socio-economic groups, without taking recourse to direct transfer of income and wealth, which if attempted might arouse the resentment of the high income groups of people.

Moreover, an idea of the nature and extent of the relationship between different types and levels of education and the earning from different professional categories is of crucial importance in the decision making processes, especially with regard to the optimum and efficient allocation of resources. This is mainly because the higher level earning reflects the higher degree of productivity of educated persons. It is, however, important to note that apart from the education of the workers, the patterns of wages and salaries reflect the influence of many other factors. The individual's natural
ability, family background and other personal characteristics also determine the pattern of the earning differentials.

### 2.4.1 Earning profiles

As discussed above, the level of education that an individual possesses, in on form or the other, is positively correlated with the amount of personal earning. Age, sex, race, native ability, social class background, place of residence, branch of employment, occupation, and on-the-job training are all important factors which have a significant bearing on the earning profiles. Of these, however, the influence of the number of years of schooling completed successfully is the most significant, which implies that additional years spent on education raise the life-time earnings of people. We have evidences on the earning functions and path analyses of the effects of an individual's background and characteristics on occupational attainment and earnings, that indicate that a large part of the variance is explained by the index of education. The number of years of successful education is the best predictor of the eventual occupational status and earning of an entrant into the labour force market. Entry for a person, who successfully completes the necessary schooling, into the sector of the modern labour market has a higher probability of getting well-paid urban jobs than one who does not have access to an adequate level of education.

The earning profiles of workers with different levels of education or length of schooling share three general characteristics as given below.

i) The average earnings of all workers, both highly educated and illiterate, increase with age up to a maximum in mid-career, and the curve then either flattens or begins to decline.

ii) The higher the level of educational attainment, the steeper the rate of increase of earnings and, in most cases, the higher the initial earning of workers at the start of their working life, the higher their emoluments towards the end of their service.

iii) The workers with higher levels of education reach their maximum earning capacity faster, and their level of earnings at retirement is also higher, as compared to those who are less educated.

These three characteristics suggest that, over a life-time, the total earnings of educated workers remain considerably higher than the life-time earnings of those with very little or no education. By and large, it has been established that the average earnings of workers rise as they grow older until they reach their peak level of earnings between the ages of about 40 and 55. Thereafter, the average level of earnings decline, even though the earnings of the individuals may continue to increase till their retirement. The average earnings of all workers decline steeply after retirement, around the age of 60 to 65.

From the foregoing discussion, it is clear that the levels of education, or the educational qualifications of workers, influence their relative average earnings. For instance, university graduates have consistently higher average earnings than workers with only secondary schooling, and likewise, the latter
earn more than those with only primary, middle or elementary schooling, or the illiterate with no schooling at all.

### 2.4.2 Earning differentials

The income derived from the sale of the labour services is determined by a variety of factors such as social, economic, political, geographical or personal traits. As it is a psychological fact that each individual is different from another, the economic fact is that the earning capacity also differs from individual to individual.

As discussed in sub-section 2.4.1 above, the differences in educational attainments and age directly affect the earning capacity of an individual, but they are not the only factors that influence the relative earnings.

Sometimes race and sex also play an equally important part in determining an individual's earning potential. In many countries, and in many industries or occupations within countries, discrimination may exist for different reasons, which may distort earning patterns. Research studies have shown that women generally earn less than men, irrespective of discrimination on account of personal characteristics or lower productivity in certain jobs. People of high castes or socio-economic backgrounds usually have higher average earnings than others. Nevertheless, the more educated earn more than the less educated, when race, sex and other similar factors are constant.

Apart from race and sex, hours of work and occupational differences also affect the average earnings of different workers. Therefore, it might be concluded that the earning differentials are caused due to the superior natural ability, family background, motivation, social class, access to well-paid jobs, etc. However, education and experience with age are the major determinants of earnings.

The relevant theories that have been evolved to explain as to why differences in earnings exist may be summarised as given below.

i) The earning differentials exist because of the differences in the nature of jobs. Since some jobs are more dangerous in nature and involve more dissatisfaction, the employee expects a compensating premium. Similarly, some occupations require additional training as compared to certain others, and as a result, some expenditure is incurred during the training period in which people generally seek to recover in the form of higher earnings.

ii) Wage differences also exist because of the differences in individuals. If more able people are scarce, the extra earning of the more-able are due to the limitations in the supply of able labour.

iii) In the absence of perfect consumption, institutional factors which are susceptible to discrimination also explain wage differentials.

### 2.4.3 Earning and productivity

Education has usually been considered an investment in human capital. The basic assumption behind this is that education raises the productivity of
workers, and that the higher earnings of the educated reflect the value of their product. The most obvious way in which education raises productivity is by imparting knowledge and skills which make a worker more efficient, and hence more valuable in the labour market than the less educated workers.

If earnings reflect differences in marginal productivity, then the extra earnings of the educated measure their higher contribution to the output. The marginal productivity of a worker is the addition to the total output which is achieved by employing one additional (marginal) worker. In this context, the economic theory suggests that the relative prices of goods and services and the relative wages and salaries of workers reflect their relative scarcity, and, hence, the productivity of the workers, provided, of course, that the market, including the labour market, is competitive. If markets are perfectly competitive, then earnings provide a completely satisfactory measure of productivity. However, if there exist some imperfections in the degree of competition, the earnings will still reflect differences in productivity, provided the forces of demand and supply ensure that scarce factors command a higher price than the plentiful factors of production. Since highly educated workers are more scarce than the unskilled and uneducated workers, they become costlier, and are paid more in terms of average wages and salaries.

**Check Your Progress 4**

Answer in about 8 lines in what way earning and productivity are related to each other.

**Notes:**

a) Space is given below for writing your answer.

b) Compare your answer with the one given at the end of the Unit.

2.5 PRODUCTION FUNCTION IN EDUCATION

Having talked about the relationship between education and productivity, let us now look into the production function of education, i.e. the input-output relationship in an educational system.
2.5.1 The production function

The concept of the production function is the theoretical construct employed by economists for analysing the effectiveness of resources allocation decisions of firms or industrial enterprises. A firm's production possibilities are assumed to be governed by certain technical relationships between inputs and outputs, which indicate the maximum feasible output that can be obtained from a given set of inputs. In other words, production function defines the boundary in the input-output relationships, specifying the maximum output from employing the best combination of inputs.

An important concept associated with the production function is the notion of productivity. Can you recall how we described this notion earlier in this Unit? (see sub-section 2.4.3 above). We defined productivity as the output obtained for the resources expended, i.e., the ratio of output to input at a particular time or place. The relationship between the total output and the total input in a particular period is called average productivity, whereas the relation between incremental output resulting from the addition of one unit of a factor of production is known as marginal productivity. Productivity may be measured either in physical terms, i.e., physical units of output resulting from the use of a combination of a factor or addition of a factor to existing ones, or in terms of value productivity expressed through money value of the products.

The production function in education is described as the process which explains the relationship between the variety of inputs to the outputs. The list of inputs include the size of the institution, number of staff, class size, classroom atmosphere, student-teacher ratio, per unit instructional expenditure, number of instructional assignments per teachers, teachers' qualifications and experience, teachers' salaries, verbal ability and job satisfaction, administrative expenditure, library and science laboratory facilities, specific vocational courses, etc. The outputs are measured by the number of students passing a particular grade and their ability to absorb and apply knowledge in their day-to-day activities. (The earning profile described in sub-section 2.4.1 also indicates the quality and quantity of the output). Thus, the production function in education can be defined as a process which transforms the fixed quantities of inputs i.e., individuals into individuals with different qualitative attributes which are conducive for the socio-cultural transformation and economic development.

2.5.2 Human capital and agricultural/industrial productivity

As discussed in section 2.3, the concepts of human and physical capital are closely interrelated. The availability of natural resources, physical capital and abundant unskilled labour alone are not sufficient for developing a modern and highly productive economy. A wide range of human skills and a high level of specialised human resources are essential for the dynamics of development. In the absence of a relatively high level of human skills, it is not possible to make the optimum use of physical and financial resources. In order to benefit fully from the new productive techniques that emerge from the advances in science and technology, every country plans for competent scientists/technicians and administrative and managerial personnel for raising productivity in every sector of development, as the contribution of human
resources in promoting economic growth is very close to that of natural resources. This is more so because in all the developmental matters where scientific know-how and technology are increasingly made use of, organisational capacity, motivation, creativity and application of knowledge play a vital role in accelerating the pace of development. The development of human capital, therefore, is crucial for improving efficiency and thereby raising productivity which, in turn, promotes economic growth.

Let us discuss productivity in both agricultural and industrial sectors.

i) Agricultural sector

As far as productivity and growth in the agricultural sector are concerned, regional variations in agricultural fields and crop responses are explained by the differences in the quality of the individual behind the plough. It is the well trained and skilled individual who is the central catalyst in the process of agricultural production as, compared to other economic activities, the agricultural sector is highly labour intensive, especially in the developing countries. It is the human being who manipulates plants and animals to produce the food and fibers which we require; who also take decisions in the production process especially with regard to what and when to plant, how to plant, in what kind of soil to plant, how to cultivate the growing plant and how to protect it against pests and diseases, when to harvest, etc.

In short, the human being is the main functionary in the process as he/she is responsible for taking and carrying out decisions pertaining to tilling the soil, planting, weeding, etc. Hence, an individual and his/her abilities and skills (that we have earlier referred to as human capital) are of crucial importance for expediting the process of agricultural development. The performance of the farm worker is reflected by the indicators of agricultural productivity such as production per acre and per worker.

As in the case of agricultural production, the role of human capital is also crucial for industrial productivity.

ii) Industrial sector

Productivity and growth in the industrial sector are dependent on the availability of material resources as well as the upgrading of human resources. The latter require the imparting of scientific knowledge and technical know-how on a continuous basis, because improvements in the quality of human resources help in realising the objective of increasing the level of outputs which constitute the means for alleviating poverty and raising the quality of the life of people. In modern times, for effective industrial growth, what is essentially required is highly qualified human resources, such as engineers, technicians, designers, managers and administrators so as to ensure efficient and effective management of industrial and commercial enterprises.

In brief, human capital is positively and significantly associated with productivity in both the sectors—agriculture and industry. It is so in all the sectors of human enterprise.
2.5.3 Level of education and output return

You have read about the contribution of education to marginal productivity in sub-section 2.4.3 above. There are research studies (Psacharopoulos, 1973 and 1981) that have shown that rates of return to education and the levels of education acquired by the human resources are positively related, though there are differences in the social and private rates of return to education of different types and levels. While the social rates of return are generally estimated to be higher at the lower levels of education like the primary and elementary stage, the accrual of private benefits are relatively more from the successively higher levels of education. It is on the basis of such evidence and reasoning that most governments everywhere on the globe have adopted a deliberate policy of providing free education for certain age groups of the population; for example, up to 14 years of age in India, while the extent of subsidy (as a proportion of total cost of education per student) is somewhat less at the higher levels of education as compared to the lower levels. However, the rates of return to education—social and private—differ considerably, not merely at different levels and types of education, but also across various regions.

2.5.4 On-the-job training

On-the-job training, which has different connotations, commonly refers to organised instruction at the work place. In a narrower sense, it implies job related training programmes sponsored by the employer or required by an employee as a pre-condition for promotion, even when conducted on other premises. On-the-job training, therefore, is a process that raises future productivity and differs from institutional training in that in the former case an investment is made on-the-job rather than in an institution that specialises in teaching. Hence, in a broader sense the term implies formal as well as informal training programmes in a job situation (the latter is also experiential learning or learning by doing) which result in improvement of the worker’s productivity.

On-the-job training is of two types: general and specific. Let us briefly discuss these two types.

i) General training

General training is useful in many firms. For example, a mechanic trained in the army finds his/her skills useful in steel and aircraft firms; or a doctor trained at one hospital finds his/her skills useful in other hospitals. Most of the on-the-job training programmes presumably increase the future additional product of workers in the firm providing it. General training also increases the additional product in many other firms or organisations as well. This implies that general training is also equally useful in many firms, and there is rise in additional product more or less in the same order in all of them. Consequently, wage rates rise in accordance with the productivity gains. Persons receiving general training pay the cost of training as it can raise their future wages as well as their productivity.
ii) **Specific training**

In contrast to general training, specific training is a kind of training which increases productivity in a particular line of production. Obviously, it increases productivity more in the firms that provide it. For example, some forms of training provided to military officers like the astronauts, fighter pilots, etc. are useful to the defence sector only. Such training schemes fall under the scope of specific training because productivity is raised in the relevant sectors but not elsewhere. In such a case, the cost of training is usually made available by the firms concerned.

In short, it may be said that on-the-job training — no matter whether general or specific, whether received virtually as a part of the job at the work-place or elsewhere — is basically a training of the active members of the labour force with the purpose of improving productivity and career prospects at one and the same time. On-the-job training entails investments in the human capital of men and women who have already entered in the labour force, and these investments are oriented towards their future in paid or self-employment.

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**Check Your Progress 5**

Given below are two questions. Space is given after each question for you to write your answer. Compare your answers with those given at the end of the Unit.

**Notes:**

a) Write your answer in the space given below.

b) Compare your answer with the one given at the end of the Unit.

i) What is meant by productivity when applied to education?

ii) Differentiate between average productivity and marginal productivity in about six lines.
2.6 WASTAGE IN EDUCATION

Planners of education have always expressed concern about educational wastage caused by repetitions and dropouts. Such wastage is one of the difficulties in fulfilling the social demand for formal education. For effective management of an educational system, it is required that the retention rate should be improved by reducing educational wastage while maintaining the quality of the system at reasonable input costs. In the following sub-sections, an attempt is made to define the concept of educational wastage, discuss the issues concerning its measurement and examine the relationship between dropouts and repetition. Though the examples given in the sub-sections pertain to school, where the magnitude of wastage is high, they are equally applicable to colleges and universities where the magnitude of repetition and dropout is comparatively lower than that at the earlier stages of education.

2.6.1 Educational wastage

Educational wastage is an economic term defined as the total number of student-years spent by the repeaters and dropouts. A repeater is a student who, in a given school year, remains in the same grade as in the previous year, while dropouts are those who leave the school before the end of the final year of, or somewhere during, an educational cycle in which they are enrolled. Wastage refers to the benefits provided to the repeater for his/her spending extra time in school, and the benefits accruing to the dropouts before their leaving the school. Total wastage, then, merely reflects the total size of repetition and dropout in the flow of promotion within an educational system. Of the two, repetition is thought to be more wasteful because repeaters:

- stay in school longer than normal duration thereby reducing the intake capacity; and
- cause the loss of investment in educational services and increase the amount of expenditure per student.

Besides, it raises inequalities as failure to get promoted at a normal pace is larger among learners of rural low socio-economic background.

2.6.2 Measurement of wastage in education

While some attempts have already been made by researchers to evolve formulae for measuring wastage, there is no foolproof method to measure it. This is so because within school systems repetition may be due to various reasons. For instance, a student’s migration from a rural school to an urban school before completing a particular grade (due to the migration of parents to the urban area), and taking admission in the same grade again in the next year in the urban school causes repetition for the student. Sometimes, students pass a year-end examination but repeat a grade to improve the overall score. For example, in some multi-lingual societies repeating the first grade (Grade I) may be a prerequisite for the students to master the language of instruction which is different from their local dialect. Moreover, high rates of repetition in the final grade (Grade X) of secondary education may be due to the desire on the part of the students to obtain favourable results needed to
qualify for admission to the senior secondary grade. Inspite of these problems, certain methods have been in use for measuring wastage at any given level. One such method which has been extensively used for this purpose includes counting the number of failures during different years from the same cohort of the students. The formula used in India for computing the indicator of wastage at school level is as follows:

\[ \text{Index of wastage} = 1 - \frac{\text{Total optimum years}}{\text{Total actual used years}} \]

where, ‘optimum years’ stands for the number of years required to complete the prescribed course on the assumption that every student will make normal and regular progress from year to year. The ‘actually used years’ are, however, calculated by counting the total number of years spent in school by every student in the age-cohort (NCERT, 1968).

The procedure described above, however, cannot be applied for quantifying the wastage at international levels. When comparing educational wastage across nations, a great deal of caution needs to be exercised because educational systems are not alike structurally; and promotion policies and achievement norms differ to a great extent.

For measuring wastage across nations, a different approach has been used with reasonable convenience and success. It consists of measuring 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). We have considered educational wastage 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 grades two and three once each, calculations would show that the student has spent five pupil years—two as a repeater and three as a dropout.

2.6.3 Repetition and dropout

Let us specifically distinguish between dropout and repetition. Dropout is generally understood to note the premature withdrawal of a student from an institution before completing the last grade of the stage of education at which he/she is studying. Thus, every student who is withdrawn from the institution before completing, for example, grade VII or VIII is a dropout. Whereas repetition is defined as the retention of a student in a grade for more than one year on account of unsatisfactory progress. Thus, if a student passes a grade in two or more years, he/she constitutes a case of stagnation or repetition.

The tendency of students to repeat and dropout is greatly influenced by socio-economic and educational factors. We have evidence that point out the fact that social and economic backwardness of the family has been one of the most important causes contributing to the phenomena of repetition and dropout. Moreover, factors like excessive involvement of learners in domestic work, parental opposition to or indifference towards education, and the educational status of the parents have a direct impact on the education of learners and their performance at school. As far as educational factors are concerned, stagnation, absence of relationship between educational system
and economic needs of the community, faulty admission policy, lack of physical facilities, poor institutional environment, etc., are some of the significant causes of repetition and dropout. Besides, certain miscellaneous factors like the death of parents, poor physical standard of learners, etc., also lead to dropping out or repetition of grades.

Check Your Progress 6

Describe in about 8 lines how wastage in education is measured.

Notes: a) Write your answer in the space given below.
    b) Compare your answer with the one given at the end of the Unit.


2.7 EFFECTIVE UTILISATION OF RESOURCES

The allocation of resources for education must be effectively utilised to derive the maximum benefit from those resources. Such resources are of three types:

i) Human resources: teaching, administration, technical and professional staff.

ii) Physical infrastructure/resources: classroom, laboratory, library, instrumentation centre, hostel, office accommodation, etc.

iii) Financial resources: fees from students, donations, endowments, government grants, etc.

Though effective utilisation of financial resources is usually taken into consideration, the human and physical resources acquired through financial resources are also equally important. Resources are deployed with the intention of achieving certain objectives and systems to study the capacity of resources for goal achievement. Factors like the organisation of a system, size of its operation, mechanism of finding, timeliness of resource allocation, flexibility in deployment, and adequacy of resources affect the efficiency of resource utilisation. An analytical framework of utilisation of resources in education is given by Qamar (1992) while studying higher education institutions. The framework takes into account the working of indicators of efficient resource utilisation, ascertaining of the status of utilisation of resources and exploring the causes of their under-utilisation. We shall discuss the indicators of the three types of resource utilisation. It may be noted that while these indicators are broad and suggestive, one may select indicators at micro-level depending on the objective of analysis and the components involved in the organisation of the system under study.
Utilisation of human resources

The indicators for a study of the utilisation of human resources take into account what different kinds of employees are expected to do, and what responsibilities are assigned to them by the organisation. In a situation involving face-to-face classroom teaching, the index of utilisation of teaching resources, for instance, can be studied with the following formula:

\[ I_T = \left( \frac{t_1}{t_0} \right) \left( \frac{h_1}{h_0} \right) \left( \frac{d_1}{d_0} \right) \]

where:
- \( I_T \) = the index of utilisation of teachers as resource
- \( t_1 \) = the actual number of teachers reported taking their classes
- \( t_0 \) = the total number of teachers working with an institution
- \( h_1 \) = the actual number of hours teachers are generally available in the campus
- \( h_0 \) = the standard number of hours teachers are expected to be available in the campus
- \( d_1 \) = the actual number of days an institution conducts teaching
- \( d_0 \) = the standard numbers of days the institution must conduct teaching as per the rules

While data relating \( t_1 \) and \( h_1 \) need to be collected from students, teachers and heads of departments through structured questionnaires, the performance of students in annual (and term-end) examinations expresses the effectiveness of teaching. The effectiveness of non-teaching (library, laboratory, administration, secretarial) resources may be studied through the following formula:

\[ I_s = \left( \frac{s_1}{s_0} \right) \left( \frac{d_1}{d_0} \right) \left( \frac{h_1}{h_0} \right) \]

where:
- \( I_s \) = the index of utilisation of a particular category of non-teaching staff
- \( s_1 \) = the actual number of staff reported efficient
- \( s_0 \) = the actual number of staff in the category of \( s_1 \)
- \( d_1, d_0, h_1, h_0 \) as above

The indices of utilisation may be calculated separately for various categories of such staff; and a final weightage may be calculated for all the indicators to suggest the effective utilisation of human resources.

Utilisation of physical facilities and infrastructure

The optimum of utilisation of physical facilities and infrastructure like classroom, library, laboratory, etc. may be studied by using the following formula:

\[ I_{PH} = \left( \frac{ph_1}{ph_0} \right) \left( \frac{h_1}{h_0} \right) \left( \frac{e_1}{e_0} \right) \]

where:
- \( I_{PH} \) = the index of utilisation of a particular type of physical facility or infrastructure
- \( ph_1 \) = the actual number or portion of the facility being in active use
- \( ph_0 \) = the total number of facility available in the educational institution
The $e_1$ refers to the actual number of persons making use of the facility in a given time frame.

The $e_0$ refers to the standard number of persons which may use the facility in a given time frame.

$h_1, h_0, d_1, d_0$ as above.

The $I_{PH}$ has to be calculated separately for each type of physical facility and infrastructure available in the institution.

**Utilisation of financial resources**

Financial resources have no meaning unless these are utilised to procure human and physical resources for further utilisation. Their efficiency to procure human and physical resources determines their effective utilisation. Three important indicators of effective utilisation of financial resources are discussed below:

i) **Allocative Efficiency**: The efficiency of financial resources vis-a-vis achievement of goals of an institution depends on how resources are allocated. The ratio or proportion of expenditure, administrative expenditure, teachers, teaching aids, procurement of facilities, maintenance of facilities, and the like indicates the allocative efficiency of financial resources.

ii) **Administrative Efficiency**: The efficiency shown by the administration in spending money determines the effective utilisation of financial resources. Administrative efficiency or inefficiency is reflected through various indicators including: over-spending, budgetary deficit, diversion, refund of funds from one activity to the other, procedural delays, refund of funds due to inability to spend in the stipulated time or financial year, delay in completion of tasks or projects, and the like.

iii) **Efficiency of Funding Mechanism**: Every institution has its own mechanism of generation, allocation and utilisation of financial resources. Factors such as adequacy, timeliness, objectivity and flexibility in funding mechanism determine the effectiveness of utilisation of financial resources.

While the above analysis was based on the consideration of effective utilisation of resources at the institutional level, some issues need to be addressed to and resolved at the system or state/government level so that resources are effectively utilised for education. Three important issues are discussed as follows (Singhal, 1992):

i) **Policy Issues**

The policies of the national or provincial governments largely affect the allocation and utilisation of resources for education. Some of the policies include the following: Whether the system of large scale public support for education should continue or there shall be greater privatisation of educational provision (at school or college or university level)? Whether there should be indiscriminate expansion of regular colleges and universities (leading to at times substandard educational provision) or education should be restricted to the selected meritorious students?
Whether there should be expansion of non-formal and distance education provisions so as to economise educational resources? Whether the norms and regulations for educational institutions should be framed and strictly followed so that quality is ensured and resources are efficiently utilised? Keeping in view the analytical findings on the rate of return, whether there should be readjustments in inter-sectoral allocation of resources? Whether there should be regular national academic and financial audit of institutions or should each of the educational institutions be left free to decide for itself? Whether grants should be linked to performance of educational institutions? These and allied issues at the policy level affect the allocation and utilisation of resources at both national and institutional levels.

ii) Management Issues

- The organisational climate affects considerably the utilisation of resources in educational institutions. At the central and provincial levels, decisions have to be made with regard to, for instance, the activities of teachers and non-teaching staff associations which largely affect the efficient utilisation of human, infrastructure and financial resources.

- Mechanisms of institutional evaluation affect their performance. The question arises as to whether there should be external evaluators or self-evaluation, or both? What reward (or even punishment) systems are adopted, based on institutional and individual evaluations?

- The system of budget management affects the extent of utilisation of resources. Modern techniques, viz. expenditure analysis, unit costing, and the like have been useful in determining the cost-effectiveness of each of the items of expenditure.

- The measures undertaken in minimising and checking wastage contribute towards the efficiency in resource utilisation. The decision as to whether institutions need to consider further utilisation of physical and human resources during the period when students are not on-campus. This would not only meet deficits if any, but also facilitate institutional goals of innovation and quality enhancement.

iii) System-Level Issues

Some decisions taken at the state level, other than those concerned with policy and management issues as discussed above, have implications for the functioning of the educational institutions at the system and institutional level. For instance, the staffing pattern in institutions and actual work (load) allocated to various categories of functionaries influence institutional efficiency. Frequent transfers of teachers adversely affect teaching. At school level, for instance, policy shift from an emphasis on enrolments to the development of mechanisms leading to higher retention and lower attrition contributes to an increase in efficiency in the system.

It may be emphasized that effective and efficient utilisation of physical, human and financial resources is the most important
indicator of success of educational systems and institutions. Efficiency in utilisation of resources is directly related to an increase in academic standards and productivity of the educational system.

**Check Your Progress 7**

How can an educational institution effectively utilise different resources?

**Notes:**
1. a) Write your answer in the space given below.
2. b) Compare your answer with the one given at the end of the Unit.

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**2.8 LET US SUM UP**

In this Unit, you studied about decision making in education—individual and institutional decision making as well as collective choice. Individual decisions are made for private benefits, while institutional decisions are undertaken to provide educational facilities to all. Collective choice is dominated purely by societal considerations. Decisions for investment in education and training are made to develop human resources—both quantitative and qualitative. Various factors like education, on-the-job training, health services, non-formal education, better living conditions, modernisation of technical education, etc. determine the quantity and quality of human capital.

We have also noted that education is seen as human capital. A more educated person is empowered with better human capital than a less educated one. Human capital formation refers to acquisition of knowledge, skill, technical know-how, experience, etc. by human beings to contribute more to the output. Therefore, a more educated person has higher earnings than a less educated person; an additional education increases the lifetime earnings of individuals. You also studied that, besides education, age, sex, race, hours of work, etc. contribute to the differences in earnings.

Another important aspect of educational investment that you studied is the production function in education. Like any production process in an industry, in education inputs in terms of teachers, institutions, class size, teacher-student ratio, expenditure on infrastructural facilities, etc. are invested to achieve the outputs measured in terms of the number of students passing a
particular grade and their ability to apply whatever is learnt in day-to-day-life situations. Investment in education and human capital formation increase both industrial and agricultural productivity. Thus, human capital formation and productivity get curtailed by wastage in education measured in terms of the number of years wasted by repeaters and dropouts. Further, for deriving the maximum benefit from educational resources, such infrastructural human and financial resources should be effectively and efficiently utilised.

2.9 CHECK YOUR PROGRESS: THE KEY

1. Both individuals and institutions make decisions with regard to investment in education. Individual investment decisions are made to buy education for oneself or for dependents where private benefits are the main concern. Investment in this case includes tuition fees, maintenance expenditure and forgone earnings. On the other hand, institutional investment decisions are mainly concerned with providing education to all for socio-economic change benefiting all the members of society. Usual investment heads include salary to staff (teaching and non-teaching) and expenditure on infrastructural facilities.

2. Human capital has two dimensions: quantitative and qualitative. Quantitative dimension refers to percentage of people getting employed, number of people and hours invested in doing a particular task. Qualitative dimension refers to the qualitative aspect of human capital, viz., extent of knowledge, skills and other attributes affecting human ability to do work efficiently and at relevant levels of specialisation.

3. The contribution of education to human capital can be seen in the difference in the quantity and quality of output made by a less educated person and a comparatively more educated one. Education directly contributes to the development of human capital by increasing one's ability to perform faster and with a qualitatively better result; inculcating scientific temper and values in the workers so that they choose the best possible alternative to accomplishing a task, and increasing the innovative ability of the individual and thereby raising productivity.

4. Education increases the productivity of workers, and usually a more educated person receives higher salary/earning than a less educated one. Difference in earnings reflects difference in marginal productivity. Extra earnings of a person, therefore, reflect his/her contribution to extra output. It should be noted in this context that earning differentials bring in difference in productivity, provided the market is competitive in nature.

5. i) Productivity refers to the ratio of output to input at a given time and place. When applied to education, it refers to the ratio of output of the system (i.e., number of student passing a particular grade with the ability to apply whatever they learnt on the course) to inputs (which consist of the teacher and his/her abilities, class/school size, teacher salary, student-teacher ratio, academic and non-academic facilities, etc.).
ii) Average productivity is the ratio of total outputs to given inputs in a particular period of time, whereas marginal productivity refers to the relation of increase in output to a given increment in one unit of input/factor of production.

6. An extensively used method for measuring wastage in education is to count the number of failure from the same cohort of pupils during different years and to apply the formula

\[
\frac{\text{total optimum years}}{1 - \frac{\text{actually used years}}{\text{total optimum years}}} = \frac{\text{total optimum years}}{\text{actually used years}}
\]

Because this method poses problems for international comparison, the method of counting the number of pupil years spent by repeaters and dropouts is used to measure educational wastage.

7. Various teaching, administrative and technical staff comprising human resources can be effectively utilised if these functionaries devote themselves to tasks by utilising fully the time allocated to them, and by optimally utilising the potentiality of each functionary. Utilisation of physical facilities and infrastructure can be enhanced if there is economy in utilisation of space and if these facilities are put to use by a large number of clients. Efficiency in utilisation of financial resources can be enhanced by ensuring efficient generation, allocation and disbursement (and actual spending) of resources.