UNIT 2 HEREDITY AND ENVIRONMENT

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2.0 INTRODUCTION

As teachers working at the school level, you must have noticed that the learner learns concepts differently. Some of the learners learn concepts quickly and others slowly. For example, take the case of drawing of a diagram of a flower or a plant. Why do you think there is some kind of variation in learning? Further, you might have observed certain variations in their handwriting or scholastic achievement in school subjects. What may be the reasons for such varied responses? It may be difficult to give an acceptable answer. As an answer to this question there are two obvious causes. They are

i) Heredity and

ii) Environment

In the first unit on ‘Understanding the Child’, a detailed coverage has been made with respect factors influencing growth and development. This unit shall focus move on the role of heredity and environment. Heredity is discussed as an internal factor and environment as an external factor. Besides these, you will also learn about the educational implications of heredity and environment to
better organize your teaching and facilitate students’ learning.

### 2.1 LEARNING OBJECTIVES

After reading this unit, you will be able to:

- define the concept of heredity.
- understand the mechanisms of heredity.
- describe the concept of environment and factors of associated with environment.
- analyse heredity and environment as causal factors for individual differences in learning.
- underline the relative significance of heredity and environment in teaching-learning.

### 2.2 MEANING OF HEREDITY

Heredity is the sum total of the traits potentially present in the fertilized ovum. All the qualities that a child has inherited from the parents is called heredity. After knowing the meaning one must know about the mechanism of heredity. How is child biologically born? Life starts as a single cell.

**Conception time**

The union of male and female germ cells causes fertilization of the ovum. The fertilized egg is known as zygote.

![Zygote Diagram](image)

Each chromosome contains about 40 to 100 genes. The genes are responsible for the development of particular traits. In the words of Peterson Heredity may be defined as “what gets from his ancestral stock through his parents”. Douglas and Holland says “Heredity consists of all the structures, physical characteristics, functions or capacities derived from parents and other ancestors”. F.L. Ruch considers the heredity as the totality of biologically transmitted factors that influence the structure of the body.

Let’s go through a short case study to appreciate the above definitions of factors associated with learning.
A Case study on Heredity

Frleture is a great mathematician and piano player and his wife Meghana is an internationally popular Hindustani classical singer. They have two children. The son Aryan who is 15 years old, is very much interested in the study of Science and Maths. He is also interested in instrumental music. He has already won several national level championships in music. They have a daughter Christina who is 12 years old. She is very much interested in music and English literature. Both the children are excellent in school studies that score above 95% in all their school subjects.

With the help of the above case study, answer the following questions before proceeding with your further study

Q1. The most dominate hereditary quality that you find in the children is- (Tick the correct answer)
   a) Creativity
   b) Positive attitude for learning skill based subjects
   c) Challenging attitude
   d) Variation in the attitude

Q2. What are the contributing factors for the children to develop love for the study of science and music?
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   ...................................................................................................................
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2.3 MEANING OF ENVIRONMENT

Environment means the totality of the stimuli that impinge on the organism from without whatever found around the individual may be called by the term environment. According to Anastaxi “The environment is everything that affects the individual except his genes”. Douglas and Holland “the term environment is the aggregate of all the external forces, influences and conditions, which affect the life, nature, behavior, the growth, and development and maturation of living organisms”. Environment consists of various types of forces like physical, social, moral, economical, political cultural and emotional forces. A favorable environment caters to the development of native abilities of a child.

According to Gilbert “environment is anything immediately surrounding an object and exerting a direct influence on it”.

The term mental environment means the atmosphere necessary for the mental development of a person. If the library, laboratory, curricular and co-curricular
activities are properly organized, the child would achieve the desired intellectual development. Therefore, teachers should try to provide best mental environment, workshop, museum, clubs, associations, debate, symposia etc., must be encouraged.

### 2.4 ARGUMENTS IN FAVOUR OF HEREDITY

Kinds of twins: There are two kinds of twins i) identical and ii) fraternal twins.

Identical twins develop from one ovum’s. Fraternal twins arise from germination of two separate ova. Identical twins resemble each other and are always of same sex while the fraternal twins mostly just brothers and sisters at the same time.

Thorndike, Newman, Freeman, David Winfield and many others have made studies on twins and they come to the conclusion that heredity is an important factor in causing individual difference. Another study was conducted by David Winfield and the following conclusions were drawn.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Description</th>
<th>Co-efficient of Correlation(r) on IQ between them</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identical twins</td>
<td>0.90</td>
</tr>
<tr>
<td>2</td>
<td>Fraternal twins</td>
<td>0.70</td>
</tr>
<tr>
<td>3</td>
<td>Siblings</td>
<td>0.50</td>
</tr>
<tr>
<td>4</td>
<td>Parents and children</td>
<td>0.31</td>
</tr>
<tr>
<td>5</td>
<td>Unrelated children</td>
<td>0.30</td>
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</tbody>
</table>

All the above studies point out that the heredity is an important factor in the life of an individual. Identical twins reared apart since infancy differ somewhat more than identical twins reared together. But still they remain more alike than the fraternal twins either reared apart or together. Fraternal twins are more alike in intelligence than ordinary siblings. It means that closer the relationship, the higher is the correlation of score on intelligence.

### 2.5 ARGUMENTS IN FAVOUR OF ENVIRONMENT

Freeman has proved that 71 children who were removed from a poor environment and placed in a good environment showed an increase in Benet’s mental rating upto 10 points. This justifies the role of environment in the life of an individual.

**Study of James – Reace:** There were two twins reared in a hill and a village respectively when their intelligence was marked, the difference of 19 points was found, this is clearly an indication of environmental effect on intelligence. Now: Is the characteristics of the child and individual differences are due to a) heredity b) environment c) or both?
If so, to what extent, what is the relative role of heredity and environment in the development of the child and in causing individual differences? That is, both heredity and environment are equally responsible for the development of child and in causing individual difference.

### A case study on Environment

Anil and Sunil are the students of 10th standard. They are studying in king George School, New Delhi. Both the students are from a leading business family. They have the ambition to do their MBA from Harvard University USA. Their parents have advised them to study commerce and accountancy and establish their own business. They also have keen interest in business studies. Both have written some articles in magazine on economic reforms in India and

Also made presentation in their School subjects.

With the help of the above case study answers the following questions briefly:

1) What are the dominant qualities of the students?

2) How did the students get such qualities?

3) How do you justify that the children have strong career goals?

4) What are the factors that influence their career goals?
2.6 RELATIVE SIGNIFICANCE OF HEREDITY AND ENVIRONMENT

Heredity is defined as the totality of bio-logically transmitted factors that influence the structure of the body and environment is the totality of conditions that serve to stimulate behavior or act to bring about modification of behavior. Both heredity and environment are important in the life of an individual; both are the determinants of development. According to ROSS, the action of these factors in determining the level of an individual’s biological, psychological and social development is sometimes expressed in the following formula:

\[ H \times E \times T = DL \]

i.e.

Heredity X Environment X Time = Development level of an individual personality.

This formula implies the fact that it is meaningless to speak of either heredity or environment, acting alone. Both are necessary for the development that takes place in an individual.

Heredity works only in some sort of environment. Without environment, it is useless and environment without heredity means nothing. It means both are very important in the life of the individual. Heredity gives us the body, structure, complexion or features etc, and the environment provides the opportunities to develop them.

Landis and Landis remarked that “heredity gives us capacities to be developed but opportunities for the development of these capacities must come from the environment”.

According to Woodworth, both are equally essential in the growth and development of the child.

Individual is the result of multiplication between heredity and environment. Individual is represented by the area of a rectangle, where as heredity is the base and environment is the height. Area of rectangle does not depend merely upon the base or height, it depends on both. Similarly, individual is a result of heredity and environment. The development of hereditary potentialities is a matter of environment.

\[ \triangle A = b \times h \]

Heredity and environment cannot act in isolation. Every individual possess heredity, these traits develop on an environment for their nourishment.

Murphy has rightly pointed out, “heredity is known only by the liberation of
heredity potentials through specific environmental forces and what is liberated is as much as function of the environing pressures as it is of the latent or potential deposition”. The following figure explains both the views as below:

Upper limits are provided by heredity and environment cannot go beyond those limits. But it helps in the maximum development of raw materials given by heredity. Heredity supplies the raw material, culture supplies the designs while family is the craftsman, because it is the parents who carry the culture of the society to the child.

Maclver and Page state “every phenomena of life is the product of both heredity and environment, each is as necessary to the result as the other. Neither can ever be eliminated and neither can ever be isolated”. Further the relative importance can be highlighted through the following illustrations:

1. Seeds (heredity) x Soil = Yield
2. Capital x Investment = Revenue

2.7 EDUCATIONAL IMPLICATION

The knowledge of relative role of heredity and environment is very important on the part of the teacher so that he can help his students in learning concepts better. The knowledge of both the factors will help the teacher in finding out the individual differences among his students in learning either Mathematics or English as well as in adjusting his teaching methods and techniques accordingly, like project method and communicative teaching techniques.

The teacher must plan to provide better education and better environment. By providing computer laboratory and adequate library facilities in each subject. He should study the child, his/her abilities as well as his environment and he/she must prepare scheme for the development. In this context, Sorenson has rightly remarked that to the teacher, knowledge, relative effect of the forces of heredity and environment on human development and their inter-relationship is of great significance. The high degree of scholastic achievement depends upon the school climate.

The school should aim at providing enriched programmed of curricular and co-curricular activities for the children like quiz and literary competition. They may have better educational, vocational, personal guidance and counseling and personality development programs. If their heredity and environment are known. The knowledge of heredity and environment is very much essential for a teacher in dealing with all kinds of exceptional children including gifted, normal, below average, and problem children, and first generation learners including educationally backward children.
Heredity and Environment

1. **The background of the learner**: previous knowledge, intelligence, family background, lack of interest, aptitude and attitude play an important role. Some students who lag behind in some do better in the other area of achievement. Hence teacher must provide a congenial atmosphere for the students and treat them equally. The teacher must motivate them to adjust with the environment.

2. There are individuals who deviate from the norms of group due to many factors. Hence the classroom teacher should try to have the desired knowledge of the abilities, capacity, interests, and attitudes, aptitudes and other personality traits of his/her pupils and in the light of this knowledge he/she should render individual guidance for the maximum utilization of their potentialities.

3. Different methods of teaching must be adopted in the classroom. This helps in catering to the needs of different individuals according to their interest and understanding level.

4. The school must be the place for personality development. The school should organized programmes on leadership group dynamics, keeping background the heredity and environment of the learner.

5. Every school must have a guidance and counseling centre.

Check Your Progress-1

1) What is heredity?

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2) What is environment?

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3) What are the factors of the heredity?

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4) What are the factors of the environment?
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5) How do you say that the heredity is more important than environment?
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6) What are the arguments in favor of environment?
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7) What is the relative importance study of Heredity and Environment?
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8) Explain the Educational implications of the study of Heredity & Environment?
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2.8 LET US SUM UP

Education is vitally linked to growth and development of children. Education aims at fullest possible bringing out of all the potentialities of children. It is said that a child is born with some natural traits and it is power of the education to foster proper growth in the special environment. Growth is the product of the interaction of the organism and its environment. Haeditarians claim that Heredity is all important as it decides and set everything about the personality of an individual. Heredity it considered as the sum total of Inborn Individual traits. Environment includes all those forces which act upon the individual. After conception, Row the child develop, is the outcome of the interaction between his hered-
Heredity and Environment characteristics and the environment. Experiments show that each trait requires both heredity and environment for its development.

Heredity and Environment both are equally important and work hand in hand, both are essential to achievement. In other words, we can say that Heredity and environment are complementary both are aspects of the same phenomenon.

2.9 ANSWER TO CHECK YOUR PROGRESS

1) Heredity is a process through which the cells carry the physical and mental traits from parents to its offspring.

2) The surroundings from which an individual receives stimulus for his/her growth and activities which include, physical, mental, and emotional aspects.

3) The factors of heredity are genes, physical appearance, height, weight, skin complexion, and all reflexes.

4) The environment factors include all that we see and hear around us. It has physical, cultural, and social aspects of environment.

5) It is natural that a tiger gives birth to a tiger cub and it cannot give birth to an elephant cub. The progeny naturally inherits all the dominant qualities of the parents. For example: children are born dwarfs due to dwarf parents.

6) The environment certainly influences the behavioral aspects of an individual. For example: the twins who are reared separately tend to acquire qualities of foster parents eg. Language acquisition depends on the environment. A child born to illiterate parents can learn ten different languages before he/she reaches 10 years.

7) The role of heredity and environment in an individual's growth is unique and they are like the sides of the same coin. An individual is the product of both heredity and environment. The degree of influence of either heredity factors or environmental factors may vary depending upon the child-rearing practices of parents. The illustration such as Seed and Soil = Yield, and Capital and Investment = Revenue, are given to highlight the relative significance of them.

8) Educational implications of the study of heredity and environment are as follows: the study of heredity and environment enables the teachers to understand the causal factors of individual differences and offer classroom instructions to minimize the variations in learning and provide equal opportunities in classroom teaching. Teacher can adopt imitable methodology, use apt teaching aids and motivate the learners to a large extent.
2.10 SUGGESTED READINGS AND REFERENCES

4) Sharma, Sagar & Nanda, SK(1967) Fundamental Educational Psychology, NBS Educational Publishers, Chandigarh.

2.11 ABBREVIATIONS/GLOSSARY

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Heredity</td>
<td>The physical and psychological qualities that the child inherits from its parents.</td>
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<tr>
<td>Environment</td>
<td>The surroundings in which a child / an individual is brought up of includes all the support that the child gets from the external world.</td>
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<tr>
<td>Attitude</td>
<td>It is a state of mind which reflects likes and dislikes of the learner.</td>
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<tr>
<td>Aptitude</td>
<td>A natural ability or a skill.</td>
</tr>
<tr>
<td>Chromosomes</td>
<td>Cells that any genetic information given from parents to its young ones.</td>
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<tr>
<td>Maturation</td>
<td>Growth or maturity or a process of becoming Matured.</td>
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<tr>
<td>Intelligence</td>
<td>It is an ability or capacity to carry out any activity or human ability e.g. thinking meaningfully.</td>
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<tr>
<td>Impinge</td>
<td>To have a negative impact.</td>
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<tr>
<td>Correlation</td>
<td>To have a mutual relationship.</td>
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<td>Exceptional</td>
<td>Children with rare abilities and silks.</td>
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<tr>
<td>Zygote</td>
<td>A union of eggs and sperms.</td>
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<td>Identical wins</td>
<td>Similar in every detail or close resemblance between two children.</td>
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<tr>
<td>Fraternal twins</td>
<td>Two brothers look alike.</td>
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2.12 UNIT-END EXERCISES

1. Discuss relative significances of heredity and Environment.
2. Discuss the Educational Implications of Heredity and Environment.