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Topic Name - Heredity and Environment

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Lecture Title

Heredity and Environment

Welcome to the Bachelor course of Physical Education. Today we will discuss Heredity and Environment and their relative importance in Growth and development of an individual.

Our behavior is influenced by two important forces i.e. heredity and environment.

Heredity is anything we inherit from our parents. Broadly, heredity is of three types: biological, Sociocultural and material. Biological heredity stands for sum total of the traits potentially present in the fertilized ovum. It is the transmission of the traits from one generation to another through genes. Sociocultural heredity is the transmission of mores, cultural values from one generation to another. Material heredity is getting material objects from forefathers in the form of property, bank balance, jewelry, etc. Here we will emphasize Biological heredity because sociocultural and material heredity comes under environment.

According to Woodworth, Heredity covers all the factors that are present in the individual when he began life right from conception, about nine months before birth.

B N Jha viewed Heredity as “the sum total of inborn individual traits.”

Biological Heredity includes the following three types of traits:-

- i) **Physical Traits** i.e. color of eyes and hair, type of skin, shape of skull, size of hands, legs and internal glands etc.
- ii) **Mental Traits** like reflex actions, instincts, intelligence, emotional stability and higher mental process such as memory, abstract thinking, reasoning, judgment, appreciations and attention.
- iii) **Other Personality Traits** like we partly inherit aptitudes, sensory equipment, etc. Even color blindness, baldness, stub finger and tendency to certain diseases like cancer, tuberculosis and mental diseases are inherited to great extent.

These innate traits provide the raw material to personality. Biologically, heredity stands for all those potentialities which are present in the child at the time of fertilization. It provides tendencies for individual to develop in particular way.

As discussed, all the physical traits are transferred biologically from parents to the off springs but still differences exist among siblings. Children are not replica of their parents. These can be better understood when we go through the laws and mechanism of heredity.

2. Laws Of Heredity

First law is

- a) **Like Begets like:** This law states that children tend to be similar to their parents. The children of tall parents tend to be tall and those of short parents tend to be short. Similarly bright parents tend to have bright children and dull parents tend to have dull ones.

But sometime we see white parents have black children and bright parents have less bright children. So the first law is not universally true.

- b) **Law of Variation:** This principle states that children are not the exact replicas of their parents. According to this law white parents may have black children and intelligent parents may have dull children. This can be justified when we study the detailed mechanism of heredity.
- c) **Law of regression:** It is the tendency for the children of very bright parents to be less bright than their parents and a tendency for the children of less intelligent parents to be less inferior to their parents (Sorenson). There is the tendency of the off springs to proceed towards to the normal.

These laws help us in understanding human qualities and characteristics.

Now, we will briefly discuss

MECHANISM OF HEREDITY

1. **Mating** is the first step for reproduction. A human being has its beginning in the union of male germ cell, the sperm with female germ cell, i.e. the ovum.
2. The union of the male germ cell with the female germ cell causes **fertilization of ovum**. Fertilized ovum is technically known as **zygote**. Growth and development takes place by the multiplication of the fertilized cell through continuous division.
3. Zygote contains 23 pairs of **chromosome**, 23 from male parent and 23 from female parent. Out of these 22 are called autosomes and 23rd pair is called sex chromosome which determines the gender of the child. Each autosome is carrier of traits like color of eye, complexion, color of hair, etc.
4. Each chromosome contains about 40 to 100 **genes**. The genes are 'carriers' of hereditary material. When the two cells unite, one gene remains recessive and another becomes dominant and the trait of the parents whose gene is dominant will appear in the offspring and its counterpart will be carried on recessively i.e. it won't show. For example, if the male parent is fair and female is dark complexioned, and if the female parent's gene dominates, the offspring will be dark complexioned. Gene of the male parent will be carried on recessively.
5. Genetics explain how the sex of a child is determined. Microscopic studies have shown that chromosomes occur in pairs. Thus sex cells of males consist of one 'X' and one 'Y' chromosome. The sex cells of females have two 'X' chromosomes. After fertilization there will be either 'XX' combination or 'XY' combination. If there is 'XX' combination it will be a female child and if there is 'XY' combination, it will be a male child. So, Sex of child is determined at the time of conception according to chromosome combination which highlights the fact that chromosome of the male parent determines the gender of the child.

3. Meaning of Environment

Environment stands for all those circumstances which are asserting their influence on the child from conception to death. Consciously or unconsciously environment molds the behavior and personality of the child. Our innate abilities are modified by the circumstances. So an individual's environment is the sum total of stimulation which he receives from the time of his conception until death. Environment consists of physical, intellectual, social, moral, economic, political and cultural forces. All these forces do exert their influence in molding the personality and behavior of the child.

Boring and Langfeld viewed Environment as "everything that affects the individual except his genes."

In words of Woodworth, "Environment covers all the outside factors that have acted on the individual since he began life."

So to sum up we can say that the environment is the sum total of the experiences surrounding the individual since conception. Broadly speaking, environment is of three types:

- a) **Physical Environment** includes physical objects surrounding the individual like food, temperature, climate, home and school building etc.
- b) **Socio Cultural environment** includes parents, members of the family, relatives, playmates, friends, neighbors, teachers and society at large.
- c) **Mental environment** consists of books around the child, libraries, laboratories, radio, museum, recreation rooms, associations, intellectual tastes and interests of the parents.

RELATIVE IMPORTANCE OF HEREDITY AND ENVIRONMENT

A great controversy has appeared in the field of education as regards the influence of heredity and environment on the development of the child. Hereditarians are of the view that heredity is everything in determining the personality of an individual and education cannot make the child superior if he is inferior. Environmentalists hold the view that environment can give any direction and form to the personality. Controversy between two groups is endless and interesting. First we will discuss the viewpoints highlighting the **influence of heredity on the development of individual.**

- 1. **Influence on physical development:** Karl Pearson is of the view that the height of the child is influenced by the height of his parents. The child is likely to possess good height if his parents are tall, and he is likely to be short statured if his parents are short statured.
- 2. **Influence on innate powers:** Thorndike is of the opinion that innate powers of the child are determined by heredity.
- 3. **Influence on intelligence:** According to Goddard, intelligence is inherited. Children of parents who possess superior intelligence are generally bright and children of feeble-minded parents possess low intelligence.
- 4. **Influence on vocational efficiency:** Cattell believes that vocational efficiency is significantly influenced by heredity.

5. **Influence on social aspect:** In the words of Winship children of noble, eminent and reputed parents attain eminence and reputation. This fact is also verified by Wedgewood-Darwin-Galton Family study and study of Karl Pearson's Family.
6. **Influence on greatness:** Galton is of the view that greatness is caused due to heredity. Studies of the life histories of eminent scientists, artists, doctors, politicians and lawyers show that many members of these families attained reputation and eminence in the same fields.

Now, we will take up the viewpoints highlighting the **Influence of Environment on development of Individual**

1. **Influence on physical development:** Franz Boaz believes that differences in physique among the different races are caused due to environment and not due to heredity. He has proved that the height of the Japanese and Jews, who have been living in America from many generations, has increased due to physical environment.
2. **Influence on intellectual development:** Studies conducted on Ramu; the wolf boy who remained among the wolves and became wolf in eating habits, speech and other traits. Instead of walk he could only crawl, proved that development suffers in the absence of suitable social and cultural environment. Gordon has also proved that suitable environment is conducive to intellectual development.
3. **Influence on identical twins:** Physical, intellectual and emotional differences were found when identical twins were brought up in different environment. Newman, Freeman and Holzinger kept 20 identical twins in different environment. He kept one member of each twin in village and the other member of the each twin in city. Notable differences were found after a few years. Those children who were brought up in the village were more worried, less intelligent and less cultured than those who were brought up in the city.
4. **Influence on orphans:** Woodworth asserts that the orphans who are given suitable environment in the orphanages prove better on the whole than their parents.
5. **Influence on different races:** Clark is of the view that superior intelligence of the races is the result of environment and not heredity. He proved this fact by giving intelligence test to some Whites and Negroes of America. Some other psychologists believe that Negroes are less intelligent than Whites because they do not get social, cultural, economic and educational environment like the White people.

Conclusion Regarding Relative Importance of Heredity and Environment:

By judging the pros and cons of both the systems of thought it is quite evident that both are equally important. The growth and development of the child is determined by these two factors. It is wrong to assume that these are opposite to each other, but they are complementary.

1. **View of Woodworth:** To use a simile stated by *Woodworth*, the individual is a joint product of his heredity and environment just in the same way as the area of rectangle is the joint product of its length and breadth. It would be absurd to speak of the personality being the product of the heredity alone, or of the environment alone, as it

would be odd to talk of the area of a rectangle being due to its length alone or its breadth alone. Heredity is responsible for all inborn traits, instincts, emotions, intelligence, reflex actions and physical traits; environment is responsible for the growth and development of physical, intellectual, emotional and social traits.

2. **View of Landis and Landis:** *Landis and Landis* beautifully remarked, ‘Heredity gives us the capacities to be developed but opportunity for the development of these capacities must come from the environment. Heredity gives us our working capital; environment gives us opportunity to invest.’”
3. **View of Sargent:** According to *Sargent* one cannot exist without the other and we cannot say in running a car whether a motor is more important or gasoline. Both should be there. According to *Pinter*, raw material is provided by heredity, and environment provides opportunities for its maximum development. So child is a product of heredity and environment.
4. **View of Woodworth and Marquis:** According to *Woodworth and Marquis* both are equally essential in the growth and development of child. We cannot say which of the blades of the scissors cuts. Both are important in operation of cutting.
5. **View of Marshall:** According to *Marshall* as in the free competition price is the result of both forces of demand and supply so is the growth and development of the child is the result of both heredity and environment.
6. **View of Maciver and Page:** *Maciver and Page* beautifully remarked, “Every phenomena of life is the product of both. Each is as necessary to the result as the other. Neither can ever be eliminated and neither can ever be isolated.”

To sum up, the following conclusions can be drawn regarding the relative importance of heredity and environment:

1. Heredity and environment both play an important role in the development of personality. There can be no simple answer to the question what part heredity plays and what part is played by environment in the developmental process. What we can say is that an individual is the product of heredity and environment. The richer the heredity the better the scope for personality development. Similarly, richer the environment better is the scope for developing an individual into a healthy human being.
2. Heredity does not completely determine any characteristic or trait but it provides basis or potential for the development of any personality trait. Training and experiences in the environment contribute to the development of traits.
3. Heredity influences physique, motor-sensory equipment and level of intelligence. Certain diseases and temperamental characteristics are also inherited from forefathers.
4. Bad environment can suppress good inheritance but good environment is not a substitute for bad heredity. Heredity sets the limit of the maximum development of a characteristic which cannot be crossed by providing best environment. The best environment cannot make a feeble minded child a bright child. Good training and experiences improve the performance.

5. Intelligence is influenced by the type of education, occupation of parents, rural-urban living and cultural environment. Substantial differences in intelligence and other aspects of personality can be created by providing suitable environment.
6. The relationship between heredity and environment is not that of addition but of multiplication. The individual is not the sum total of heredity and environment but he is the product of heredity and environment.

Thus heredity and environment both are significant factors in the development of personality. None of the two can be ignored. At the same time, neither of the two can be given the prime importance. Both play a significant role in the growth and development. Thus heredity and environment are complementary to each other. It becomes clear if we take the analogy of seed and soil. If a very productive seed is sown in the unfertile soil and not properly taken care of, the potentialities of the seed will go waste. On the other hand, if we sow a poor quality seed in a very fertile soil and provide quality nurturance, it won't result into very good harvest. So we can say that heredity and environment both play a significant role in the growth and development of the individual.

We will now discuss the **EDUCATIONAL IMPLICATIONS** of the knowledge about role of Heredity and environment in the development of the individual

4. Educational Implications

1. **Knowledge of laws of heredity:** Teacher must know the laws of heredity. He must study the heredity of the child and then mold his educational theory and practice. He cannot guide without proper understanding of the inborn traits. He punishes a boy unnecessarily, considering him to be careless, when actually he is endowed with weak mental powers.
2. **Knowledge of individual differences:** While using the various methods of teaching, knowledge of heredity and environment assists the teacher to know the individual differences among the students and hence he should devise means and methods of teaching accordingly.
3. **Providing guidance:** Educational, vocational and psychological guidance depends upon the knowledge of heredity and environment. In order to provide guidance to the pupils, teacher shall have to know the heredity and environment of the child.
4. **Conducive home environment:** The home environment should be conducive to proper development of the child. If the home atmosphere is not conducive to development, due to bickering and maladjusted parents and there is no scope for improvement in home environment, child should be sent to hostels or foster homes.
5. **Suitable environment in the school:** Teacher should provide a suitable environment in the school for all round development of the child. There must be provision for variety of co-curricular activities. The library facilities must be adequate. The teaching and instructional guidance must be efficient. The staff must be qualified and trained having control over the emotions. The equipment must be adequate. School should be situated in an open locality with, fresh air and sufficient sunlight. It should be properly ventilated and away from distracting sounds.

6. **Suitable social environment:** Suitable social environment should be provided, because suitable social environment in the neighborhood, in the school and in the society at large is necessary for harmonious development of personality. Parents, teachers, educationists and members of the society at large should all try their best to create suitable social environment.

Conclusion

To sum up, every individual is the product of hereditary potentialities and environmental opportunities. Hereditary potentialities are whatever an individual receives from parents or forefathers. Environment is sum total of the influences that affects the individual right from conception till death.

Heredity and environment both have significant role to play in developmental process. Parents, teachers and coaches must understand the importance of heredity and environment in the life of an individual. Before taking up any step of guiding and teaching, they must understand the hereditary potential of the individual so that complementary and supplementary environment can be provided to ensure proper development of the individual.

That's all for today's lecture

Thank you