SOLUTIONS MANUAL

LIFESPAN DEVELOPMENT

Infancy Through Adulthood

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CHAPTER 2

Nature with Nurture

LEARNING OBJECTIVES

1. Show how scientists' views have changed over time regarding genetic and environmental influences on development.
2. Define heritability. How do studies of twins, adopted children, and blended families help us understand heritability?
3. Describe the current epigenetic view of development.
4. Explain the concept of canalization in genetic expression. Give examples of how evolution has helped select for certain highly canalized traits.
5. Describe what genes are. Discuss their structure, components, and arrangement on chromosomes.
6. Define the words genotype and phenotype. Explain why they might be different in a particular individual.
7. Describe the processes of meiosis and mitosis. Show how meiosis helps account for the differences between people.
8. Define the concepts of dominant genes, recessive genes, and regulator genes. Give examples of each type of gene.
9. Discuss how your genes may affect your vulnerability to environmental influences.
10. Consider Urie Bronfenbrenner's ecological perspective on human development. Explain why it compares the contexts of development to a series of nested Russian dolls. Give an example of a developmental influence found in your own microsystem, mesosystem, exosystem, and macrosystem. Explain how particular situations or institutions in the different contexts of Bronfenbrenner's model may influence each other.
11. Describe the four main types of interaction between genetic and environmental influences on children's development.
12. Explain the idea of reaction range. Give some examples to demonstrate how reaction range works.

CHAPTER OUTLINE

The map of the **human genome** (a complete set of genes) is like the instruction manual for the human species. With its publication, scientists turned toward the goal of determining which genes influence which characteristics. No complex human trait appears to be determined by a single gene or multiple genes. Genes and environment act in concert, with environment influencing the development of genes as well as genes directly influencing behavior.

I. Perspectives on Nature and Nurture

In studying the role of heredity and environment in development, four main views have emerged 1) development is driven by nature; 2) development is driven by nurture; 3) development is part nature, part nurture; 4) development results from the interaction of nature and nurture. The fourth view is the most recent.

A. Development Is Driven by Nature

The idea that characteristics are innate is known as **nativism**.

Preformationism. **Preformationism** is the 17th century idea that embryos are preformed—miniature adults with determined anatomy and behavior. It is accompanied by ideas about human nature. For example, Western culture has typically emphasized the belief that people are innately bad via the concept of "original sin." The idea of needing to "beat the devil" out of children who were innately evil also exemplifies preformationism.

Rousseau's Innocent Babes. French Philosopher Jean Jacques Rousseau rejected both preformationism and the need for children to be "broken" (like horses). Rather, he argued that children are innocent at birth and develop according to nature's plan. The environment matters, but not as much as nature in his view. He believed that if they were raised properly, children would grow into beautiful human beings. He viewed a parent's job as protecting a child from harm. The Montessori school movement held similar view on child development.

Genetic Determinism and Eugenics. **Genetic determinism** is the idea that human qualities are genetically determined and unable to be altered by nurture. To preformationists, internal factors control development, and development is viewed as merely a process of growing.

Carried to an extreme, the idea of genetic determinism has led to the **eugenics** ("good gene") movement, in which some proponents advocated for controlled breeding to produce desirable characteristics and to eliminate undesirable ones by discouraging those individuals with such traits. The Nazis are some of the best-known eugenicists and applied these principles in their attempt to purify the Aryan race by extermination of "undesirable" groups (e.g., Jews, homosexuals, Gypsies). This dark chapter in history led the study of genetic influences to become somewhat disreputable for a number of years. However, the idea of being a "born athlete" or "born musician" does remain popular in American society.

B. Development Is Driven by Nurture

Environmentalists like philosopher John Locke believe that an individual's characteristics are entirely the product of experience. Locke argued that an infant's mind is like a **tabula rasa**, or "blank slate," and everything written on it is the result of experience (i.e., nothing about development is predetermined). He saw childhood as a formative period in which parents have a responsibility to teach their children. The success, or failure, of the child is the product of those experiences.

One result of the belief that development was driven by nature was a change in the belief of viewing the insane as being possessed by devils to the mental hygiene view that insanity was a treatable illness.

Watson's Behaviorism. Watson's behaviorism was a revival of Locke's take on environmentalism. His "Give me a dozen healthy infants, well-formed…" declaration provides a solid example of a philosophy in which nurture determines behavior.

C. Development Is Part Nature, Part Nurture

In the second half of the 20th century, scientists became dissatisfied with nativism and environmentalism, and began to question how much nature versus nurture contributed to different traits.

Heritability. Developmentalists began calculating the degree to which different traits were influenced by genetic factors—the **heritability** of the trait. These measures are called the heritability quotient of the trait. Studies of heritability employed several designs including **twin studies**. In one version, **identical twins** (born from a single fertilized egg) are compared to **fraternal twins** (born from two separate eggs). If the identical twins are more similar on a trait than fraternal twins are, then the trait is understood to have a high heritability quotient. Twin studies may also examine twins separated at birth.

Adoption studies examine children raised by individuals other than their birth (or biological) parents. The researchers test to see if the children are more similar to their biological parents than their adoptive parents. If children resemble biological parents more, then it suggests a high heritability quotient for the trait in question.

Family relatedness studies examine blended families in which children with different degrees of biological relatedness (e.g., full vs. half vs. step siblings) are raised in the same environment. Individuals raised in blended families are usually more similar to the members to whom they are more closely biologically related.

Research on heritability has shown that most human traits have substantial heritability components. However, that same research also reveals that the environment influences these traits, as well. For example, full siblings raised in the same environment have a **shared environment**, which may contribute to their similarity even as their similar genes do. Siblings also have a **non-shared environment**, in which they have different friends at school, different teachers, and so forth. Both nature and nurture (shared and non-shared) influence human development.

Heritability studies have been criticized on three main counts: 1) genetic and environmental influences work hand in hand; 2) the impact of genes may vary depending on the quality of the environment; and 3) heritability quotients ignore the facts that human traits are malleable, or changeable. Despite the criticism of heritability studies, they did result in most scientists agreeing that studying genetics was necessary to the understanding of child development.

D. Development Results from the Interplay of Nature and Nurture

The contemporary view of development emphasizes the interaction of nature and nurture. More than combination, interaction implies that the result of something is quite different than the initial ingredients.

Darwin's Influence. Darwin's **theory of evolution** rests on two main ideas: **survival of the fittest** and **natural selection**. The "fittest" are those organisms best adapted to the

situation, which are most likely to survive and then pass on their characteristics. Natural selection is the result of the interplay between a changing environment and the species members. What is adaptive in one environment may not be in the next, so what is most "fit" for survival is changeable.

Epigenesis. Most developmental scientists ascribe to the idea of development as **epigenesis**, a gradual process of development involving increasing complexity due to interaction between heredity and environment. This perspective sees little being predetermined. Epigenesis is rooted in embryology (the study of development from conception to birth) and the theory of evolution. Embryologists describe this time of development in terms of distinctive stages, and it is clear that an embryo is not a miniature adult.

G. Stanly Hall, the first president of the APA, held that early life resembled the evolutionary history of a species. The idea that humans go through a "fish stage" and a "reptilian phase" was ultimately rejected, but Darwin's central concept that change is the result of interaction with the environment remains a powerful contemporary developmental principle.

Stem cells are primitive, undifferentiated "pre-cells" found in large numbers in an embryo and appear to illustrate epigenesis. With development, these simple cells can become a complex set of tissue that the body needs (e.g., brain tissue, muscle). At birth, many traits are like stem cells as they represent an inherited potential that can be shaped by experience.

II. What Are Genes, and What Do They Do?
The study of genetics focuses on how genes make humans distinct from other species, and how they explain individual differences within humankind.

A. Becoming Human
Walking upright on two feet, or **bipedalism**, is a human trait that results from natural selection. This trait freed up our ancestor's hand for key tasks, such as making tools, constructing weapons, and carrying food. Defining human traits like handedness and self-awareness are found in other animals (e.g., great apes – self-awareness, birds – use of tools).

"Like a Rolling Stone." **Canalization**, the degree to which an element of development is dictated by the genetic program inherited by all humans, is the phenomena that explain why features such as bipedalism are so pervasive in humans. Some traits are highly canalized (e.g., locomotion) while others are less so (e.g., morality). In general, early development is more canalized than later development.

The Importance of Being Cute. One distinctive feature of humans is that we are born "prematurely." We are unable to take care of ourselves for many years and have a prolonged immature appearance and behavior. One reason for this is that humans have evolved to be highly social, and prolonged immaturity promotes social attachments: making babies "cute" attracts the interest of caregivers. From an evolutionary perspective, smiling babies receive more attention, which is why the trait became so common.

Another reason for prolonged immaturity is that humans are highly dependent on learning, and immaturity at birth increases receptivity to environmental learning. Humans are also predisposed to learning and are better than most species at changing behavior in response to environmental conditions.

The Human Genome Project has determined that human beings share genes with some of the simplest organisms (e.g., bacteria), with other mammals, and with our closest evolutionary kin (e.g., great apes). Human and chimpanzee DNA is 98 to 99 percent identical, and these species can receive blood transfusions from one another.

B. Human Diversity
No human beings have the exact set of genes except identical twins.

The Genetic Code. The human body is made up of trillions of cells, with the nucleus of almost everyone of them containing 23 pairs of chromosomes, one pair from mom and one pair from dad. **Chromosomes** are long strands of DNA containing a complete set of instructions for the development of a unique human being. The DNA "double helix" ladder contains four chemical bases: adenine (A), which always connects with thiamine (T), and guanine (G), which always connects with cytosine (C). The order of the **base pairs** determines genetic instructions. Genes, the segments of chromosomes, are the units of heredity that pass from one generation to the next.

Chromosomes direct cellular activity by attracting molecules of ribonucleic acid (RNA). RNA carries out genetic instructions, which result in the synthesis of enzymes, hormones, and proteins. Proteins are created through different combinations of amino acids and lead to the production and reproduction of cells.

A **gene** is a segment of the chromosome that controls a particular aspect of the production of a specific protein. A gene is about 3,000 base pairs in length, although the actual length of genes is highly variable. The key to heredity is the ability of DNA to replicate itself, which permits a single fertilized cell to develop into an adult human being.

Genotypes and Phenotypes. The 23 pairs of chromosomes one inherits from his or her parents makes up his or her **genotype**, a package of biochemical information that is unique to the individual (unless he or she has an identical twin). Your genotype in contained in nearly every cell but does not determine who you become. Your observable appearance and characteristics, or **phenotype**, depend on experience and environment.

Sexual Reproduction. Bacteria and some other organisms reproduce asexually with offspring being clones of the parent. Sexual reproduction results in more variety and increases the likelihood of adaption by some members of a population.

Mitosis and Meiosis. During ordinary cell reproduction, or **mitosis**, a cell divides into a copy of itself. Reproductive cells, or **gametes**, are different. They reproduce by meiosis. **Meiosis**—the production of sperm and ova—produces cells with only half of a set of chromosomes. During the initial "crossing over" phase, each pair of chromosomes lines up and exchanges bits of genetic material. During the second phase of meiosis, the chromosome deck is reshuffled. The cell then divides in two, and the new chromosomes duplicate themselves producing a daughter cell. This daughter cell then divides, producing four cells each with 23 chromosomes.

At fertilization, the reproductive cells merge, and the chromosomes from the mother's ovum link with those from the father's sperm. This results in cells with two sets of chromosomes and two copies of every gene (**alleles)**.

Gene-Gene Interaction. Twenty-two of the 23 pairs of chromosomes are "homologous," containing the two versions of the gene for each trait (one allele from each parent). The 23rd pair is the sex chromosome, in which most females have two X chromosomes and most males have one X and one Y chromosome.

Additive Heredity. Additive heredity occurs when a number of the mother's genes and a number of the father's genes affect a trait. If a tall man and a short woman have a child, the offspring will probably be of medium height.

Dominant/Recessive Heredity. In the case of **dominant/recessive** heredity, one version of a gene overrides the other. For example, the gene for brown eyes dominates the gene for blue eyes. Thus, if a child inherits one gene for brown eyes and one gene for blue eyes, the dominant gene will be expressed, and the child will have brown eyes. Blue eyes will be expressed only if the child inherited both recessive genes for blue eyes. In some cases, the expression of a trait is the result of a combination of genes (e.g., hazel eyes = green eye gene + brown eye gene).

"Regulator" Genes. **Regulator genes** do not directly affect traits but turn other genes on or off at different points in the life cycle. The larger jaw in chimps versus humans is the result of the jaw-growing gene being turned on longer during the fetal stage of chimps versus humans.

Environmental Influences. The environment is an active partner in these genes' actions and interactions. The 5-HTT gene influences the levels of serotonin, a brain chemical known to affect depression. Individuals with shorter versions of the allele for the gene are more likely to respond to stress by become depressed. Note that the gene does not "cause" depression but impacts vulnerability to depression in the face of stress. Environmental factors (e.g., growing up in a stable environment versus being moved to unfamiliar, stressful places) can influence the expression of traits like depression regardless of the presence of identical 5-HTT genes.

Occasionally, copying errors, or **mutations**, do occur. The impact of a mutation can be maladaptive, neutral, or adaptive.

III. The Importance of Context

A. The Ecological Perspective on Development

Bronfenbrenner developed a way of thinking about developmental contexts as nested. A child is nested within the immediate context of whomever he/she interacts with, and that context is nested within the community, the community is nested within the region, and so forth. Bronfenbrenner challenged developmentalists to think about the ways in which an individual is influenced by both the immediate setting as well as more distant contexts (e.g., society).

Scientists with an ecological perspective assess questions from different levels of analysis. For example, Hispanic teenagers are less likely to graduate from high school

than individuals from other ethnic groups. Bronfenbrenner's ecological perspective provides a way to look at this problem from different contextual levels of analysis.

B. Microsystems

A **microsystem** is a setting in which a child interacts with others face-to-face every day (e.g., family, school, daycare). Influences within microsystems are *bidirectional* (e.g., children influence teachers who in turn influence the child). Microsystem relationships are also *multifaceted* (many-sided). For example, the presence of different types of individuals (e.g., father, grandparent, another child) might impact the interaction between a mother and a toddler.

At this level of analysis, one could ask if the reason Hispanic teens are less likely to graduate from high school has to do with the parenting style with which they were raised. Research has shown that children whose parents use an "authoritative" parenting style (warm and strict) do better in school. Some research suggests that parenting style differences in Hispanic families may play a role in graduation rates.

Additional microsystem assessments could involve investigating whether classroom factors or peer group factors contribute to dropout rates. Research has shown that school achievement is increased in adolescence if friends value the act of doing well in school.

C. The Mesosystem

The **mesosystem** refers to the ways in which microsystems are connected. Two types of connections are important. First, events in one setting may affect behavior in another setting. Secondly, the characteristics in one microsystem may either conflict with or reinforce the experiences in another microsystem. At this level of analysis, one could ask if the reason Hispanic teens are less likely to graduate from high school has to do with the conflict between values instilled at home (collaboration-cooperation) and those operating at school (individuality-competition).

D. The Exosystem

The **exosystem** comprises the contexts outside the child's immediate, everyday experiences. These larger settings of which a child only knows a part include the neighborhood and their parents' workplace. Living in impoverished, high-crime Latino neighborhoods places chronic stress on families and may negatively impact parenting and ultimately impact a child's development. At this level of analysis, one could ask if the reason Hispanic teens are less likely to graduate from high school has to do with the nature of the neighborhoods in which they tend to live. Are the neighborhoods more stressed?

A neighborhood may also offer examples of adults without regular employment or who earn money through illegal activity (e.g., dealing drugs). This might result in a child concluding that school success is not an effective route to earning a living as an adult. One question that this would lead to concerning the issue of Hispanic teens is, "Are the neighborhoods more populated with individuals dealing with unemployment?"

E. The Macrosystem

The **macrosystem** is the "outer layer" of the Bronfenbrenner system and includes the larger forces that define a society at a given point in time (e.g., cultural values, political and economic conditions, major historical events). Developmentalist who focus on the

macrosystem levels are especially interested in the impact of societal, ethnic, and socioeconomic differences.

At this level of analysis, one could ask if the reason Hispanic teens are less likely to graduate from high school has to do with **familism** (placing high value on the interest of the family versus the individual), which is especially valued in Hispanic cultures and puts pressure on children to work to serve the family over working toward their own, individual achievement. Some have suggested that the higher rate of dropouts in Hispanic students is the result of them being more likely than other students to drop out to support their family.

Although there is evidence to support each of the explanations above for why Hispanic teens are less likely to graduate from high school, it is most likely that it is due to the cumulative effects of many different aspects of life for Hispanic teens. The value of the ecological perspective is that it provides a framework for looking at multiple contextual influences, at different levels of analysis.

IV. The Interplay between Genes and Context

A. Environmental Effects on Gene Expression

Until recently, scientists thought that genes contained a fixed set of instructions and operated on set timetables. However, the ways that genes affect development is through the proteins they "instruct" the body to produce in what scientists refer to as **gene expression**. The gene expression depends not just on the instruction code but also on the context in which the instructions occur. The fact that the combination of eggs, milk, and flavoring (e.g., vanilla, sugar) can, in the right context, manifest itself as custard or in a different context (e.g., heating milk too high) result in a curdled mess illustrates the fact that expression of a trait is not solely determined by genetic ingredients (e.g., genes).

The Nurturant Rat. Manipulating the environment to see what happens to human gene expression is unethical but has been done with rats. In one study, scientists reared two strains of rats, one group with nurturant mothers (e.g., prone to grooming of pups) and the other with non-nurturant mothers. The rats born to the nurturant were less anxious in response to a fearful stimulus, but it was hard to tell if that was because the rats had good genes or favorable experiences. So, scientists transferred rats born to "good moms" to the "bad moms" and vice versa in a practice called **cross-fostering**. The rats with "good genes" raised by "bad moms" turned anxious, in spite of their good genes.

B. Environmental Effects on Heritability

No characteristic has one single heritability quotient that applies to everyone. It is impossible to pin down how much of a trait is influenced by genes as the heritability of a trait depends on the environment. Given cuttings from two strains of roses, one can genetically breed to produce blooms all summer and the other to not; if they both received optimal levels of water and fertilizer, you would spot a difference. If you deprive both of water and fertilizer, neither would thrive. Calculating the heritability of bloom production varies by environmental level (e.g., best environment versus terrible environment).

In humans, the way in which the environment changes the heritability of a trait is not the same. Many studies have found that the heritability of intelligence is higher in more advantaged environments. Estimating the genetic influence on alcohol use would differ

in a country in which drinking is legal versus a country in which it is not (where it would appear that genes had little impact on drinking).

C. Gene-Environment Interaction
How a person's genotype becomes a phenotype depends on **gene-environment interaction**, that is, inherited traits lead to different characteristics in different contexts. The best way to look at inherited traits is as an array of possibilities, not fixed points—what scientists call a **reaction range**. Height is an obvious example of reaction range as there is no gene for a specific height (e.g., 5'10"). Rather, people inherit a range of possibilities (e.g., 5'7" to 5'11"), and their phenotypic actual height is influenced by such factors as pre- and postnatal nutrition.

D. Gene-Environmental Correlations
Genotypes can also have an impact on the environment as the developing child can shape his or her world just by being who he or she is. These relationships refer to correlation, not necessarily causation.

Passive gene-environment correlations result from the fact that parents provide both genes and environments for their children. This correlation is "passive" in that the child doesn't do anything; both are part of what has been passed down, either through parents' biology or behavior. This correlation might be called the "double-whammy effect" as in double dose of advantage. For example, children who grow up in intellectually stimulating environments probably have intelligent parents (who have passed along their genetic intelligence).

Evocative gene-environment correlations result from the fact that genotypically different individuals elicit different responses from their environments. This correlation is "evocative" in that the child evokes a response from others based on how he or she behaves. A person with a genetic predisposition to being cheerful evokes more positive social interactions from others.

Active gene-environment correlations occur because children select contexts that they find stimulating and rewarding, a process called **niche-picking**. Children choose to participate in contexts that tend to strengthen the traits that lead them to select those contexts (e.g., a child with artistic genetic tendencies chooses to create things from items collected in the backyard).

The importance of these different types of gene-environment correlations changes over the course of development. Passive gene-environment correlations are most important in infancy and young childhood. Evocative gene-environment correlations are important throughout the lifespan.

LECTURE AND DISCUSSION TOPICS

Topic 2.1 Eugenics in America

Sir Francis Galton wanted to improve humanity. Influenced by his cousin Charles Darwin's theory of evolution and the traditional crop selection methods of farmers, he reasoned that we could do the same with our offspring. Through selective breeding, we could (and should)

eliminate undesirable qualities and promote greater intelligence, strength, and other desirable traits (Galton, 1865). His idea was called "eugenics," which means "good genes."

Many people embraced eugenics. In the United States, it was one of the primary foundations of the intelligence testing movement, led by Goddard, Yerkes, Terman, and others (Gould, 1981). Unfortunately, some people used eugenics to justify harmful activities. For example, intelligence testing was used to claim that members of some races were dramatically superior to members of other races. Psychologist H.H. Goddard and others called for strict immigration quotas on certain "inferior" races and for selective breeding, forced colonization, and sterilization to eliminate the genes for "feeble-mindedness" (Gould, 1981). In 1927, the United States Supreme Court upheld the forced sterilization of Carrie Buck by the state of Virginia. Justice Holmes argued "three generations of imbeciles are enough" (Gould, 1981, p. 335), maintaining that the state had an abiding interest in the purity of its gene pool, which would override the interests of any particular individual (Buck v. Bell). This sterilization law was enforced in Virginia's mental health facilities until 1972.

Eugenics still influences our educational system. Children are routinely tested for intelligence, and often sorted into classes or groups based on those scores. High-scoring children are targeted for enrichment ("gifted and talented" programs), while others are given the minimal education deemed necessary for their abilities as workers. Although the definition of giftedness now includes talents other than having a high IQ, the idea that some children are inherently more talented than others is still prevalent (Kosslyn & Rosenberg, 2004).

Ask your students about their experiences with IQ testing and eugenic thinking. Many may not realize that IQ tests were among the many measures to which they have been subjected and will not know how that affected the direction of their educations. Do your students support the basic ideas of eugenics? If not, what sort of changes would they like to see?

References

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Topic 2.2 The Evolution of Emotions

Charles Darwin (1872–1965) noted that many of our facial expressions seem to exist in all cultures. This made him think that facial expressions might be genetically predetermined, and that they evolved because of their usefulness in interpersonal communication. Another explanation for the evolution of emotions is that they increase our chances of mating or successfully protecting our offspring. Both possibilities would increase the chance that our genes would survive, which is the measure of success in evolutionary terms.

Cross-cultural studies have confirmed Darwin's observations. People in many cultures seem to share six basic emotions: anger, fear, disgust, sadness, happiness, and surprise (Nevid, 2007). Ask your students to speculate about the evolutionary advantage of each emotion. How might they help us reproduce more successfully?

Some points to consider include:

Anger. A good motivator, anger helps in the acquisition of necessities such as food, water, territory, and mating partners. You may wish to talk about the roles of scarcity and competition in evolution.

Fear. Imagine walking past a dark, mysterious-looking cave and hearing something growl. People with a healthy fear response will run away, while fearless people might take unnecessary risks and be killed before they reproduce.

Disgust. The "euuw, yuck!" response may keep us from eating poisonous or spoiled foods. If you become horribly sick after eating something, you may find it disgusting in the future, which would prompt you to avoid it. (You may wish to review the concept of taste aversion from the learning unit in introductory psychology.)

Sadness. Students often find this one hard to understand. Consider describing it in terms of missing the people to whom you're close. Imagine that you're a hunter in a primitive tribe. You're out with your hunting buddies looking for a fresh mastodon for the tribe's dinner, having a fine old time, drinking and telling the usual stories about your prowess as hunters. Why would you ever want to go back to the tribe? Perhaps because you miss your mate and children. Sadness helps hold the tribe together.

Happiness. Like sadness, happiness can help hold a society together. We all want to spend time with people who make us happy. It can also work in our favor when attracting mates and colleagues. If you can make others happy, they'll want to be with you. (How many personal ads talk about needing a good sense of humor?) In addition, consider how much trouble the average child can be. Unless there were ways in which they made us happy, we might have no reason to care for them. (So you can show that happiness and sadness may be instrumental in keeping children alive.)

Surprise. This emotion is key in triggering the "fight-or-flight" response (general adaptation syndrome). If a hungry tiger appeared in front of a couple of our early ancestors, the one with the greater capacity to be surprised would likely be the one to survive, as she'd be off and running long before her companion was even ready. (This would be a good time to review the basic concepts involved in general adaptation syndrome, including the functions of the autonomic nervous system and the appropriate parts of the endocrine system.)

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Topic 2.3 Perspective Effects

Why can't scientists just pick the "correct" perspective on development and discard the others?

One way to see how our differing theories matter is to investigate their practical effects on child rearing. For example, let's look at how different perspectives on intelligence guide parents.

Some people believe that children inherit their intelligence from their parents and that they're born with a certain level of smartness that will never change. Some children get a lot of intelligence from their parents, others not so much. Other people believe that the development of intelligence is entirely governed by a child's environment and that genetics plays a minimal role in development. How do these views affect the ways in which people raise their children?

Those who believe that intelligence is purely genetic might conclude that

- Only certain children can benefit from a good education. Those children deserve the best. Conversely, children at the low end of the intelligence scale can't take advantage of the opportunity and could legitimately be denied enriching activities.
- You've got it or you don't—hard work won't make much difference in academic achievement. Ironically, this idea can damage a child's motivation at both extremes of the intelligence scale. Told that they cannot change their inherit talents, children might have little reason to make the effort to improve.
- Schools should sort children by intellectual level to prepare each child for an appropriate place in society. Schooling should resemble the work of a jewelry factory, in which gems are sorted, processed, and packaged based on their inherent qualities. Efficiency matters and can easily be demonstrated with statistical descriptions of the students' progress.

Such beliefs have directed public education in the United States. You may wish to discuss educational policies that were influenced by the IQ testing movement and the ideas of such researchers as Goddard and Terman. Gardner's theory of multiple intelligences may be seen as another example of this perspective on intelligence.

Those who believe that intelligence is determined by the child's environment might conclude that:

- Measuring achievement is more important than measuring IQ.
- All children should be required to put forth more effort. They would be taught that achievement is a result of hard work, not talent. This should raise children's achievement motivation.
- We should develop teaching methods that help children advance from their current levels of academic achievement to higher levels in appropriate steps.
- Schooling should resemble the work of individual artists working with different materials to create new forms of expression. Individuality should be prized. System-wide statistics would not have much meaning in such a paradigm. Effectiveness might be measured by looking at students' knowledge or abilities before and after their years of instruction.

Ask your students to reflect on their own schooling and how it might have been influenced by ideas of nature and nurture. Class discussion can also branch out onto non-academic subjects, such as belief in talent versus hard work in music, painting, dance, or other arts.

Topic 2.4 The Nature and Nurture of Brain Development

Many years ago, it was believed that a person's brain cells formed throughout their early childhood and then stopped developing. More recently, researchers have found evidence that neurons in the brain continue to develop, and even to multiply, at much later stages of life.

Early research in this area found that old rats placed in a stimulating environment develop many new synapses per square inch of the brain (Black, Jones, Nelson, & Greenough, 1998; Nelson, 1999), while those who never experience these new environments do not. This implies that human brains should also flourish in enriching situations.

After introducing your class to this information, begin a discussion about what people can do at different ages to promote healthy brain development and growth. Ask your students what sorts of activities might be best for infants, toddlers, school-age children, adolescents, young adults, and older adults.

One interesting way to do this might be to split your class into groups. Ask each group to develop a program for a specific age range. Have each group present their thoughts to the class after a few minutes of in-class discussion.

References

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Topic 2.5 Using the Ecological Perspective

The textbook uses Bronfenbrenner's ecological perspective as a way to analyze the problem of the low high school graduation rates of Hispanic students. Help your class apply this model to another common developmental problem, childhood obesity.

According to the United States Centers for Disease Control and Prevention (2007a), there has been a tremendous rise in childhood obesity between the years 1980 and 2004. This is illustrated in the chart below.

	Overweight children in 1980	**Overweight children in 2004**
Children ages 2–5	5%	13.9%
Children ages 6–11	6.5%	18.8%
Children ages 12–19	5%	17.4%

This is a disturbing trend with serious implications for our children's future health. Being overweight or obese has been linked to high blood pressure, osteoarthritis, Type-2 diabetes, coronary heart disease, stroke, sleep apnea, and many other problems that might occur later in life (CDC, 2007b).

Ask your students to identify how specific factors at the Bronfenbrenner's microsystem, mesosystem, exosystem, and macrosystem may contribute to the issue of childhood obesity and how factors at each level might be used to reduce this problem.

References

Centers for Disease Control and Prevention. (2007a). *Overweight Prevalence.* Retrieved from http://www.cdc.gov/print.do?url=http%3A%2F%2Fwww.cdc.gov%2Fnccdphp%2Fdnpa%2Fobesity%2Fchildhood%2Fprevalence.htm

Centers for Disease Control and Prevention. (2007b). *Overweight and Obesity: Health Consequences.* Retrieved from http://www.cdc.gov/nccdphp/dnpa/obesity/consequences.htm

Topic 2.6 Using the Behavioral Perspective

Behaviorism has had a relatively short but very strong place in the science of psychology. Help your class apply this model to a common developmental problem, childhood obesity.

Ask your students to explain possible behavioral causes of childhood weight gain. How can the ideas of reward and punishment explain children's obesity? Next, have your students speculate about how they might design a behavioral approach to reduce the problem of childhood obesity in our society.

STUDENT ACTIVITIES

Activity 2.1 Developmental Perspectives on Handling Bad Behavior

Divide your students into four teams, each representing one of the basic philosophies of development described at the beginning of the chapter. Give each team one of the **Activity 2.1 Handouts**. Ask them to analyze a set of problems according to their assigned philosophy.

Things to look for in their responses:

Puritans. The responses should reflect the preformationist idea that children are born in sin and need punishment to correct their natural sinful natures.

Followers of Rousseau. Responses from this team should reflect the basic preformationist idea that children are born in a state of natural innocence. If their behavior is problematic, it's because they were taught to be bad. Corrections should take the form of returning them to their natural state of grace.

Followers of Locke. This team's responses should include the idea of the *tabula rasa*: children are born with no inclinations toward either good or bad; their behaviors are a result of what they have been taught. (This is somewhat like Rousseau's philosophy.) However, having become what they are, there is likely no easy way to return them to goodness.

Behaviorists. Answers from this group ought to discuss the ideas of reinforcement and punishment. Students may write about shaping, if they remember that term from their introductory psychology course.

Handling Bad Behavior (Puritans) (Handout 2.1a)

You are working as a child development specialist for a group of Puritans in the late 17th century. Several parents have asked for help with problem children. Based on Puritan beliefs, explain the causes of each child's behavior. Then write a prescription for what the parents can do to correct each child's behavioral problem.

Child #1: Joshua is a bully. He often pushes other children around, steals their possessions, and terrorizes the younger ones.

Child #2: Bathsua is a wasteful little girl. She will use something once and then throw it away, even though it might be used many times. She has no regard for the cost or value of anything and often leaves quite a mess behind her.

Child #3: Jethro doesn't pay attention in school and will not study at home. He's not learning as he should be.

Handling Bad Behavior (Rousseau) (Handout 2.1b)

You are working as a child development specialist in 18th century France, under the direction of Jean Jacques Rousseau. Several parents have asked for help with problem children. Explain the causes of each child's behavior, based on Rousseau's philosophy. Then write a prescription for what the parents can do to correct each child's behavioral problem.

Child #1: Jean-Luc is a bully. He often pushes other children around, steals their possessions, and terrorizes the younger ones.

Child #2: Marie-Claire is a wasteful little girl. She will use something once and then throw it away, even though it might be used many times. She has no regard for the cost or value of anything and often leaves quite a mess behind her.

Child #3: Sophie doesn't pay attention in school and will not study at home. She's not learning as she should be.

Handling Bad Behavior (Locke) (Handout 2.1c)

You are working as a child development specialist in 17th century England, under the direction of John Locke. Several parents have asked for help with problem children. Explain the causes of each child's behavior, based on Locke's philosophy. Then write a prescription for what the parents can do to correct each child's behavioral problem.

Child #1: Elfreda is a bully. She often pushes other children around, steals their possessions, and terrorizes the younger ones.

Child #2: Stuart is a wasteful little boy. He will use something once and then throw it away, even though it might be used many times. He has no regard for the cost or value of anything and often leaves quite a mess behind him.

Child #3: Cecil doesn't pay attention in school and will not study at home. He's not learning as he should be.

Handling Bad Behavior (Behaviorists) (Handout 2.1d)

You are a behavioral psychologist working as a child development specialist in 20th century America, under the direction of B.F. Skinner. Several parents have asked for help with problem children. Explain the causes of each child's behavior, based on your behaviorist perspective. Then write a prescription for what the parents can do to correct each child's behavioral problem.

Child #1: Boris is a bully. He often pushes other children around, steals their possessions, and terrorizes the younger ones.

Child #2: Leilani is a wasteful little girl. She will use something once and then throw it away, even though it might be used many times. She has no regard for the cost or value of anything and often leaves quite a mess behind her.

Child #3: Athena doesn't pay attention in school and will not study at home. She's not learning as she should be.

Activity 2.2 The Developmental Perspective of Proverbs

We've all gotten a lot of advice from people over the years. Often that advice comes in the form of proverbs or aphorisms, wise sayings that tell us how to act in different situations. Many of these proverbs can be used to remind your students about current research in human development.

Recall the different historical developmental philosophies of Locke, the Puritans, Rousseau, and the Behaviorists discussed in Chapter 2. Then look at the following list of proverbs from several different countries, and write down which of these philosophies might have given rise to each. (A chart for use by your students follows.)

Proverb:	**Philosophy:**
The apple doesn't fall far from the tree.	Puritans
Adversity is a good teacher.	Locke or Behaviorists
Once burned, twice shy.	Locke or Behaviorists
You're never too old to learn.	Locke or Behaviorists
You can't teach an old dog new tricks.	Rousseau
You have to learn to walk before you can run.	Locke or Behaviorists
No pain, no gain.	Puritans
Wonder is the beginning of wisdom.	Rousseau
Spare the rod and spoil the child.	Puritans
Better late than never.	Locke or Behaviorists
Everyone is kneaded out of the same dough but not baked in the same oven.	Locke or Behaviorists
As you sow, so shall you reap.	Locke or Behaviorists
Praise the young and they will blossom.	Rousseau
The gem cannot be polished without friction, nor the man perfected without trials.	Puritans
The nail that sticks up will be hammered down.	Puritans
The leopard cannot change his spots.	Rousseau
Children should be seen, not heard.	Puritans
You live, you learn.	Locke or Behaviorists
As the twig is bent, so grows the tree.	Locke or Behaviorists
To each, his own.	Rousseau

The Developmental Perspective of Proverbs (Handout 2.2)

We've all gotten a lot of advice from people over the years. Often that advice comes in the form of proverbs or aphorisms, wise sayings that tell us how to act in different situations. Many of these proverbs can be used to remind your students about current research in human development.

Recall the different historical developmental philosophies of Locke, the Puritans, Rousseau, and the Behaviorists discussed in Chapter 2. Then look at the following list of proverbs from several different countries, and write down which of these philosophies might have given rise to each.

Proverb:	**Philosophy:**
The apple doesn't fall far from the tree.	
Adversity is a good teacher.	
Once burned, twice shy.	
You're never too old to learn.	
You can't teach an old dog new tricks.	
You have to learn to walk before you can run.	
No pain, no gain.	
Wonder is the beginning of wisdom.	
Spare the rod and spoil the child.	
Better late than never.	
Everyone is kneaded out of the same dough but not baked in the same oven.	
As you sow, so shall you reap.	
Praise the young and they will blossom.	
The gem cannot be polished without friction, nor the man perfected without trials.	
The nail that sticks up will be hammered down.	
The leopard cannot change his spots.	
Children should be seen, not heard.	
You live, you learn.	
As the twig is bent, so grows the tree.	
To each, his own.	

Activity 2.3 Bronfenbrenner's Ecological Perspective & You

Bronfenbrenner's ecological perspective on development looks at the world of a developing human as a set of interlocking contexts. Have students think about their own life and list some of the elements at each level: microsystem (settings in which they interact face-to-face with objects and others), mesosystem (interconnected elements of the macrosystem), exosystem (more distant elements like neighborhood or parents' workplace), macrosystem (cultural and historical factors). You could do this either as an in-class project with small groups generating responses or as a 3-5 page paper.

An alternative would be to select a specific social issue (e.g., drug use, racism) and have students identify potential factors at work at each system level.

Activity 2.4 The Human Genome Project

Information obtained from The Human Genome Project has revolutionized our understanding of the contribution of genetic factor to development. To further expand student's knowledge of genetics and the relationship of specific chromosomes to behavior, have them visit the Human Genome Project website at
http://www.ornl.gov/TechResources/Human_Genome/posters/chromosome/chooser.html

Once there, have them select any two chromosomes and create a list of 15 of the most important characteristics (e.g., disorders, physical traits) that have been linked to each chromosome.

Activity 2.5 Recessive and Dominant and Ressive Gene outcomes

An effective way to ensure that students understand the complex nature of dominant versus recessive genes is to provide them with examples to solve (like those on **Handout 2.5**).

The correct answers are

1. Four combinations: BB (blue hair), Bp (blue hair), pB (blue hair), pp (purple hair)
2. Four combinations: TT (neither has nor carries), Tt (carries but not express), tT (carries but not express), tt (has the disorder)
3. Four combinations: all Ee and all offspring and dad can wiggle their ears but mom cannot.

Recessive and Dominant and Recessive Gene outcomes (Handout 2.5)

1. Assume that blue hair is dominant and designated by the genetic symbol "B" and purple hair is recessive and designated by the genetic symbol "p." Using the parents described below, map out the four possible genetic combinations for hair color that could be passed along to their children. Then describe the phenotypic hair color for each child.

DAD (B p) MOM (B p)

2. Truckers-eye is caused by a recessive trait and designated by the genetic symbol "t," while the letter "T" designates the dominant genetic counterpart. Map out the four possible genetic combinations for Truckers-eye that could be passed along to the children of the dad and mom described below. Which of the child(ren) would have the disorder and which child(ren) would carry (but not express) the disorder?

DAD (T t) MOM (T t)

3. Assume that ear wiggling is dominant and designated by the genetic symbol "E" and the inability to wiggle one's ear is recessive and designated by the genetic symbol "e." Using the parents described below, map out the four possible genetic combinations for ear wiggling ability that could be passed along to their children. Then describe the phenotypic ear wiggling ability for each offspring and for the parents.

DAD (E E) MOM (e e)