Topical Approach to Lifespan Development 10th edition Santrock Solutions Manual

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CHAPTER 2: BIOLOGICAL BEGINNINGS

Chapter Outline and Related Resources

Please note that much of this information is quoted from the text.

I. THE EVOLUTIONARY PERSPECTIVE

A. Natural Selection and Adaptive Behavior

- *Natural selection* is the evolutionary process, proposed by Charles Darwin, that favors individuals of a species that are best adapted to survive and reproduce.
- Over time, organisms with the characteristics needed for survival make up an increased percentage of the population.

B. Evolutionary Psychology

- **Evolutionary psychology** emphasizes the importance of adaptation, reproduction, and "survival of the fittest" in explaining behavior.
- The evolutionary process of natural selection favors behaviors that increase an organism's reproductive success and its ability to pass its genes to the next generation.

1. Evolutionary Developmental Psychology

- An extended childhood period evolved because humans require time to develop a large brain and learn the complexity of human societies.
- Evolved mechanisms are not always adaptive in contemporary society.

2. Evolution and Life-Span Development

- According to Paul Baltes, the benefits of evolutionary selection decrease with age, mainly because of a decline in reproductive fitness.
- While evolutionary selection benefits decrease with age, cultural needs increase.

3. Evaluating Evolutionary Psychology

- Albert Bandura, the social cognitive theorist, acknowledges evolution's important role in human adaptation and change. Yet he rejects "one-sided evolutionism," in which social behavior is the product of evolved biology. He argues for a bidirectional view that enables organisms to alter and construct new environmental conditions.
- Studying specific genes in humans and other species may be the best approach for testing the evolutionary psychology perspective.

II. GENETIC FOUNDATIONS OF DEVELOPMENT

- The principles of genetics explain the mechanism for transmitting characteristics from one generation to the next. Each individual has a genetic code, inherited from our parents, within every cell in our bodies.

A. The Collaborative Gene

- **Chromosomes** are threadlike structures that contain the genetic substance deoxyribonucleic acid (DNA).
- **DNA** is a complex molecule that contains genetic information. The double helix shape looks like a spiral staircase.

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- **Genes** are short segments composed of DNA. Genes act as a blueprint for cells to reproduce themselves and manufacture proteins that maintain life.
- Completion of the Human Genome Project has led to the use of the *genome-wide association method* to identify genetic variations linked to a particular disorder.
- *Linkage analysis,* in which the goal is to discover the location of one or more genes in relation to a marker gene (whose position is already known), is often used in the search for disease genes.
- *Next-generation sequencing* is the vast increase in genetic data generated at a much reduced cost and in a much shorter period of time.
- The Thousand Genomes Project is the most detailed study of human genetic variation to date.
- The activity of genes (*genetic expression*) is affected by their environment.
- The human genome consists of many genes that collaborate both with each other and with nongenetic factors inside and outside the body.
- Certain genes are turned on or off as a result of exercise, mainly through a process called *methylation*.

B. Genes and Chromosomes

1. Mitosis, Meiosis, and Fertilization

- **Mitosis** is the process by which each chromosome in the cell's nucleus duplicates itself.
- **Meiosis** is the process by which cells divide into gametes (testes/sperm in males, ovaries/eggs in females), which have half the genetic material of the parent cell.
- During **fertilization**, an egg and a sperm fuse to create a single cell, called a **zygote**.
- The 23rd pair of chromosomes differs in males and females. In males, the 23rd pair is XY, whereas in females it is XX.

2. Sources of Variability

- Genetic variability is ensured when pieces of the parents' chromosomes are exchanged, which creates a new combination of genes.
- There is an exchange of chromosomal segments during meiosis, resulting in a truly unique combination of genes for the zygote.
- Mutated genes are another source of variability.
- Two important terms are **genotype** (all of a person's genetic material) and **phenotype** (the external, observable characteristics).

C. Genetic Principles

1. Dominant-Recessive Genes

- If one gene of a pair is *dominant* and one is *recessive*, the dominant gene exerts its effect, overriding the potential influence of the recessive gene. A recessive gene exerts its influence only if the two genes of a pair are both recessive.

2. Sex-Linked Genes

- Most mutated genes are recessive. When a mutated gene is carried on the X chromosome, the result is called *X-linked inheritance*.

3. Genetic Imprinting

- This occurs when genes exert different influences based on whether they are inherited from the mother or the father.

4. Polygenetic Inheritance

- When a characteristic is the product of interaction of many different genes, it is said to be *polygenically determined*.

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D. Chromosomal and Gene-Linked Abnormalities

1. Chromosome Abnormalities

- Chromosome abnormalities occur when the sperm or ovum does not have its normal set of 23 chromosomes.

a. Down Syndrome

- **Down syndrome** is a chromosomally transmitted abnormality caused by the presence of an extra chromosome (approximately 1 out of 700 live births). An individual with Down syndrome typically has a round face, a flattened skull, an extra fold of skin over the eyelids, a protruding tongue, short limbs, and intellectual and motor disabilities. Maternal age may contribute to this syndrome.

b. Sex-Linked Chromosomal Abnormalities

- Sex-linked chromosome abnormalities occur when there is a deviation from the typical XX or XY combination of sex chromosomes. Sex-linked chromosomal disorders include the following:
- **Klinefelter syndrome** is a genetic disorder in which males have an extra X chromosome, making them XXY instead of XY (approximately 1 in 1000 live births). Males with this disorder have undeveloped testes and enlarged breasts and are tall.
- **Fragile X syndrome (FXS)** is a genetic disorder that results from abnormality in the X chromosome (it becomes constricted and breaks). Mental deficiency is the primary outcome, including cognitive deficits in inhibition, memory, and planning. It is more common in males than in females.
- **Turner syndrome** is a chromosome disorder in which females are missing an X chromosome, making them XO instead of XX. These females (1 in 2,500 live births) are short in stature and have webbed necks. They may be infertile and have difficulty in mathematics, while their verbal ability is often quite good.
- The **XYY syndrome** is a disorder in which the male has an extra Y chromosome. Despite assumptions, XYY males are no more likely to commit crimes than are XY males.

2. Gene-Linked Abnormalities

- More than 7,000 genetic disorders are caused by harmful genes, although most are rare.
- **Phenylketonuria (PKU)** is an easily detected genetic disorder in which the individual cannot properly metabolize an amino acid. If left untreated, intellectual disability and hyperactivity result. It occurs about once in every 10,000 to 20,000 live births.
- **Sickle-cell anemia**, which occurs in 1 of 400 African Americans, is a genetic disorder affecting the red blood cells, and often results in early death. Recent research strongly supports the use of hydroxyurea therapy for infants with sickle cell anemia beginning at 9 months of age.
- Other genetic disorders include cystic fibrosis, diabetes, hemophilia, Huntington disease, spina bifida, and Tay-Sachs disease.

CONNECTING WITH CAREERS: **Jennifer Leonhard, Genetic Counselor**

III. HEREDITY AND ENVIRONMENT INTERACTION: THE NATURE-NURTURE DEBATE

A. Behavior Genetics

- **Behavior genetics** seeks to discover the influence of heredity and environment on individual differences in human traits and development. Behavior is assumed to be jointly determined by the interaction of heredity and environment.

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- Twin studies and adoption studies are used to examine the influences of heredity and environment.
- **Twin studies** compare the behavioral similarity of identical twins to fraternal twins.
- Comparing fraternal and identical twins, behavioral geneticists capitalize on the basic knowledge that identical twins are more similar genetically than are fraternal twins.
- Potential concerns regarding twin studies include the notion that identical twins may be treated more similarly than fraternal twins and have more similar environments. If so, observed similarities may be caused by environmental influences rather than genetics.
- In **adoption studies**, researchers assess whether adopted children are more like their adoptive parents (environment) or their biological parents (genetics) with respect to behavior and psychological characteristics.
- Another form of adoption studies compares adoptive and biological siblings.

CONNECTING DEVELOPMENT TO LIFE: **Am I an "I" or "We"?**

- How twins move from a sense of "we" to "I" is a critical task for them as children and sometimes even as adults.
- The separation process often accelerates in adolescence when one twin is likely to mature earlier than the others; but sometimes the process does not occur until emerging adulthood or even later.
- Helping twins develop their own identities should be done on a child-by-child basis.

B. Heredity-Environment Correlations

- The concept of heredity-environment correlations is that individuals' genes influence the types of environments to which they are exposed.
- Scarr proposes three ways that heredity and environment are correlated:
  - **Passive genotype-environment correlations** occur when biological parents, who are genetically related to the child, provide a rearing environment.
  - **Evocative genotype-environment correlations** occur because a child's genotype elicits certain types of physical and social environments.
  - **Active (niche-picking) genotype-environment correlations** occur when children and adolescents seek out environments they find compatible and stimulating.
- Scarr proposes that the relative importance of these genotype-environment correlations change as children develop from infancy to adolescence.

C. The Epigenetic View and Gene × Environment (G × E) Interaction

- The **epigenetic view** states that development is the result of an ongoing, bidirectional interchange between heredity and the environment.
- Heredity and environment operate together—or collaborate—to produce a person's intelligence, temperament, height, weight, ability to pitch a baseball, ability to read, and so on.
- **Gene × environment interaction** is the interaction of a specific measured variation in DNA and a specific measured aspect of the environment.
- There are difficulties in replicating the results, inflated claims, and other weaknesses to this theory.

D. Conclusions about Heredity-Environment Interaction

- The relative contributions of heredity and environment are not additive.
- We cannot say that full genetic expression happens only once at conception or birth. Genes produce proteins throughout the life span, in many different environments.
- Complex behaviors are influenced by genes in ways that give people a propensity for a particular developmental trajectory.

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IV. PRENATAL DEVELOPMENT

A. The Course of Prenatal Development

1. The Germinal Period

- The **germinal period** takes place in the first two weeks after conception, beginning with the creation of the zygote and ending with implantation—that is, attachment of the zygote to the uterine wall.

2. The Embryonic Period

- The **embryonic period** occurs from two to eight weeks after conception. Rate of cell differentiation intensifies, support systems for cells form, and organs appear. The inner layer of cells, called the *endoderm*, will develop into the digestive and respiratory systems. The outer layer of cells contains the *ectoderm*, which will become the nervous system, sensory receptors, and skin; and the *mesoderm*, which will become the circulatory system, bones, muscles, and excretory and reproductive systems.
- **Organogenesis** is the process of organ formation during the first two months of prenatal development.

3. The Fetal Period

- The **fetal period** begins two months after conception and lasts for seven months. Growth and development continue, and organ systems mature to the point at which life can be sustained outside of the womb.
- Prenatal development also can be divided into equal three-month periods, called *trimesters*.

4. The Brain

- Babies are born with around 100 billion neurons.
- **Neurons** are nerve cells that process information at the cellular level.
- The structure of the brain develops during the first and second trimesters.
- Establishing connections and functioning are highlights of brain development during the third trimester through the first two years of life.

a. Neural Tube

- The first part of the nervous system to form is the *neural tube*, which develops from the ectoderm between 21 and 27 days after conception.
- Two birth defects are related to the neural tube failing to close:
  - *Anencephaly* is the result of the highest regions of the brain failing to develop, leading to death.
  - *Spina bifida* results in paralysis of the lower limbs to varying degrees.
  - Adequate amounts of folic acid help to prevent neural tube defects.

b. Neurogenesis

- *Neurogenesis*—the massive proliferation of new neurons—begins once the neural tube has closed, around 5 weeks. This neurogenesis continues throughout the pregnancy. At the peak of neurogenesis, approximately 200,000 neurons are created every minute.

c. Neural Migration

- *Neuronal migration*—neurons moving to their destination in the brain, building the structures of the brain as they go—begins at about week 15. Once at its destination, the neuron matures and develops a more complex structure.

d. Neural Connectivity

- Beginning around the 23rd week and continuing postnatally, connections between neurons begin to develop.

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B. Prenatal Diagnostic Tests

1. Ultrasound Sonography

- *Ultrasound sonography* is a prenatal medical procedure that allows one to see the fetus's inner structures. It can be used to detect many structural abnormalities and the baby's sex.

2. Fetal MRI

- *Fetal MRI* is a tool that can be used to diagnose fetal malformations and provides more detailed images than an ultrasound can provide.

2. Chorionic Villus Sampling

- *Chorionic villus sampling (CVS)* can detect genetic defects and chromosome abnormalities by testing a small sample from the placenta.

3. Amniocentesis

- *Amniocentesis* can detect chromosome and metabolic disorders by testing a sample of amniotic fluid.

4. Maternal Blood Screening and Cell-Free Fetal DNA

- *Maternal blood screening* can identify the risk of some disorders such as spina bifida and Down syndrome.
- Cell-free fetal DNA testing, a recent advance, has especially improved the accuracy of prenatal testing for fetal abnormalities such as Down syndrome as early as 10 weeks into the first trimester.

5. Fetal Sex Determination

- The sex can be determined between 11 and 13 weeks of gestation using chorionic villus sampling. Recently, though, some noninvasive techniques have been able to detect the sex of the fetus at an earlier point, as early as 4.5 weeks.

C. Hazards to Prenatal Development

1. General Principles

- A **teratogen** is any agent that causes a birth defect or negatively alters cognitive and behavioral outcomes. Teratogens include drugs, incompatible blood types, environmental pollutants, infectious diseases, nutritional deficiencies, maternal stress, advanced maternal and paternal age, and environmental pollutants.
- *Teratology* is the field of study that investigates the causes of birth defects.
- The severity and type of defect that results from teratogens can be a function of *dose*, *genetic susceptibility*, and *time of exposure*.

2. Prescription and Nonprescription Drugs

- Prescription drugs, such as antibiotics, some antidepressants, estrogen, and Accutane have teratogenic effects.
- Nonprescription drugs such as aspirin and diet pills can have teratogenic effects.

3. Psychoactive Drugs

- Psychoactive drugs act on the nervous system to alter states of consciousness, modify perceptions, and change moods.
  - **a. Caffeine**
    - Maternal caffeine is linked to lower birth weight and babies being born small for gestational age.
  - **b. Alcohol**
    - Alcohol taken during pregnancy can result in **fetal alcohol spectrum disorders (FASD)**, a cluster of abnormalities that appear in the offspring. The abnormalities include facial deformities, defective limbs and heart, and mild to moderate intellectual disability.

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c. **Nicotine**
   - Nicotine can cause increased risk of preterm births, fetal and neonatal death, low birth weight, nicotine withdrawal, ADHD, respiratory problems including asthma and wheezing and, SIDS

d. **Cocaine**
   - Cocaine exposure during the prenatal development is associated with reduced birth weight, length, and head circumference. Impaired motor development, lower arousal, less effective self-regulation, higher excitability, lower quality reflexes, impaired language development, and information-processing deficits are found as well.
   - Other factors in the lives of pregnant women who use cocaine cannot be ruled out as contributors.

e. **Marijuana**
   - Marijuana use during pregnancy has been associated with the offspring's low birth weight and a greater likelihood of being placed in a neonatal intensive care unit, as well as preterm births and lower levels of attention, memory, and impulse control in offspring.

f. **Synthetic Opioids and Opiate-Related Pain Killers**
   - Opioid use by pregnant mothers can result in opioid withdrawal symptoms in infants. Other potential effects are currently being studied.

4. **Maternal Diseases**
   - Diseases and infections can cause birth defects by crossing the placental barrier or causing damage during birth.
   - Rubella, syphilis, genital herpes, and HIV/AIDS are all diseases that can produce birth defects and/or damage during birth.
5. **Maternal Diet and Nutrition**
   - Malnourishment is a risk factor for a baby to be born malformed.
   - Obesity is a risk factor for stillbirth and placement in a neonatal intensive care unit. Additionally, maternal obesity is linked to childhood and adult obesity in children.
   - Neural tube defects are linked with less-than-adequate folic acid consumption.
6. **Emotional States and Stress**
   - Intense fears, anxieties, and stress in pregnancy have bene linked to preterm delivery and low birth weight.
   - High levels of stress during pregnancy is a risk factor for having a child with emotional or cognitive problems, ADHD, and language delay and having a very low birth weight infant.
   - Maternal depression during pregnancy is liked to low birth weight.
7. **Maternal Age**
   - The mortality rate of infants born to adolescent mothers is double that of infants born to mothers in their twenties.
   - The risk of Down syndrome increases with age, beginning at age 35.
   - The risk for low birth weight, preterm birth, and fetal death increases for women over 35 years of age.
   - A recently Norwegian study found that maternal age of 30 years and older was linked to the same elevated risk of having fetal death as a 25- to 29-year-old pregnant women who were smokers or overweight/obese.

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- If women remain active, exercise regularly, and are careful about nutrition, their reproductive systems may remain healthier at older ages than was thought possible in the past.

8. Environmental Hazards

- Radiation, pollutants, and toxic wastes are all potential hazards.

9. Paternal Factors

- Men's exposure to environmental toxins may cause abnormalities in sperm that lead to miscarriage or diseases such as childhood cancer.
- Smoking may decrease birth weight and increase early-term miscarriages.
- The risk of spontaneous abortion (miscarriage), autism, and schizophrenic disorders increases with paternal age.

D. Prenatal Care

- Prenatal care is important for numerous reasons.
- Prenatal care educates the mother about teratogens and other prenatal hazards.
- Prenatal care provides health care for the baby and mother.
- Prenatal care can provide information about educational, social, and nutritional services available in the community.
- Inadequate prenatal care increases the risk of low birth weight and a number of other physical problems.
- An innovative program that is rapidly expanding in the U.S. is CenteringPregnancy. This relationship-centered program provides complete prenatal care in a group setting.

V. BIRTH AND THE POSTPARTUM PERIOD

A. The Birth Process

1. Stages of Birth

- The first stage lasts about six to 12 hours for a woman having her first child. The cervix dilates to about 4 inches as a result of uterine contractions.
- The second stage begins when a baby's head moves through the cervix until the baby's body emerges completely, about 45 minutes to an hour.
- The third stage is called *afterbirth*, at which time the placenta, umbilical cord, and other membranes are detached and expelled. This takes a few minutes.

2. Childbirth Setting and Attendants

- In the U.S., most births take place in a hospital. The rate varies across countries.
- In the U.S., the father is typically the birth coach. This also varies across cultures.

a. Midwives

- *Midwifery* is practiced in most countries in the world.

b. Doulas

- **Doulas** (who provide continuous physical, emotional, and educational support for the mother before, during, and after childbirth) are used in many countries.
- Women who used a doula were four times less likely to have a low birth weight baby.

3. Methods of Childbirth

a. Medication

- Three basic kinds of drugs that are used for labor are analgesia, anesthesia, and oxytocin/Pitocin. Predicting how a drug will affect an individual woman and her fetus is difficult.

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b. Natural and Prepared Childbirth
- The mother's pain can be reduced by decreasing fear through education in the use of breathing and relaxation techniques.

c. Other Nonmedicated Techniques to Reduce Pain
- Other nonmedicated techniques to reduce pain include *waterbirth*, massage, and *acupuncture*.

d. Cesarean Delivery
- In caesarean delivery, the baby is removed from the mother's uterus through an incision made in her abdomen. This is usually done when the baby is having difficulty emerging through the birth canal because of its size, breech position, or other problem.
- The U.S. cesarean birth rate in 2015 was 32 percent, the lowest rate since 2007; however, the benefits and risks of cesarean deliveries continue to be debated in the United States and around the world.

4. The Transition from Fetus to Newborn
- *Anoxia,* which can cause brain damage, can occur when the fetus has an insufficient supply of oxygen as a result of the delivery taking too long.
- Hormones, adrenalin and noradrenalin, are secreted to protect the fetus against stress.
- The umbilical cord is cut immediately after birth.
- The **Apgar Scale** is widely used to assess the health of newborns at one and five minutes after birth, evaluating an infants' heart rate, respiratory effort, muscle tone, body color, and reflex irritability.

CONNECTING WITH CAREERS: **Linda Pugh, Perinatal Nurse**

B. Low Birth Weight and Preterm Infants
- Three related conditions pose threats to many newborns: low birth weight, preterm birth, and being small for date.
- **Low birth weight** infants weigh less than 5 1/2 pounds at birth.
  - *Very low birth weight* newborns weigh less than 3 pounds, 4 ounces.
  - *Extremely low birth weight* newborns weigh less than 2 pounds, 3 ounces.
  - The incidence of low birth weight varies considerably from country to country.
  - The U.S. low birth weight rate is 8.2 percent (2018) and has been rising in the past two decades.
- **Preterm** infants are those born 35 or fewer weeks after conception. In 2017, 9.9 percent of U.S. infants were born preterm.
- **Small for date infants** are those whose birth weight is below normal when considering the length of pregnancy.

1. Consequences of Being Born Preterm and Low Birth Weight
- Low birth weight children are more likely to develop a learning disability, attention deficit hyperactivity disorder, autism spectrum disorder, or breathing problem such as asthma.
- Approximately 50 percent of all low birth weight children are enrolled in special education programs, although disadvantaged environments are also a contributing factor.
- A study in four Asian countries revealed that very low birth weight infants had a much higher mortality rate than other neonates.

2. Nurturing Low Birth Weight and Preterm Infants
- Two increasingly used interventions in the neonatal intensive care unit (NICU) are kangaroo care and massage therapy.

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- **Kangaroo care** is a way of holding a preterm infant so that there is skin-to-skin contact, two to three hours per day, over an extended time in early infancy.
  - Kangaroo care helps preterm infants to stabilize their heartbeat, temperature, and breathing.
  - Preterm infants who experience kangaroo care have more stable heartbeat, temperature, and breathing, as well as reduced infant mortality and other benefits.
  - Kangaroo care is increasingly being recommended for all infants.
  - There are long term positive benefits through as much as 20 years of age for children who were exposed to newborn kangaroo care.

***CONNECTING WITH RESEARCH:* How Are Preterm Infants Affected by Touch?**

- Preterm infants who were massaged were more active and alert than preterm infants who were not massaged.
- Full-term infants that were massaged gained more weight, performed better on the orientation scale of the Brazelton, were less excitable and less depressed, and were less agitated during sleep than infants not massaged.
- Preterm infants exposed to cocaine in the womb benefited from infant massage (better weight and scores on developmental tests) compared to those not massaged.
- Reviewing research indicates that preterm infant massage is consistently correlated with increased weight gain and earlier discharge from the hospital.

C. Bonding

- **Bonding** is the formation of a connection between the parent and infant.
- Some physicians consider this time critical for the development of emotional attachment; however, research findings regarding the critical nature of early close contact in the first few days of life do not support this claim.
- *Rooming-in* arrangements are now offered at most hospitals to facilitate bonding.

D. The Postpartum Period

- The **postpartum period** is the period after childbirth or delivery that last for about six weeks or until the mother's body has completed its adjustment and has returned to a nearly prepregnant state.

1. Physical Adjustments

- Physical adjustments include hormone production changes and *involution*, where the uterus returns to its prepregnant size.

2. Emotional and Psychological Adjustments

- Emotional fluctuations are common.
- About 70 percent of new mothers in the United States experience postpartum blues—feelings of depression, anxiety, and upset.
- Some women develop **postpartum depression**, which involves a major depressive episode that may become worse and last for many months without treatment.
- Major risk factors for postpartum depression include depression during pregnancy, a history of physical abuse, migrant status, and postpartum physical complications.
- Fathers also undergo considerable adjustment during the postpartum period.

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Learning Goals

1. Discuss the evolutionary perspective on life-span development.
   - How can natural selection and adaptive behavior be defined?
   - What is evolutionary psychology?
   - What are some basic ideas about human development proposed by evolutionary psychologists?
   - How might evolutionary influences have different effects at different points in the life span?
   - How can evolutionary psychology be evaluated?

2. Describe what genes are and how they influence human development.
   - What are genes?
   - How are genes passed on?
   - What basic principles describe how genes interact?
   - What are some chromosome and gene-linked abnormalities?

3. Explain some of the ways that heredity and environment interact to produce individual differences in development.
   - What is behavior genetics?
   - What are three types of heredity-environment correlations?
   - What is the epigenetic view of development?
   - What conclusions can be reached about heredity-environment interaction?

4. Characterize the course of prenatal development and its hazards.
   - What is the course of prenatal development?
   - How does the brain develop in the prenatal period?
   - What are some prenatal diagnostic tests?
   - What are some of the main hazards to prenatal development?
   - What do prenatal care programs provide?

5. Summarize how birth takes place and describe the nature of the postpartum period.
   - What are the three main stages of birth?
   - What are some different birth strategies?
   - What is the transition from fetus to newborn like?
   - What are the outcomes for children if they are born preterm or with a low birth weight?
   - What is bonding?
   - How is it linked to child outcomes?
   - What are some characteristics of the postpartum period?

Key Terms

active (niche-picking) genotype-environment correlations
adoption study
Apgar Scale
behavior genetics
bonding
chromosomes
DNA
doula
Down syndrome

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embryonic period
epigenetic view
evocative genotype-environment correlations
evolutionary psychology
fertilization
fetal alcohol spectrum disorders (FASD)
fetal period
fragile X syndrome (FXS)
gene × environment (G × E) interaction
genes
genotype
germinal period
kangaroo care
Klinefelter syndrome
low birth weight infants
meiosis
mitosis
natural childbirth
neurons
organogenesis
passive genotype-environment correlations
phenotype
phenylketonuria (PKU)
postpartum depression
postpartum period
prepared childbirth
preterm infants
sickle-cell anemia
small for date infants
teratogen
Turner syndrome
twin study
XYY syndrome
zygote

Key People

Paul Baltes
Albert Bandura
David Buss
Charles Darwin
Tiffany Field
Gilbert Gottlieb
Ferdinand Lamaze
David Moore
Sandra Scarr

Lecture Suggestions

Lecture Suggestion 1: Natural Selection

This lecture gives students an example that is easily understandable and that demonstrates the principles of natural selection, starting with a brief overview of Darwin's theory of evolution. The theory of evolution proposed by Charles Darwin (1809–1882), and modified somewhat since, attempts to explain how the characteristics of any species change over time, and how new species can evolve from earlier ones (Darwin, 1859). The main arguments are as follows:

- *There is genetic variation in a species.* Some members of the species have different genes (and different genetically influenced characteristics and behaviors from others). If all members of the species were genetically identical, there would be no way for the genetic makeup of the species to change over time.

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- *Some genes aid in adaptation more than others do.* Suppose that some members of a species have genes that make them strong and intelligent, whereas others have genes that make them weak and dull. Surely those with the genes for strength and intelligence would be better able to adapt to their environment (e.g., to win fights for survival or to figure out how to obtain food).

- *Those genes that aid their bearers in adapting to the environment will be passed on to future generations more often than those genes that do not.* This is the principle of **natural selection—**the idea that nature "selects," or allows to survive and reproduce, those members of a species whose genes permit them to adapt to their environment. By contrast, those genes that somehow reduce the chances that an individual will survive and reproduce become more rare over time, because they will not be passed on to many offspring through natural selection. Then, the genetic makeup of a whole species can slowly change over time.

Consider a classic example of speeded-up evolution. H. B. D. Kettlewell (1959) carefully studied moths in England. Genetic variation among moths makes some of them dark in color and others light in color. By placing light and dark moths in several different sites, Kettlewell found that, in rural areas, light moths were most likely to survive. Just the opposite was true in the industrial areas of Birmingham: Dark moths were most likely to survive. The explanation: In rural areas, light-colored moths blend in well with light-colored trees and are better protected from predators by camouflage. Natural selection favors them. In sooty industrial areas, however, light-colored moths are easy pickings against the darkened trees, whereas dark moths are well disguised. When industry came to England, the proportion of dark moths increased; as pollution was brought under control in some highly industrialized areas, the proportion of light-colored moths increased (Bishop & Cooke, 1975).

Notice, then, that evolutionary theory is not just about genes—it is about the interaction between genes and environment. A particular genetic makeup may enhance survival in one kind of environment but prove maladaptive if the environment changes dramatically. Which genes are advantageous, and therefore become more common in future generations, depends on what traits the environment demands. According to evolutionary theory, humans—like any other species—are as they are and develop as they do partly because they have a shared species heredity that has evolved through natural selection. Perhaps the most significant legacy of human evolution is a powerful brain that allows us to learn from our experiences and to master a complex language so that we can communicate almost anything to others. What could be more adaptive? Humans have not had to wait for biological evolution to give them furrier bodies as protection from the cold; they have been able to use their brains to invent better clothing and heating systems and to teach what they know to their children (Scarr & Kidd, 1983). Many of the changes we see over the course of history are the result of this kind of cultural, rather than biological, evolution. What evolutionary biologists teach us is that the abilities to learn and teach others are themselves the products of biological evolution.

Source:
Sigelman, C. K. (1999). *Life-span human development,* 3rd ed. Pacific Grove, CA: Brooks/Cole.

Lecture Suggestion 2:
Guest Speaker Idea and Prenatal Counseling

Students often find the role of a genetics counselor difficult to understand. Invite a genetics counselor to come and discuss what he or she does to assist couples who want testing. You might ask the counselor to

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discuss the most common reasons why couples come for testing and methods of testing. If you are not able to have a guest speaker attend your class, give a lecture on these ideas.

Genetic counseling involves using potential parents' medical and genetic histories and tests to help couples estimate their chances of having a healthy baby and to discuss the best course of action in view of risks and family goals. Ideally, this counseling occurs prior to pregnancy. Individuals likely to seek prenatal counseling include the following:

- Couples who have a child with a serious defect (Down syndrome, spina bifida, limb malformation, etc.)
- Couples with a family history of genetic diseases or intellectual disability
- Couples who are blood relatives (first or second cousins)
- Any woman older than 35 years of age
- Members of high-risk ethnic groups (e.g., African Americans, Ashkenazi Jews, Italians, Greeks)

Source:

Feinbloom, R. I., & Forman, B. Y. (1987*). Pregnancy, birth and the early months: A complete guide.* Reading, MA: Addison-Wesley.

Lecture Suggestion 3:
Three Laws of Behavior Genetics

This lecture extends the discussion of behavior genetics relative to the nature-nurture debate. The traditional nature-nurture debate focused on whether genes influenced complex behavioral outcomes. The answer is yes. The current nature-nurture debate focuses on how to proceed from partitioning sources of variance to specifying concrete developmental processes. Turkheimer (2000) has synthesized the following three laws of behavior genetics:

- First Law: All human behavioral traits are heritable.
- Second Law: The effect of being raised in the same family is smaller than the effect of genes.
- Third Law: A substantial portion of the variation in complex human behavioral traits is not accounted for by the effects of genes or families.

If the first two laws are taken literally, the nature side of the great nature-nurture debate wins. That is, genes matter and families or environment do not; however, this is a massive oversimplification. The claim that genes are involved in all traits does not preclude environmental influences. Individual genes and their environments (including other genes) interact to influence developmental processes. Interactivity is the primary component of this process. Subsequent environments are influenced by prior states, and these interactions influence developmental trajectories of the organism, which affect future expression of genes. There are no direct cause-and-effect relationships in developmental processes. Rather, any individual gene or environmental event influences development only by interacting with other genes and environments.

Heritability per se has few implications for scientific understanding of development. It is important to remember the following point: Heritability does not have one certain consequence. Correlations among biologically related family members are not *prima facie* evidence of sociocultural causal mechanisms. Just because a child of a depressed mother becomes depressed does not demonstrate that being raised by depressed mothers is itself depressing. That child might have become depressed regardless of the environment because of the influence of the mother's genes.

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Related to the second and third laws, Plomin and Daniels (1987) asked this question: Why are children in the same family so different from one another? They proposed that children in the same family are different because nonshared environmental events are more potent causes of developmental outcomes than shared environmental factors. In other words, children's environments, their peers, and the aspects of parenting their siblings do not share help explain differences among siblings. The part of the family environment that siblings do not share appears to matter more than the part of the family environment that siblings do share. Plomin and Daniels also state that the salient environment is almost impossible to research because it is a combination of unsystematic, idiosyncratic, or serendipitous events.

Genetic material is a more systematic source of variability in development than environment. Yet this statement is based on methodological rather than substantive issues. Genetic experiments with identical and fraternal twins statistically assess this component better than social scientists' ability to assess unsystematic and idiosyncratic events within environments. Turkheimer states that twin studies are a methodological shortcut, but they do not demonstrate that genes are more important than environments. Turkheimer further states that human developmental social science is difficult to conduct for two major reasons: (1) human behavior develops out of complex, interactive nonlinear processes, and (2) experimental control is impossible to implement in human developmental processes because of ethical constraints.

Sources:

Plomin, R., & Daniels, D. (1987). Why are children in the same family so different from one another? *Behavioral and Brain Sciences, 10*, 1–60.

Turkheimer, E. (2000). Three laws of behavior genetics and what they mean. *Current Directions in Psychological Science, 9,* 160–164.

Lecture Suggestion 4:
Technology and Images of Prenatal Development

A compelling way to bring home the value of observation as a research technique and, at the same time, stress the importance of prenatal development as a pivotal period in human development is to present and discuss images of prenatal development. Amazing images of prenatal development are available at The Visible Embryo Web site (http://www.visembryo.com/). The spiral represents the 23 stages occurring in the first trimester of pregnancy and every 2 weeks of the second and third trimesters. Use the spiral to navigate through the 40 weeks of pregnancy and preview the unique changes in each stage of human development. Images are provided for the first trimester, with in-depth descriptions for all 40 weeks of pregnancy.

Lecture Suggestion 5:
Principles of Teratogenic Effects

The concept of an interaction was introduced in Chapter 2 and can be further elaborated with a lecture about the principles that govern the effects of teratogens on the developing embryo. These effects vary depending on the genotype of the mother and the baby, as well as the amount and timing of exposure to the teratogen. Some of the principles of teratogenic effect are as follows:

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- The effects of a teratogen vary with the developmental stage of the embryo. Systems or organs in the process of development (organogenesis) are generally affected more than are completed organs and systems. Because the various organ systems begin and end their prenatal development at different times, their sensitivity to agents varies over time.
- The most vulnerable time for the brain is from 15 to 25 days postconception; for the eye from 24 to 40 days postconception; and the heart from 20 to 40 days postconception.
- Individual teratogens influence specific developing tissues, which leads to particular patterns of developmental deviations. German measles affects mainly the heart, eyes, and brain. Thalidomide, the antinausea drug from the 1960s, results in malformation of the limbs.
- Both maternal and fetal genotypes can affect the developing organism's response to teratogenic agents and may play an important role in the appearance of abnormalities in offspring. Not all pregnant women who used thalidomide or had German measles during early pregnancy produced infants with abnormalities. The physiological or pathological status of the mother will influence the action of a teratogen.
- Not only will nutritional deficiencies themselves directly affect prenatal development, but they may also intensify the adverse effects on the fetus of certain drugs ingested by the mother. Other maternal factors such as obesity, high blood pressure, and liver dysfunction may increase the impact of damage by teratogens.
- The level of teratogenic agent that will produce malformations in the offspring may show only mild detrimental effects on the mother or none at all. Radiation from x-rays, drugs (alcohol, thalidomide, etc.), and dietary deficiencies may have no impact on the mother but cause gross deviations in the infant.

As you present each principle, relate it to the concept of interaction as well as other relevant developmental concepts. For example, the first principle is an example of an interaction in which developmental level mediates the influence of a specific experience. This idea is related to the concepts of critical/sensitive period, fixation, and developmental readiness. The third principle provides a complicated example of heredity/environment interaction and an example of dyadic interaction (physiological level).

Sources:

Hogge, A. (1990). Teratology. In I. R. Merkatz & J. E. Thompson (eds.), *New perspectives on prenatal care*. New York: Elsevier.

Moore, K., & Persaud, T. (1993). *The developing human: Clinically oriented embryology*, 5th ed. Philadelphia: Saunders.

Lecture Suggestion 6:
Dangers of Drug Use During Pregnancy

Information about the teratogenic effects of "everyday drug use" is important to students as present or future parents. You may wish to underscore this point with a lecture that explores this issue in greater depth than is possible in the text. Place special emphasis on the potential dangers of even normal everyday drug use, in particular the use of caffeine (coffee), nicotine (cigarettes), and alcohol. Some important points to address include the following:

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- These teratogens have graded effects, which makes it risky to talk about "safe" levels of exposure. For example, having just one serving of alcohol a day increases risks for developmental disorders. Fetal alcohol syndrome can have mild, moderate, or severe effects on the developing fetus.
- Effects of drug exposure may be direct or indirect. Alcohol use may lead to organic abnormalities; nicotine use may lead to temperamental difficulties in babies, which can reduce the quality of their interactions with their caregivers.
- Risks can be vitiated by discontinuing use of the drug. It is not reasonable to continue using a drug on the grounds that harm has already been done and cannot be reversed. Risks may depend on the timing of prenatal exposure (see Lecture Suggestion 1).
- The drug use habits of both parents can affect the fetus, either directly or indirectly. Secondhand smoke has been found to adversely affect fetuses. Maternal exposure to environmental tobacco smoke for one hour or more per day is associated with spontaneous abortion (Windham et al., 1992). The quality of care and support a partner can provide to his or her pregnant wife could influence the outcome of the pregnancy.
- Caffeine exposure is common in pregnancy. The consumption of greater than 300 milligrams per day of caffeine during pregnancy is potentially harmful. This is equivalent to three (8-ounce) cups of coffee or 7.5 cups of tea or cola. The results indicated that women who consumed caffeine in moderation (less than 300 milligrams per day) did not have a significant risk for pregnancy loss, intrauterine growth retardation, or microcephaly.
- An important addition to your lecture could be a treatment of how mothers (and fathers) can deal with drug use habits that may endanger their unborn baby. Classroom Activity 2 addresses issues related to drug use during pregnancy and the social ramifications for the parent(s) and child.

Sources:

Eskenazi, B. (1993). Caffeine during pregnancy: Grounds for concern? *JAMA, 297*, 3–4.

Mills, J., et al. (1993). Moderate caffeine use and the risk of spontaneous abortion and intrauterine growth retardation. *JAMA, 269*, 593–597.

Windham, G. C., Swan, S. H., & Fenster, L. (1992). Parental cigarette smoking and the risk of spontaneous abortion. *American Journal of Epidemiology, 135,* 1394–1403.

Lecture Suggestion 7:
Birth Defects Are Too Often Blamed on Alcohol

Students are aware that pregnant women should not drink alcohol during pregnancy, because alcohol exposure has been linked to birth defects such as small heads, small eye openings, smooth upper lips, and intelligence deficits. Fetal alcohol syndrome (FAS) is one of the most common causes of birth defects (1 in 500 to 1,000 births). A diagnosis of FAS depends on the presence of facial abnormalities, short stature, and low IQ. Children who do not meet all three criteria are often diagnosed with fetal alcohol effects (FAE), considered a mild form of fetal alcohol syndrome, on the assumption that their birth defects arose from exposure to alcohol prenatally.

Researchers at the University of Arizona Health Sciences Center in Tucson reanalyzed 437 cases involving Arizona children (19 percent diagnosed with FAS, the rest with some FAE). Using facial abnormalities as the criteria, they found that 56 percent could be diagnosed with FAS and that 13 percent of children diagnosed with FAS suffered from misdiagnosed genetic problems (Down syndrome, neurofibromatosis). The researchers classified 41 percent as having some prenatal alcohol exposure, but

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they could not claim that alcohol had caused the birth defects. Dr. H. Eugene Hoyme urges doctors and geneticists to eliminate the diagnosis of fetal alcohol effects. He states that the risk of stigmatizing children and missing other serious diagnoses is great if doctors too easily blame alcohol. You may want to use Classroom Activity 1 before beginning this lecture. This activity assesses students' knowledge of the prevalence of FAS.

Source:
Seachrist, L. (1995). Birth defects too often blamed on alcohol. *Science News, 148.*

Lecture Suggestion 8:
Social Support and Prenatal Development

As we focus on the potentially damaging effects of various teratogens, we often fail to pay attention to other, nonphysical factors that could influence prenatal outcomes. The text mentions maternal emotional states and stress as nonphysical factors that influence prenatal development. Although experimental research with animals demonstrates a causal link between maternal stress and negative outcomes in children, it is difficult to generalize this research to humans, given that humans have the added factor of cognition, and it is difficult to hypothesize exactly how this factor may mediate or moderate effects (King & Laplante, 2005). King and Laplante also suggest that it is difficult to disentangle the effects of maternal stress prenatally and the transmission of genetic predispositions to stress (e.g., temperament). With these caveats in mind, King and Laplante did find significant relations between maternal prenatal stress and negative outcomes in children. In their study, 150 children whose mothers experienced a natural disaster during pregnancy were followed. The researchers did find negative effects on cognitive and language development in 2-year-olds that were commensurate with the objective severity of exposure and that the time of exposure moderated some of the effects.

Another factor that seems to play a role is the amount of social support the pregnant woman receives. One study found that maternal mental health *and* level of social support during pregnancy affects outcomes in children even after controlling for sociodemographic, obstetric, and behavioral risk factors (Federenko & Wadhwa, 2004). Another study examined social support in 247 women (Feldman, Dunkel-Schetter, Sandman, & Wadhwa, 2000). The types of social support that were assessed included support from the woman's family, support from the baby's father, and more general functional support. The authors found that social support predicted fetal growth (birth weight adjusted for length of gestation). Marital status and education were also related to fetal growth, but only indirectly through their relationship with social support. Thus, it appears that prenatal social support is associated with at least one outcome (infant birth weight).

Sources:
Federenko, I. S., & Wadhwa, P. D. (2004). Women's mental health during pregnancy influences fetal and infant developmental and health outcomes. *CNS Spectrums, 9*(3), 198–206.
Feldman, P. J., Dunkel-Schetter, C., Sandman, C. A., & Wadhwa, P. D. (2000). Maternal social support predicts birth weight and fetal growth in human pregnancy. *Psychosomatic Medicine, 62*(5), 715–725.
King, S., & Laplante, D. P. (2005). The effects of prenatal maternal stress on children's cognitive development: Project Ice Storm. *Stress: The International Journal on the Biology of Stress, 8*(1), 35–45.

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Classroom Activities

Classroom Activity 1:
Principles of Genetic Transmission

This activity helps students understand the principles of genetic transmission. Ask students to bring in as complete a description as possible of the hair type (straight or curly) of their siblings, parents, grandparents, and, if possible, great-grandparents. Some students will be unable to get the information, so it might be a good idea to break the class into groups and have them use the data of the student with the most complete history. Using Mendel's principles of genetic transmission, have students draw genetic models that explain how they and their siblings got their hair type. Encourage the students to include their parents and grandparents in their models.

- The allele for curly hair is dominant (represent it as C), and the allele for straight hair is recessive (c). Children who inherit either a homozygous pair (CC) of dominant alleles or a heterozygous pair (Cc) will have curly hair (although the Cc individuals could pass on a straight hair gene to their children; thus they are called carriers). Children who inherit a homozygous recessive pair (cc) will have straight hair.

- If the father is homozygous for straight hair (cc) and the mother is heterozygous for curly hair (Cc), 50 percent of the children will be heterozygous for curly hair and 50 percent will be homozygous for straight hair.

Logistics:
- Group size: Individual or small group (2 to 4)
- Approximate time: 10 minutes

Classroom Activity 2:
Ethical Dilemmas Regarding Genetic Counseling

In order for students to appreciate the value of the information they are learning, it is sometimes useful to present them with everyday situations faced by people in which knowledge of life-span development can be useful, but at the same time, controversial. This activity also affords students an opportunity to review concepts from the chapters (recessive-dominant, genetic testing, etc.). In the November 1994 issue of *Science News*, four ethical dilemmas were presented, and readers were asked to write in and indicate how they would respond to each situation. We will present two of the dilemmas and suggest issues for students to consider as **Handout CA 2-2**.

The first scenario deals with dwarfism and is quoted from *Science News*.

> A husband and his pregnant wife seek genetic counseling. Each carries one flawed copy of the gene responsible for achondroplasia; therefore, they are both dwarfs. Recently, a California research team described the mutation in a gene on chromosome 4 that causes achondroplasia. The counselor explains that genetic testing can determine whether the fetus has inherited the mutated gene. In the discussion, the couple informs the counselor

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that they will abort any fetus that carries two mutant genes. That's not surprising because children born with two such genes rarely survive beyond infancy. This couple has had a child in this circumstance who died when it was 2 months old.

This time around, they say, they want a baby who is heterozygous for the achondroplasia trait. This child inherits a flawed gene from one parent and a healthy gene from the other parent. That genetic combination means the child will be a dwarf—just like the parents. At the same time, the parents say, they will abort any fetus that does not inherit one copy of the mutant gene. Should the counseling center perform the test, knowing that the couple plans to abort a healthy fetus?

Some of the things to consider include the fact that achondroplasia is a serious disorder. The bones can be abnormal in structure, sometimes requiring the use of a wheelchair. Yet, many dwarfs live long, healthy lives and don't regard their condition as a disability. In addition, some couples with this condition worry about problems involved in raising a normal-sized child.

- Have students determine what the ethical dilemma is for the scenario (perform the test or not?).
- What would they do if they were the genetic counselor?
- Have students present arguments for both sides of the issue.
- Remind students that genetic counselors should present options to clients and not make decisions.

The second scenario deals with paternity and is quoted from *Science News*.

A husband and wife have a child who suffers from cystic fibrosis (CF), an incurable, fatal hereditary disease that results in frequent infections and difficulty breathing. The couple wants to determine their risk of having another child with this disorder. Because CF is a recessive disorder, a child usually must inherit the CF gene from both parents to get the disease. A child with just one CF gene is a carrier: Such a person doesn't have the disorder but can pass the trait on to the next generation. The DNA test revealed that the mother of the child carried the CF trait; however, her husband did not. The DNA tests showed that he was not the biological father of the child.

The fact significantly decreased the couple's chance of having another child with CF. But the test has put the counselor in a difficult situation. Should the counselor tell the couple about the nonpaternity findings? Should the mother be told privately? If so, is the center colluding with the mother to withhold information from the husband?

In addition, this case brings up issues concerning the biological father of the child. This man has not contracted with the genetics center for the test, yet the counselor now knows that this man is probably a carrier of the mutant gene for CF. Should the genetic counselor call this man and tell him about his risk?

- Have students determine what the ethical dilemmas are for the scenario (reveal paternity to wife? reveal paternity to husband? reveal carrier status to biological father?).

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- What would they do if they were the genetic counselor?
- Have students present arguments for both sides of the issue.

In the December 1994 issue of *Science News*, the author presents the results of people's responses to these dilemmas. Compare the opinions of your class with those of the people who responded to the article.

Scenario 1:
- Of the adults who answered, 84 percent said the center should perform the test for this couple.
- The students were split more evenly; 59 percent said they would okay the test, but 41 percent would veto the test.

Scenario 2:
- Of the adults, 35 percent believed the counselor should explain the low risk of having another child with CF without revealing the paternity issue (some said to reveal paternity if the couple wanted more details).
- Of the adults, 35 percent believed the counselor should tell the couple about the paternity data (some thought to tell the mother separately first).
- Of the adults, 30 percent thought the counselor should relay the paternity findings to the mother only.
- Of the students, 9 percent would reveal only the CF risk.
- Of the students, 56 percent would tell the couple about the paternity (most would tell the mother first).
- Of the students, 35 percent would tell only the mother the paternity results.
- Seventy-one percent of the students and 52 percent of the adults wanted the biological father to know he was a CF carrier.
- Most genetic clinics now tell prospective clients that paternity can be determined through DNA testing and ask them how they want the situation handled if it arises.

Logistics:
- Materials: Handout CA 2-2 (ethical dilemmas)
- Group size: Small groups (2 to 4) and full class
- Approximate time: Small groups (20 minutes) and full class (10–15 minutes per dilemma)

Sources:
Fackelmann, K. (1994). Beyond the genome: The ethics of DNA testing. *Science News, 146*, 298–299.
Fackelmann, K. (1994). DNA dilemmas: Readers and "experts" weigh in on biomedical ethics. *Science News, 146*, 408–410.

Classroom Activity 3:
Pros and Cons of Genetic Testing for Huntington Disease

A genetic diagnostic test has been developed for the 100,000 Americans with a history of Huntington disease in their families. The test identifies which individuals have inherited the defective gene. These individuals will usually begin to show symptoms between ages 35 and 45. The symptoms include progressive dementia and loss of body control; irritability and depression; and symptoms that mimic "drunkenness," such as slurred speech, slowed thought processes, impaired memory, and diminished

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problem-solving ability. These individuals also exhibit uncontrolled movements. Students should discuss the disadvantages and advantages of conducting these simple blood tests, and if they would have the test and why.

Disadvantages:

- Some people may be unable to cope with the knowledge that they will inevitably suffer from an incurable disease. Some individuals diagnosed with symptoms of the disease attempt suicide (25 percent).
- Some families may break up, and some people may not be able to concentrate on their jobs.
- Sibling relationships may change as one is "liberated" from the disease and another is "doomed."
- Fetal testing will cause some families to make decisions about abortions that they are uncomfortable making, or they will have to live with the belief that their children are "doomed."

Advantages:

- Some people will be relieved to know that they will not get Huntington disease, lifting a lifetime burden from their shoulders.
- Some people, who are informed that they will get the disease, may prefer the knowledge and plan their lives accordingly, just as many cancer patients would rather know their fates.
- The 50 percent of family members who will not get the disease can have children without wondering whether they are passing on a serious genetic condition. The rest can be more certain about their decisions not to have children.
- This genetic screening test represents a first step in prevention and successful treatment of Huntington disease. Somewhere down the line, potential victims may be treated with medicines or genetic surgery.

Logistics:

- Group size: Full class discussion
- Approximate time: 15 minutes

Classroom Activity 4:
Fetal Alcohol Syndrome Quiz

This activity increases students' understanding of fetal alcohol syndrome (FAS). Have students get into groups of two or three and answer the Fetal Alcohol Syndrome Quiz presented as **Handout CA 2-4**. After they have discussed the questions and indicated the answer they believe to be correct, discuss the correct answers as a class. The answers below are also included in Handout CA 2-4, in case you want the students to have a copy on which to take notes.

This activity should clear up some misconceptions students have about this syndrome. Ask students to generate ideas about how this information can be disseminated to the public so that the incidences of FAS can be reduced.

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Answers to the Fetal Alcohol Syndrome Quiz

1. E. Some argue that this is a conservative estimate.
2. C. Characteristic abnormalities include facial deformities, heart deformities, and intellectual disability.
3. D. FAS is the primary threat to children's mental health, much greater than either Down syndrome or spina bifida.
4. C. The risk for African Americans is 6.7 times that of European Americans. Native Americans are 33 times more likely to suffer from FAS than European Americans.
5. B. Risk may be minimal during the first 2 weeks; however, during the rest of the first trimester the organs are developing and tremendous damage can be caused by exposure to alcohol.
6. A. Alcohol can be ingested in the breast milk.
7. A. Scandinavia, Boston, and Atlanta studies all indicate that some correction may occur. Size and healthiness improve, but there is no evidence that intelligence is improved.
8. B. Barbiturates and opiates affect the nervous system; alcohol can affect any cell.

Logistics:
- Materials: Handout CA 2-4 (Fetal Alcohol Syndrome Quiz) and Handout 2 (answers)
- Group size: Small group discussion and full class discussion
- Approximate time: Small groups (10 minutes) and full class (10–15 minutes)

Sources:
Dorfman, A. (1989). Alcohol's youngest victims. *Time,* August 28, *60*.
Simons, J. A. (1989). *Quiz on Fetal Alcohol Syndrome*. Des Moines, IA: Central Iowa Psychological Services.

Classroom Activity 5:
Court's Treatment of Substance-Abusing Pregnant Women

In August 1989, 23-year-old Jennifer Johnson was found guilty of delivering a controlled substance to a minor; the minor was her baby who was born a cocaine addict. She could have received a 30-year sentence, but she was sentenced to a year of house arrest in a drug rehabilitation center and 14 years of probation. In your discussion, inform students of the typical effects of cocaine in personality and physical aspects of offspring (babies whose mothers used cocaine during pregnancy had significantly lower cardiac output, lower stroke volume, and higher mean arterial blood pressure with a higher heart rate). Divide students into groups, and have them discuss the following questions (**Handout CA 2-5**):

- Do you think that mothers who use drugs during pregnancy should face criminal prosecution? Might this policy keep some pregnant women from getting prenatal care and having a hospital delivery? How far should the prosecution go? What alternative solutions can you suggest?
- Is fetal abuse equivalent to child abuse?
- Should fathers who use drugs during their partner's pregnancy face criminal prosecution?

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- Maternal exposure to environmental tobacco smoke for one hour or more per day is associated with spontaneous abortion (Windham et al., 1992), and paternal smoking is related to intellectual disability in offspring (Roeleveld et al., 1992).
- How responsible is a drug-using male in infertility and newborn health problem situations? Do you think a wife should be able to sue her husband for infertility problems caused by the use of cocaine?
- Cocaine use lowers sperm count, increases abnormally shaped sperm, and decreases sperm mobility. Infertility problems may last more than two years after a man quits using cocaine.
- Research suggests, for example, that mothers who smoke tobacco during pregnancy and up to the time their children are 5 years old increase the risk of their offspring getting asthma. Should smoking mothers also be prosecuted?

Logistics:
- Materials: Handout CA 2-5 (The Court's Treatment of Substance-Abusing Pregnant Women Activity)
- Group size: Small group discussion
- Approximate time: Small groups (30 minutes)

Sources:
Roeleveld, N, Vingerhoets, E., Zielhuis, G. A., & Gabreels, F. (1992). Mental retardation associated with parental smoking and alcohol consumption before, during, and after pregnancy.
Van Bel, F., Van de Bor, M., Stijnen, T., Baan, J., & Ruy, J. (1990). Decreased cardiac output in infants of mothers who abused cocaine. *Pediatrics, 85,* 30–32.
Van Pelt, D. (1990). Smokers' offspring more prone to asthma. *Insight, 47*.
Van Pelt, D. (1990). Sperm abnormalities among cocaine users. *Insight, 50*.
Windham, G. C., Swan, S. H., & Fenster, L. (1992). Parental cigarette smoking and the risk of spontaneous abortion. *American Journal of Epidemiology, 135,* 1394–1403.

Classroom Activity 6:
Prenatal Smoking and Childhood Behavior Problems

A recent research study found a strong dose-related correlation between prenatal smoking and conduct problems in children studied at 5 and 7 years of age (Maughan, Taylor, Caspi, & Moffitt, 2004). This study examined 115 twins and found that mothers who smoked during pregnancy were significantly different from mothers who did not smoke. For instance, the mothers (and fathers) themselves were more likely to be antisocial, came from more disadvantaged backgrounds, and were more likely to have experienced depression. The effects of prenatal smoking were reduced 75 to 100 percent after controlling for the aforementioned factors along with genetic influences.

This study demonstrates very well the major concern with correlational research—correlation does not equal causation. This study could be used to promote critical thinking in students and to review issues related to research methods from Chapter 1.

Students should be broken down into small groups. They should then be told about the relationship between prenatal smoking and conduct problems in 5- and 7-year-olds. They should not be given the information about the differences between women who smoke when pregnant and those who do not. Students should then be asked to brainstorm about the relationship between smoking and conduct problems.

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After brainstorming in their groups for a short while, groups should share their responses with the entire class. The class discussion should involve the remainder of the findings from the Maughan et al. (2004) study and the caution that should be exercised when interpreting data from correlational studies. Students can then be asked to generate (ethical) experimental research studies that could further examine the findings from the Maughan et al. study.

Logistics:

- Group Size: Small groups (3–5 students)
- Followed by full class discussion
- Approximate time: 20–30 minutes (10–15 minutes for small group discussion, 10–15 minutes for full class discussion)

Source:

Maughan, B., Taylor, A., Caspi, A., & Moffitt, T. E. (2004). Prenatal smoking and early childhood conduct problems: Testing genetic and environmental explanations of the association. *Archives of General Psychology, 61*(8), 836–843.

Classroom Activity 7:
Reproductive Double Standards for Men and Women

Pro-choice legislator Pruitt introduced some legislative bills restricting male reproductive rights to illustrate how abortion restrictions amount to unequal treatment of women and men in reproductive matters. She said, "If women's rights and bodies are going to be violated, then men's should be too." Her proposed bills would require that:

- Men who failed to keep up with child support payments be sterilized.
- A husband must get his wife's permission before undergoing a vasectomy.
- Husbands must be counseled about having a vasectomy just as their wives are if considering tubal ligation.

Ask the students the following questions:

- Do you think Pruitt has made her point? Why or why not?
- Do you approve of any of her proposals that she herself labels "absolutely outrageous"?

Take it further with the following information and questions:

- "The reasons most frequently cited were that having a child would interfere with a woman's education, work or ability to care for dependents (74%); that she could not afford a baby now (73%); and that she did not want to be a single mother or was having relationship problems (48%). Nearly four in 10 women said they had completed their childbearing, and almost one-third were not ready to have a child. Fewer than 1% said their parents' or partners' desire for them to have an abortion was the most important reason. Younger women often reported that they were unprepared for the transition to motherhood, while older women regularly cited their responsibility to dependents." (https://www.guttmacher.org/journals/psrh/2005/reasons-us-women-have-abortions-quantitative-and-qualitative-perspectives)

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- Women have the choice to have an abortion if their lifestyle would be interrupted with an unplanned pregnancy. What about men who are unprepared for fatherhood? Many men who are facing an unplanned pregnancy feel they are not ready to be responsible for a child, cannot afford a child, or a child would interfere with their work or school; yet, they are forced to pay child support for 18 years if the woman chooses to keep the baby. Do women have more reproductive rights than men? Is this okay? Should men be able to say that this pregnancy wasn't planned, they do not wish to keep the child, and financially abort the pregnancy (i.e., give up rights to the child so they are not financially responsible)? If a father wants to keep a baby, but the woman wants to abort, should his wants and needs be considered equally to the female's? Why or why not?

Logistics:
- Group size: Full class discussion
- Approximate time: Full class (10–15 minutes)

Source:
Powell, M. (1990). Bills take aim at double standard. *Insight*, 49.

Classroom Activity 8:
Psychological Effects of Method of Delivery

Are there different psychological consequences for women who experience cesarean deliveries as compared to women who experience vaginal deliveries? Some research suggests that women who experience cesarean births report increased levels of depression and negative affect over their inability to witness and participate in the birth (Garel, Lelong, & Kaminski, 1987) and perceive childbirth more negatively than women who deliver vaginally (Mercer, Hackley, & Bostrom, 1983), whereas other studies find no differences in maternal adjustment or psychological functioning based on the method of delivery (Bradley, 1983; Fawcett et al., 1993). Fawcett et al. suggest that the lack of difference may be due to higher rates of cesarean deliveries.

- *Instructions to Students:* Imagine the psychological consequences of the method of delivery for mothers. Are there different psychological consequences for women who experience cesarean deliveries as compared to women who experience vaginal deliveries? Speculate on what these consequences could be. Are cesarean deliveries "normalized" now that they are being used more and more?

Use in the Classroom: Have the class break down into small groups to discuss the potential psychological consequences of method of delivery. Have groups share their answers and perhaps even speculate about what could be done to attenuate any psychological consequences.

Sources:
Bradley, C. F. (1983). Psychological consequences of intervention in the birth process. *Canadian Journal of Behavioural Science, 15*(4), 422–438.
Fawcett, J., et al. (1993). Effects of information on adaptation to Caesarean birth. *Nursing Research, 42*(1), 49–53.

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Garel, M., Lelong, N., & Kaminski, M. (1987). Psychological consequences of Caesarean childbirth in primiparas. *Journal of Psychosomatic Obstetrics & Gynaecology, 6*(3), 197–209.
Mercer, R. T., Hackley, K. C., & Bostrom, A. G. (1983). Relationship of psychosocial and perinatal variables to perception of childbirth. *Nursing Research, 32*(4), 202–207.

Discussion Board Prompts

For each chapter, a few discussion board prompts are provided. Some of these prompts may be controversial, but all should encourage the student to further process course material. Although these are intended for online discussions, they could easily be used for an in-class discussion.

1. What were some of the cultural beliefs about pregnancy that you were taught as a child? How are these beliefs similar to or different from the ones discussed in the text?
2. The textbook discusses the influence of age on pregnancy and birth outcomes. Many older women need the assistance of fertility clinics to get pregnant. At what age would you say clinics should stop providing fertility treatments to women? Why? Is there a double standard that women should stop having children in their mid-thirties, but no such limit exists for men becoming fathers? If yes, why do you think this is so?
3. When do you believe life begins? Is it at conception when the zygote has its own unique DNA and its sex is already determined? Is it during the embryonic period when its heart begins beating and by the end of this period all organs are present in at least their rudimentary forms? Is it early in the fetal period, when the fetus becomes active, moving his or her arms, legs, mouth, and head? Is it at the age of viability? How does your position on when life begins impact your position on abortion? How does your position on when life begins impact your position on whether a woman should be prosecuted for abusing drugs or alcohol during pregnancy? How does your position on when life begins impact your position on whether a person who murders a pregnant woman should be prosecuted for one or two murders?

Classroom Discussion Questions

These questions can be utilized in the classroom with a partner or small group. They can be used as an introduction to the topic or as questions to start class discussions.

1. With a partner, create a list the possible teratogens that could impact prenatal development.
2. With a partner, create a list of way to assist someone who is going through postpartum depression

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Journal Entry

For each chapter, a journal entry is suggested that encourages each student to apply that chapter's material to his or her own development.

Journal entry prompt: This journal entry will take a little additional research via the Internet or a magazine/book devoted to prenatal development, but the information is easy to find.

For this entry, you should write a diary of your prenatal development. For example, what happened on day one of your development during fertilization? At what week did your heart start beating or were electrical brain waves recordable? When were you able to begin hearing your mom talking or see a flashlight go across your mother's belly? Entries should be included weekly for the germinal and embryonic period, because so much is happening during this time! For the fetal period, you can make monthly entries.

Personal Applications

Personal Application 1: All in the Family

This exercise gets students to recognize the varied influence of heredity and environment within a family. The power of genetics is phenomenal, and although each cell contains only 23 pairs of chromosomes, the possible manifestations of this hereditary material are nearly limitless. Sayings such as "Blood is thicker than water" indicate that we feel close to our family members because we share inherited traits; however, we can't ignore the fact that we grow up in the same environment. To what extent does that contribute to our similarity to our siblings? Or does it? The challenge of identifying the relative influences of nature and nurture is tremendous.

- *Instructions for Students*: Describe the major traits you share with each of your siblings. What major traits are different for you and your siblings? Which ones do you believe are biologically based, and which ones do you think are the result of your environment? How do you explain the differences, given you have the same parents and grew up in the same family? If you are an only child, compare and contrast your traits with those of each of your parents.

- *Use in the Classroom*: Have students contribute examples of both similar and dissimilar traits shared with siblings. Make a list on the board of all traits, and discuss which ones appear to be more "nature" based and which ones seem to be more a function of "nurture." Are there discrepancies among what students believe or is there a common perception of inherited and noninherited traits? Challenge students to provide evidence, counterarguments, reasoning, or research methods that might determine the answer.

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Personal Application 2:
I Am What I Am

This exercise helps students understand the correlation between heredity and environment from Sandra Scarr's perspective of the three major influences on development. Genetic and situational contributions to an individual's makeup are inexorably linked, and the combination of influences impacts individuals in three distinct ways. The way in which we are raised not only impacts us because of the experience itself, but also because those experiences are the result of the combination of genetic and environmental influences on our *parents*. And our own genetic makeup influences both the environmental influences that come to us and those that we particularly seek out. The combination of these three processes of confounded influence creates the person we become.

- *Instructions for Students*: Present your profile with regard to Sandra Scarr's three ways in which heredity and environment are correlated. Passive: What kind of environmental experiences did your parents provide for you because of who they were? Evocative: What environmental experiences did you have because of your genetic makeup? Active: What environmental experiences did you seek out as a result of aspects of your genetic makeup?

- *Use in the Classroom*: Plan to help your students get in the frame of mind for thinking through these concepts. Provide examples from your own life, including specifics about parents and their characteristics and particular inherited traits that obviously influenced life experiences. This may be a difficult concept to grasp, so you may have students work through it in class. If certain students feel they have good examples, have them share in order to provide as many concrete examples as possible; then have students proceed to write their full responses.

Source:

Scarr, S. (1993). Biological and cultural diversity: The legacy of Darwin for development. *Child Development*, *64*, 1333–1353.

Personal Application 3:
The Same but Different

This exercise enables students to realize that a combination of factors contributes to one's environmental experiences. We automatically assume that because we live in the same house and have the same parents, we share the same environment with our siblings. But few siblings would admit that they share similar life experiences. The older siblings will swear that the younger ones always get their way and that their parents aren't nearly as hard on their younger brother or sister as they were on them. The younger ones believe the older siblings get to do everything, and they are treated like babies with all their restrictions. Then there are the middle children! Developmental psychologists know that being an older brother is different from having an older brother, and that despite living under the same roof, siblings' environments are not the same.

- *Instructions for Students*: Consider how your environment growing up was different from those of your siblings, given you were raised in the same household.

- *Use in the Classroom*: This can be a fun way to get students talking and sharing childhood (and even current) stories. Feel free to share some of your own, and encourage students to compare their

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experiences with those of their siblings. How many believed they had an overall easier time of it than their siblings? A harder time? Were their parents' reactions to them stricter, harsher, more unfair? Conclude by emphasizing the varying circumstantial influences experienced by people functioning in close proximity, and how that contributes to differences in behavior.

Personal Application 4: But *Everybody's* Doing It!

This exercise gets students to consider the various individual influences on the person they've become. Judith Harris presented a shocking and controversial theory stating that parents have little to no influence on the development of their children. She believes that genes and one's peer group determine the path our lives will take. This theory contrasts directly with numerous existing notions about human development and the irreplaceable role that parents play; however, much data exists illustrating the profound influence of peers, particularly during the adolescent years.

- *Instructions for Students*: Discuss the evidence from your life that supports or refutes Judith Harris's provocative contention that what parents do does not make a difference in their children's and adolescents' behavior—that genes and peers are the primary influence.

- *Use in the Classroom*: Given the controversial nature of this theory, it makes a great topic for class discussion! If you can read Harris's book before class, come prepared with some specific quotes from the book to prompt discussion and debate. Make sure that students back up their arguments for or against with specific reasoning and examples. You could also plan a more formal debate on the topic, giving students a week or two to prepare and research the material.

Source:

Harris, J. R. (1998). *The nurture assumption: Why children turn out the way they do: Parents matter less than you think and peers matter more.* New York: Free Press.

Personal Application 5: In a Family Way

This exercise demonstrates the significance of pregnancy from a cultural standpoint. Each culture takes its own particular view of the major stages of life: birth, childhood, puberty, parenthood, work, old age, and death. It's interesting and important to be aware of the different cross-cultural perspectives, especially in our multicultural society.

- *Instructions to Students*: Describe your cultural views of pregnancy. How are pregnant women viewed and treated by society? What beliefs are held about the biological processes occurring with regards to her body? What is the perception of the developing fetus? What preparations are made for the upcoming labor, delivery, and birth? How is impending parenthood anticipated?

- *Use in the Classroom*: If you are fortunate and have an ethnically diverse group of students, make a grid on the board comparing and contrasting beliefs for each of the aforementioned categories. If you have a homogeneous class, put students in groups, and assign them particular cultures to research

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with regard to the various aspects of pregnancy and childbirth. Each group will then present their findings to the class.

Personal Application 6: Adolescent Pregnancy

This activity may be especially useful if Lecture Suggestion 8: Social Support and Prenatal Development is used. Research suggests that social support plays a role in at least one aspect of prenatal development (i.e., birth weight; Feldman et al., 2000). Another study found that pregnant adolescents who experienced social support from their parents reported more mastery and life satisfaction and less depression and anxiety during their pregnancy (Stevenson, Maton, & Teti, 1999). Further, social support from friends did not relate to well-being in pregnant adolescents and social support from the father of the child was associated with increased self-esteem. One might suspect that pregnant adolescents would have a greater chance of having limited social support than pregnant adults due to their emotional and financial dependence on their families and limited resources. If pregnant adolescents do indeed receive less social support during their pregnancy, their social environment could have effects on the baby throughout the pregnancy (remember what the text indicates about emotional states and stress during pregnancy) as well as postpartum. Indeed, one study found that social support felt by mothers (assessed when infants were 3 months of age) was the best predictor of secure attachment between mothers and their infants (Crockenberg, 1981). Social support appeared to be especially important for mother-infant attachment when infants were irritable. Clearly, social support affects infant outcomes, both prenatally and postnatally.

Have the class brainstorm about why adolescents might receive less social support (e.g., parents are upset that they are pregnant, the babies' fathers may not be committed to the relationship or the pregnancy, still have an education to complete, and so on) and then discuss the implications for the child—both prenatally and postnatally.

Sources:

Crockenberg, S. B. (1981). Infant irritability, mother responsiveness, and social support influences on the security of mother-infant attachment. *Child Development, 52*(3), 857–865.

Feldman, P. J., Dunkel-Schetter, C., Sandman, C. A., & Wadhwa, P. D. (2000). Maternal social support predicts birth weight and fetal growth in human pregnancy. *Psychosomatic Medicine, 62*(5), 715–725.

Stevenson, W., Maton, K. I., & Teti, D. M. (1999). Social support, relationship quality, and well-being among pregnant adolescents. *Journal of Adolescence, 22*(1), 109–121.

Research Projects

Research Project 1: Heritability of Height

This project demonstrates the concept of heritability by using height as an example (**Handout RP 2-1**). Have students do a kinship study of two families (one of the families can be their own) to collect the necessary data. Students should record the height of all family members older than 18 years of age and

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separate them by sex. Next, they should calculate the mean and range of heights of both sexes for both families and compare them. This exercise is intended to give them experience both with a kinship study design and with the concept of heritability for a variable with a clear operational definition. Once data collection is done, they should answer the questions that follow:

- Which family in your sample is, on average, taller (for both males and females)?
- Of the taller family, how many females are taller than the females in the shorter family? How many of the males are taller than the males in the shorter family?
- From your data, does it appear that height is an inherited trait?
- What is the advantage of examining the heritability of a variable like height rather than a variable such as temperament or intelligence?

Have students examine family differences for the following factors:

- Evidence for the heritability of height: The expectation is that the closer the relative is genetically, the more similar the characteristic measured will be—identical twins, fraternal twins and siblings, parents, (blood) uncles and aunts, cousins, and so on.
- Ideas about environmental differences that might play a role in height: The data from those in the older generations may be difficult to interpret because 60 or more years ago different health and nutrition standards may have influenced growth (cohort effects).
- Reasons for separating the data according to sex: The data must be segregated by sex because humans are sexually dimorphic in height. Males are characteristically larger than females.
- Advantages of using height as a measure rather than intelligence or temperament: Height is a good measure to use because it has an easy, noncontroversial, operational definition. Intelligence and temperament are harder to define in exact terms and are therefore more controversial.

Research Project 2:
Why Do Some Pregnant Women Drink, Smoke, or Use Drugs?

The dangers of drinking alcohol, smoking, and other drug use on fetal development are now well known and widely publicized. Yet many women continue to use these substances while they are pregnant. This research activity attempts to find out why (**Handout RP 2-2**).

Have students ask several female friends who smoke or drink to talk to them about whether they will do these things when they are pregnant. Then have them ask their friends whether they know that smoking and drinking endanger prenatal development and about what they know in detail. Have them talk about the dangers, and then ask again whether their friends will drink and smoke. You may want to suggest that they prepare an interview schedule of questions to ask. Be sure to instruct the students to avoid judgmental statements and to interview the women individually so their answers are confidential.

Discuss the findings in class. Do different people give different reasons? Or are there common reasons among many? Discuss whether the women suggested ways that the message about the dangers of drinking and smoking for prenatal development can be made more convincing to prospective parents.

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Source:
Salkind, N. (1990). *Child development*. Fort Worth, TX: Holt, Rinehart, & Winston.

Research Project 3:
Teratogens

This project increases students' knowledge of teratogens and asks them to find ways to convey this information to the general public. Students should be instructed to choose three different teratogens that could affect prenatal development. At least one of the chosen teratogens should be from a source outside of the textbook (in other words, only two of the three teratogens may coincide with those discussed in the text). Students should outline the known effects of each teratogen (this should involve information from the text as well as other, reputable sources) in a paper and pay particular attention to how these teratogens may influence prenatal development in sensitive periods of development and should highlight any connection/similarities or disparities between the chosen teratogens (e.g., does cocaine have similar effects to heroin; how are they different?). Finally, students should use the information they have found to design a single pamphlet that alerts the public to the hazards of their "chosen" teratogens. The pamphlet should be concise, informative, accurate, and attractive. Keep in mind that the pamphlet would be for the "general public," so it is not necessary (and probably not appropriate) to discuss sensitive periods and similarities/differences in the pamphlet (remember that pamphlets should catch readers' attention and be informative—too much or too detailed information may turn readers away).

Research Project 4:
Paternal Effects on Prenatal Development

Discussions of teratogens and effects on prenatal development typically focus on the mother. Let's face it, the mother has constant contact with the developing fetus and thus may be more likely to affect the development of this organism. However, this does not mean that paternal influences are irrelevant. Indeed, there is some evidence that sperm and/or the chemical composition of semen can be affected by paternal behavior such as alcohol consumption (e.g., Cicero, 1994).

Instructors could use Cicero's (1994) study to instigate a research project examining the effects of paternal behavior on prenatal development. Students can examine the literature and report their findings to the class orally or in a written report.

Source:
Cicero, T. J. (1994). Effects of paternal exposure to alcohol on offspring development. *Alcohol Health & Research World, 18*(1), 37–41.

Research Project 5:
Fatherhood

How actively are fathers participating in the births of their children these days? Have the students find out by carrying out an interview project (**Handout RP 2-4**). They should identify two first-time, expectant

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fathers and two fathers of children younger than age 2, and then interview these men using the following sets of questions:

Expectant fathers:
- What are your feelings about becoming a father?
- How have you been involved in your partner's pregnancy?
- What part will you play in your child's birth? What part would you like to play?
- What do you think being a "good father" means?
- How will having a child change your life?

Fathers:
- What part did you play in the birth(s) of your child(ren)? What were your feelings about this experience?
- What are the three biggest challenges you face as a father?
- What do you think a "good father" is?
- How has having a child changed your life?
- What advice would you give a new father?

Instruct students to write a brief report indicating what they were trying to find out. They need to describe their sample and how they interviewed the fathers and soon-to-be fathers, and then summarize similarities and differences between the two pairs of men. Finally, they should relate what they learned to material on fathers' participation in childbirth from the text.

Have students form groups of three or four to discuss and compare their findings. Have each group report to the class to identify any trends and generalizations that seem warranted by their findings.

Source:
Salkind, N. (1990). *Child development*. Fort Worth, TX: Holt, Rinehart, & Winston.

Research Project 6: Stem Cell Research

In general, stem cells are cells that have the potential to develop into any type of body tissue. They are being researched as a way of treating many diseases. Stem cell research is also a politically charged topic. Indeed, politics may be hindering science.

Three main ways of obtaining stem cells are from embryos, amniotic fluid, and adults. *Embryonic stem cells* come from boy or girl embryos up to 8 weeks after conception—although most research uses stem cells considerably younger than 8 weeks. Obtaining these stem cells kills the embryo and no cures have been found, yet, using embryo stem cells. There have been some reports of tumor development in the patient when using embryonic stem cells. Researchers feel that the benefit of embryonic stem cells is their flexibility.

Adult stem cells come from adult patients and no harm is done to the patient. Amazingly, over 72 diseases have been treated using adult stem cells. A benefit of using adult stem cells is that the body rejects them less than embryonic stem cells; however, they are not as flexible as embryonic stem cells.

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Amniotic stem cells come from pregnant women and there have been no reports of harm being done to the donor. This is a new method, so no cures have yet been found. The benefit of these stem cells is their flexibility; however, this method is new and largely unresearched.

For this assignment, you need to investigate stem cell research and research funding. Then, write a paper answering the following questions:

- What diseases are hoped to be cured using stem cells?
- What cures have been found using which types of stem cells?
- What are some of the benefits and downsides for each of the type of stem cells that you found in your research?
- How much funding does each of these types of stem cell research receive from the government? Does this funding seem in line with the progress made for each type?
- Are politics hindering research? Why or why not?

Below are some Web sites to help in getting started:
Information on cures using adult stem cells: http://www.stemcellresearch.org/
National Institute of Health: https://stemcells.nih.gov/

Research Project 7: Method of Delivery

Are there different psychological consequences for women who deliver vaginally as opposed to via cesarean? For this project, students should be instructed to research the literature to see if any differences in adjustment have been found for different methods of delivery. After exploring the literature, students can construct a list of questions that they can use to interview women who have experienced different methods of delivery (e.g., vaginal, forceps, emergency vs. planned cesarean). Students' interview questions should be derived from the literature and should demonstrate their understanding of any potential psychological consequences that may ensue due to method of delivery.

Students can report their findings in class and a class discussion can be used to examine these differences (if there are any), and why students found what they found in their interviews. Students could also be asked to brainstorm about things that could reduce differences (if any were found) or could be asked to review the literature for interventions that have been used in the past.

Research Project 8: Unassisted childbirth

Have students investigate the concept of "free-birthing," unassisted childbirth, and answer the following questions:

- What is unassisted childbirth?
- What are the benefits to unassisted childbirth?
- What are the risks when using unassisted childbirth?
- Should parents have a backup plan in place?

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Film and Video List

The following films and videos supplement the content of Chapter 2. Please note that some of the video descriptions are quoted from the publisher's/distributor's description.

AIDS Babies (Cinema Guild, 1990, 58 minutes). This documentary examines the plight of babies born with AIDS. It is filmed in various countries around the world and compares the reaction of different governments to the AIDS crisis and speculates on future consequences of a generation of AIDS babies.

At a Loss for Words (Heritage House, 2001, 30 minutes). This film discusses how to help those suffering due to miscarriage, stillbirth, or newborn death.

Autism Genes: NOVA Science Now 2009 (PBS, 2009). This episode of *NOVA scienceNOW* introduces Rudy Tanzi, a pioneer in discovering genes for Alzheimer disease, now turning his attention to autism.

The Beginnings: Fertility (Insight Media, 2003, 28 minutes). This program shows how three families cope with infertility. It explores in vitro fertilization, adoption, and surrogate motherhood.

The Beginnings: Prenatal Development and Birth (Insight Media, 2003, 28 minutes). This program follows an expectant family through the prenatal process to the live birth of their child. It examines the trimesters of pregnancy and highlights health factors that influence the conception and delivery of a healthy baby.

Biological Growth: Nature's Child (Insight Media, 60 minutes). This video explores the nature/nurture controversy with a focus on genetic influences on intelligence, personality, temperament, sex differences, and mental illness. It also deals with environmental influences on prenatal development.

Birth (Films for the Humanities and Sciences, 1999, 54 minutes). This program weaves footage of many women's experiences of childbirth with valuable commentary from obstetricians, midwives, psychologists, counselors, and recent mothers and fathers. Key topics covered are sonograms and prenatal examinations, changing attitudes to the role of pain in childbirth, postpartum depression or "baby blues," and birthing scenarios, such as in-hospital, at-home, and cesarean section.

Birth Without Violence (New Yorker Films, 1975, 21 minutes). Dr. Frederick Leboyer shows his method of quiet childbirth during this video.

Boy or Girl? When Doctors Choose a Child's Sex (Films for the Humanities and Sciences, 14 minutes). *ABC News* correspondent Dr. Nancy Snyderman investigates the once-accepted belief that surgical sex assignment determines gender. Arguments are made for the notion that gender comes from the brain, not the body, and no operation can alter that basic fact.

Burden of Knowledge (Fanlight Productions, 54 minutes). This video examines ethical and emotional implications of prenatal testing for genetic defects in seven couples by health care and genetic specialists.

Complex Problems, Serious Questions…Honest Answers (Heritage House, 17 minutes). This film investigates women facing crisis pregnancies, sensitively and candidly tackles the issues surrounding an unplanned pregnancy. Selena Lin, M.D. describes the physical characteristics of a preborn baby at

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different stages of development, as well as abortion procedures and the accompanying risks at each stage. Interwoven with these facts are the testimonies of women who have had unplanned pregnancies. Whether they choose adoption or parenting, women from all walks of life speak with poignancy and openness about their experiences. A woman facing these tough decisions can hear for herself some of the feelings and concerns she is experiencing as these women share their raw, honest, and unscripted stories.

Contemporary Childbirth (Films for the Humanities, 1987, 19 minutes). This video portrays the various ways of giving birth.

David With Fetal Alcohol Syndrome (Films for the Humanities & Sciences, 1996, 45 minutes). David Vandenbrink seems like a normal 21-year-old man; however, David suffers from FAS. This program provides a personal look at what it is like to live with the effects of FAS.

Dillon Is Different: Fragile X Syndrome (Films for the Humanities & Sciences, 2002, 22 minutes). Talking with 10-year-old Dillon Kelley, it is not readily apparent that he has a form of intellectual disability. But that does not stop his fourth-grade classmates, who discern that he is unlike them without understanding why, from teasing and shunning him. In this program, *ABC News* anchor Ted Koppel compassionately presents Dillon's story as an opportunity to better understand the genetic disorder called Fragile X syndrome. Through anecdotes, Dillon's family members describe aspects of his behavior, the ostracism he faces, and the time when, in a bold and unusual step, they went to his school to explain to his peers why he is different.

Down Syndrome (Films for the Humanities and Sciences, 28 minutes). This is a Phil Donahue program that is devoted to presenting medical and psychological breakthroughs in the treatment of Down syndrome.

Fetal Abuse: The Effects of Drugs and Alcohol (Films for the Humanities and Sciences, 1997, 18 minutes). Children born to mothers with substance abuse problems frequently suffer severe physical, cognitive, and behavioral abnormalities. Fetal Alcohol Syndrome (FAS) occurs when pregnant women drink during pregnancy and may result in babies who have problems with the central nervous system, facial irregularities, joint and limb abnormalities, heart defects, intellectual disability, and behavioral problems. Mothers who use drugs during pregnancy have babies who are addicted at birth; have an increased risk of learning disabilities; and delayed motor, speech, and language development. The vital importance of being drug- and alcohol-free before and during pregnancy is stressed.

*Fetal Alcohol Syndrome and Other Drug Use During Pregnancy (*Films for the Humanities and Sciences, 1992, 19 minutes). This program profiles an 8-year-old boy born with FAS and examines babies born to cocaine-addicted mothers.

Fetal Alcohol Syndrome: Life Sentence (Films for the Humanities and Sciences, 1997, 24 minutes). This video deals with the injury that can result from prenatal exposure to alcohol.

Footprints on Our Hearts (Heritage House, 2004, 60 minutes). How can a person cope after a miscarriage, stillbirth, or newborn death? The agony is complex and intense, as it mixes with misplaced guilt, hurt, helplessness, and deep sorrow. A baby is not supposed to die. *Footprints on Our Hearts* offers ways to cope with these feelings in the days and weeks of grieving that follow, as mothers and fathers who have suffered the death of a baby speak words of understanding, encouragement, and hope for the future.

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The Forgetting: A Portrait of Alzheimer's (PBS). This compelling documentary follows the trials and triumphs of researchers battling Alzheimer disease. Dr. Steven DeKosky's team conducts breakthrough scientific tests, while Dr. Rudy Tanzi, pioneer in genetics, tells of discoveries that may help pinpoint the cause of Alzheimer disease. The experts make the research palpable and real, explaining in down-to-earth terms how the disease dismantles the day-to-day lives of Gladys, Fran, and Isabelle.

The Ghost in Your Genes (Films for the Humanities and Sciences, 2005, 50 minutes). Could the trauma of a terrorist attack change the genetic characteristics of one's descendants? This program examines the emerging science of epigenetics, which studies biological heredity unrelated to DNA sequencing. With commentary from leading scientists in the field—including geneticist Marcus Pembrey, among the first to observe that dietary stress can produce health problems two generations later—the program explores a wide variety of clinical evidence for epigenetic inheritance. An experiment focusing on children born shortly after 9/11 evokes the new discipline's powerful implications.

The Growing Years: Conception to Childhood (Insight Media, 2006,30 minutes). This DVD explores the process of human development, from the union of sperm and egg through the physical, cognitive, and social changes in the early stages of life. It also presents conflicting views on the findings from the Yale Infant Cognition Lab regarding infants' abilities to add and subtract.

How Babies Get Made (BBC-TV, 58 minutes). This video examines the processes by which embryos develop from single cells into complex organisms and the efforts of scientists to discover the cellular and genetic mechanisms that account for both normal and abnormal embryological development.

In the Womb (Heritage House, 2005, 89 minutes). From the moment of conception, every human embryo embarks on an incredible nine-month journey of development. Now, cutting-edge technology makes it possible for National Geographic Channel's *In the Womb* to open a window into the hidden world of the fetus and explore each trimester in amazing new detail. Revolutionary 3-D and 4-D ultrasound imagery sheds light on the delicate, dark world of a fetus as never before and follows a rare fetoscope operation, performed in utero, with the hope of correcting life-threatening complications before birth.

Keltie's Beard: A Woman's Story (Filmakers Library, 9 minutes). This touching film illustrates genetic variations and personal reactions to a unique woman who comes from a family in which the women have heavy facial hair. Keltie takes the atypical course of not removing this hair.

Kinship Care: Birth Mothers Speak Out (Insight Media, 2004, 33 minutes). In this program, birth mothers share their experiences with kinship care. They discuss their relationships with their children and the challenges of reuniting a family.

Knowing the Unborn (Heritage House, 29 minutes). This film explores the newly emerging and truly important concept of prebirth parenting. We see parents interact and bond with their babies in utero. Fetal motion pictures encourage us to think of unborn babies as aware, interactive beings.

Life Begins (Heritage House, 60 minutes—but broken into 28 one- to two-minutes clips). Different clips on this video cover topics such as conception, fetal development, genetics, births (including a c-section), newborn care, breast feeding, and bottle feeding. There are also 22 animations, 13 slideshows, and a section on sexually transmitted diseases.

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Letting Go (Heritage House, 2006, 20 minutes). Only birth parents that have experienced adoption can help us understand this selfless act of love. Eight birth parents frankly describe their wide array of experiences and emotions in deciding to release their child for adoption. How did they feel when they first discovered that they were pregnant? How did their friends and families react? What steps are involved in an adoption plan? You'll hear why these birth parents decided not to parent their children, and what it was like to give birth to an infant that they were going to entrust to someone else.

Little People (Filmakers Library, 58 minutes). This video focuses on a genetic condition that influences one's entire life by highlighting discrimination and difficulties of access for dwarfs.

Maternal PKU (Fanlight Productions, 29 minutes). This video highlights the monitoring and treatment of adult women with PKU who could be at risk for giving birth to children with intellectual disability.

The Mind: Development (PBS, 1988, 60 minutes). This video examines the development of the human brain from a single cell to that of a 6-year-old child.

More Than Baby Blues: Unmasking Postpartum Depression (Insight Media, 2003, 30 minutes). Examining the signs and symptoms of postpartum depression, this DVD considers what family members and friends can do for women who suffer from the disorder. It debunks the mysteries and misunderstandings surrounding postpartum depression to enable easier identification and treatment. The program offers practical methods for dealing with postpartum depression and shows how to help affected women.

The Newborn: Development and Discovery (Magna Systems, Inc., 1996, 29 minutes). Topics included in this video are appearance and behavior states, bonding, high-risk newborns, assessment scales, physiological functioning, and breast versus bottle feeding.

NOVA: Cracking the Code of Life (PBS). Robert Krulwich lends a lighthearted touch to genetic science, going inside the amazing, complex, and contentious race to decode the human genome. Discover how the study of our DNA made history—and may predict your future.

Pediatric Brain Development: The Importance of a Head Start (Films for the Humanities and Sciences, 1995, 17 minutes). "The nation's children are everybody's future, and what happens in those first three years, before school, really, really matters to that future," says child development expert Penelope Leach. In this program, *ABC News* anchor Diane Sawyer reports on the neurological connections that form in a child's brain during pregnancy and early childhood and the long-term effects of sensory stimulation and deprivation during those formative periods. Commentary by Dr. Leach; UCLA's Dr. Michael Phelps, co-inventor of the PET scan; and others sheds light on topics ranging from the complexities of language acquisition to a possible link between premature birth and ADD.

Pregnancy and Birth: Caring and Preparing for the Life Within (Magna Systems, Inc., 1996, 26 minutes). This video highlights such topics as fertilization, pregnancy trimesters, maternal prenatal care, prenatal tests and interventions, fetal abuse, childbirth choices, labor, and birth.

Pregnancy and Substance Abuse (Films for the Humanities and Sciences, 1990, 28 minutes). This program follows several couples through pregnancy and prenatal care.

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Prenatal Development: A Life in the Making (Magna Systems, Inc., 1996, 26 minutes). This video shows the stages of prenatal development and discusses critical periods and factors that influence development.

Preview of a Birth (Heritage House, 15 minutes). Explore the wonders and hidden mysteries of fetal development in this up-to-date, medically accurate "preview" of a birth. This fascinating DVD chronicles the journey from conception to birth, with an astounding full-color view of life within the womb.

Reproduction: Designer Babies (Films for the Humanities and Sciences, 20 minutes). This program examines some of the issues raised by the potential uses and misuses of genetic technology. Topics include DNA, implications of genetic manipulation, prenatal screening techniques, genetic abnormalities, artificial insemination, and embryo transplants.

Secrets of the Death: Mystery of the Black Death (PBS). When the Black Plaque bacterium ravaged Europe, not everyone who came in contact with it died. Geneticist Steven O'Brien investigates why some survived by visiting a small English town struck by plague in 1665. Historical records, town archives, and modern forensic techniques construct a medical case study with startling implications: Survivors carried a genetic mutation that made them immune to plague—and their descendants immune to AIDS.

Spring Garden (Heritage House, 2003, 180 minutes). This can be purchased as a five-video set or on one DVD. It is a comprehensive source of information about pregnancy. The first segment covers the first trimester of pregnancy: nutrition, exercise, what to expect, what to avoid during pregnancy. The second segment covers the second trimester: preterm labor, lab tests, genetic screening, anesthesia, and making preparations for your baby's arrival. The third segment covers the third trimester: culminating with the birth of your baby, childbirth classes, labor and delivery, indications for cesarean section, and newborn issues. The fourth segment covers caring for your newborn, breast feeding and bottle feeding, "baby blues," and resuming life. The fifth segment contains special information designed for teens, dads, and pregnant women age 35 and over.

Teaching Children With Fetal Alcohol Syndrome (Films for the Humanities and Sciences, 2002, 14 minutes). This program highlights the long-term effects—in this case, cognitive deficits—of exposure to alcohol during prenatal development.

39, Single and Pregnant (Filmakers Library, 1982, 18 minutes). Although a bit dated, this video discusses the decision to become a single parent and the idea of a "biological clock."

Threads of Life: The Power of Genes (Films for the Humanities and Sciences, 2001, 59 minutes). How are Aborigine children able to score so well on memory tests? Why do Europeans have a higher alcohol tolerance than Asians? What makes Kenyans such extraordinary marathon runners? Drawing from a fascinating array of examples, this program uses outstanding graphics and illuminating metaphors to bring home the power of a set of chemical instructions called genes. Laboratory experiments and real-life cases also show the dramatic effects of mutations, such as atavism and albinism. As scientists discover what these genetic switches control, the grim fact of heredity—that two out of three people will die for reasons connected with the genes they carry—may be relegated to the dustbin of history.

Ultrasound: Eyewitness to the Earliest Days of Life (Heritage House, 25 minutes). This film utilizes ultrasound and fetoscopy to show prenatal development.

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Unborn Addicts (Films for the Humanities and Sciences, 1994, 50 minutes). This program presents case studies of two pregnant women who are lifelong addicts and have entered a treatment program.

Understanding: The Power of Genes (Insight Media, 2005, 55 minutes). This DVD examines the degree to which humans are genetically programmed with traits and abilities. It probes similarities in identical twins, discusses biotechnology, and considers the nature versus nurture debate in light of modern technological advances.

Working With Birth Parents: Visitation (Insight Media, 2007, 40 minutes). This program for foster parents and foster care workers explains what to expect during visitations with birth parents. It shows how to deal with cancellations and no-shows and teaches how to help foster children transition back into a foster home.

Yours to Keep (Direct Cinema Limited, 75 minutes). This movie focuses on an individual with Down syndrome who is "just like other people, but lower."

Web Site Suggestions

Apgar Scoring: http://kidshealth.org/en/parents/apgar.html

Behavior Genetics Association Home Page: www.bga.org

Center for Evolutionary Psychology: https://www.cep.ucsb.edu/

Childbirth: https://medlineplus.gov/childbirth.html

Fertility Care Centers of America: www.fertilitycare.org

Genetics Primer from Mount Sinai Hospital: http://www.mssm.edu/departments-and-institutes/genetics-and-genomic-sciences

Holt International Children's Services: http://www.holtinternational.org/

Low Birth Weight Information: http://www.marchofdimes.org/complications/low-birthweight.aspx

National Society for Genetic Counselors: www.nsgc.org

Postpartum Depression: http://www.nlm.nih.gov/medlineplus/postpartumdepression.html

Prenatal Development and Prenatal Diagnostic Techniques: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3004373/

Teratology Society: Birth Defects Research/Education/Prevention: www.teratology.org

The Visible Embryo: http://www.visembryo.com/

Ultrasound slide show and prenatal development information: http://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/multimedia/fetal-ultrasound/sls-20076294

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Resources Available Within Connect

Listed below is a sampling of the resources available with this chapter within McGraw-Hill Education's digital learning platform, Connect.

Chapter	Activity Titles	Activity Type	Learning Objective
2	Buss's Evolutionary Theory	Concept Clip	Discuss the evolutionary perspective on life-span development.
2	NewsFlash: Can Genes Be Patented?	NewsFlash	Describe what genes are and how they influence human development.
2	Prenatal Development	Interactivity	Characterize the course of prenatal development and its hazards.
2	NewsFlash: Are Antidepressants Safe During Pregnancy?	NewsFlash	Characterize the course of prenatal development and its hazards.
2	Midwifery	Video	Summarize how birth takes place and the nature of the postpartum period.
2	The Birth Process	Sequencing	Summarize how birth takes place and the nature of the postpartum period.

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Ethical Dilemmas Regarding Genetic Counseling

In order to appreciate the value of the information you are learning, it is sometimes useful to examine everyday situations people face in which knowledge of life-span development can be useful, but at the same time, controversial. In the November 1994 issue of *Science News*, four ethical dilemmas were presented and readers were asked to write in and indicate how they would respond to each situation. Two of the dilemmas are presented as follows. Answer the questions that follow the dilemma.

The first scenario deals with dwarfism and is quoted from *Science News*.

> A husband and his pregnant wife seek genetic counseling. Each carries one flawed copy of the gene responsible for achondroplasia; therefore, they are both dwarfs. Recently, a California research team described the mutation in a gene on chromosome 4 that causes achondroplasia. The counselor explains that genetic testing can determine whether the fetus has inherited the mutated gene. In the discussion, the couple informs the counselor that they will abort any fetus that carries two mutant genes. That's not surprising because children born with two such genes rarely survive beyond infancy. This couple has had a child in this circumstance who died when it was 2 months old.
>
> This time around, they say, they want a baby who is heterozygous for the achondroplasia trait. This child inherits a flawed gene from one parent and a healthy gene from the other parent. That genetic combination means the child will be a dwarf—just like the parents. At the same time, the parents say, they will abort any fetus that does not inherit one copy of the mutant gene. Should the counseling center perform the test, knowing that the couple plans to abort a healthy fetus?
>
> Some of the things to consider include the fact that achondroplasia is a serious disorder. The bones can be abnormal in structure, sometimes requiring the use of a wheelchair. Yet, many dwarfs live long, healthy lives and don't regard their condition as a disability. In addition, some couples with this condition worry about problems involved in raising a normal-sized child.

- What is the ethical dilemma for the scenario?
- What would you do if you were the genetic counselor?
- Present arguments for both sides of the issue.

The second scenario deals with paternity and is quoted from *Science News*.

> A husband and wife have a child who suffers from cystic fibrosis (CF), an incurable, fatal hereditary disease that results in frequent infections and difficulty breathing. The couple wants to determine their risk of having another child with this disorder. Because CF is a recessive disorder, a child usually must inherit the CF gene from both parents to get the disease. A child with just one CF gene is a carrier: Such a person doesn't have the disorder but can pass the trait on to the next generation. The DNA test revealed that the mother of the child carried the CF trait; however, her husband did not. The DNA tests showed that he was not the biological father of the child.

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The fact significantly decreased the couple's chance of having another child with CF. But the test has put the counselor in a difficult situation. Should the counselor tell the couple about the nonpaternity findings? Should the mother be told privately? If so, is the center colluding with the mother to withhold information from the husband?

In addition, this case brings up issues concerning the biological father of the child. This man has not contracted with the genetics center for the test, yet the counselor now knows that this man is probably a carrier of the mutant gene for CF. Should the genetic counselor call this man and tell him about his risk?

- What are the ethical dilemmas for the scenario?
- What would you do if you were the genetic counselor?
- Present arguments for both sides of the issue.

Sources:

Fackelmann, K. (1994). Beyond the genome: The ethics of DNA testing. *Science News, 146*, 298–299.
Fackelmann, K. (1994). DNA dilemmas: Readers and "experts" weigh in on biomedical ethics. *Science News, 146*, 408–410.

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Fetal Alcohol Syndrome (FAS) Quiz

1. About _____ American babies are born each year with alcohol-related defects.
   A. 5,000
   B. 15,000
   C. 25,000
   D. 40,000
   E. 50,000

2. Of babies affected by alcohol, _____ are affected enough to be diagnosed with fetal alcohol syndrome.
   A. 2,000
   B. 6,500
   C. 12,500
   D. 18,000
   E. 25,000

3. FAS is responsible for _____ percent of all cases of intellectual disability in this country.
   A. 5
   B. 10
   C. 15
   D. 20
   E. 35

4. Which group has the highest risk for having a child with FAS?
   A. African Americans
   B. European Americans
   C. Native Americans
   D. There are no differences in FAS rates among ethnic groups.

5. Drinking during the first trimester does not lead to FAS.
   A. True
   B. False

6. Motor development can be impaired for breast-feeding babies whose mothers drink alcohol.
   A. True
   B. False

7. Some injuries to the fetus resulting from alcohol exposure may be corrected in the womb if a mother gives up alcohol before her third trimester.
   A. True
   B. False

8. Barbiturates, opiates, and alcohol have similar effects on developing fetuses.
   A. True
   B. False

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Answers to the Fetal Alcohol Syndrome Quiz Activity

1. E. Some argue that this is a conservative estimate.

2. C. The damage these children have includes facial deformities, intellectual disability, and heart abnormalities.

3. D. FAS is the primary threat to children's mental health, much greater than either Down syndrome or spina bifida.

4. C. The risk for African Americans is 6.7 times that of European Americans. Native Americans are 33 times more likely to suffer from FAS than European Americans.

5. B. Although the risk may be minimal during the first 2 weeks, during the rest of the first trimester the organs are developing, and tremendous damage can be caused by exposure to alcohol.

6. A. Alcohol can be ingested in the breast milk.

7. A. Scandinavia, Boston, and Atlanta studies all indicate that some correction may occur. At least size and healthiness improve, but there is no evidence that intelligence is improved.

8. B. Barbiturates and opiates affect the nervous system; alcohol can affect any cell.

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Handout CA 2-5

The Court's Treatment of Substance-Abusing Pregnant Women Activity

- Do you think that mothers who use drugs during pregnancy should face criminal prosecution?

- Might this policy keep some pregnant women from getting prenatal care and having a hospital delivery?

- How far should the prosecution go?

- What alternative solutions can you suggest?

- Is fetal abuse equivalent to child abuse?

- Should fathers who use drugs during their partner's pregnancy face criminal prosecution? (Maternal exposure to environmental tobacco smoke for one hour or more per day is associated with spontaneous abortion [Windham et al., 1992], and paternal smoking is related to intellectual disability in offspring [Roeleveld, et al., 1992].)

- How responsible is a drug-using male in infertility and newborn health problem situations? Do you think a wife should be able to sue her husband for infertility problems caused by use of cocaine? (Cocaine usage lowers sperm count, increases abnormally shaped sperm, and decreases sperm mobility. Infertility problems may last more than two years after a man quits using cocaine.)

- Research suggests that mothers who smoke tobacco during pregnancy and up to the time their children are 5 years old increase the risk of their offspring getting asthma. Should smoking mothers also be prosecuted?

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Heritability of Height

This project demonstrates the concept of heritability by using height. You will do a kinship study of two families (one of the families can be your own) to collect the necessary data. Record the height of all family members older than 18 years of age and separate them by sex. Calculate the mean and range of heights of both sexes for both families and compare them. This exercise is intended to give you experience both with a kinship study design and with the concept of heritability for a variable with a clear operational definition. Use the following data sheet to record heights. Then answer the questions that follow.

Person/Sex	Family 1	Family 2
Self	_____	_____
Mother	_____	_____
Father	_____	_____
Grandmother 1	_____	_____
Grandmother 2	_____	_____
Grandfather 1	_____	_____
Grandfather 2	_____	_____
Sibling	_____	_____
Sibling	_____	_____
Sibling	_____	_____
Aunt	_____	_____
Aunt	_____	_____
Aunt	_____	_____
Uncle	_____	_____
Uncle	_____	_____
Uncle	_____	_____
Cousin	_____	_____
Cousin	_____	_____
Cousin	_____	_____
Cousin	_____	_____
Other	_____	_____
Other	_____	_____
Other	_____	_____

Data	Family 1	Family 2
Average female	_____	_____
Average male	_____	_____
Tallest female	_____	_____
Tallest male	_____	_____
Shortest female	_____	_____
Shortest male	_____	_____

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- Which family in your sample is on average taller (for both males and females)?

- Of the taller family, how many females are taller than the females in the shorter family? How many of the males are taller than the males in the shorter family?

- From your data, does it appear that height is an inherited trait?

- What is the advantage of examining the heritability of a variable like height rather than a variable such as temperament or intelligence?

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Handout RP 2-2

Why Do Some Pregnant Women Drink, Smoke, or Use Drugs?

The dangers of drinking alcohol, smoking, and other drug use on fetal development are now well known and widely publicized. Yet many women continue to use these substances while they are pregnant. This research activity attempts to find out why.

Ask several female friends who smoke or drink to talk to you about whether they will do these things when they are pregnant. Then ask them whether they know that smoking and drinking endanger prenatal development, and about what they know in detail. Talk about the dangers, and then ask again whether your friends will drink and smoke. You may want to prepare an interview schedule of questions to ask before meeting with your friends. You will want to come up with a list of about 10 questions to ask. Be sure to avoid judgmental statements/questions. You will want to interview the women individually so their answers will be confidential.

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Handout RP 2-4

Fatherhood

How actively are fathers participating in the births of their children these days? Find out by carrying out an interview project. Identify two first-time, expectant fathers and two fathers of children younger than age 2, and interview these men using the following sets of questions:

Expectant fathers:

- What are your feelings about becoming a father?
- How have you been involved in your partner's pregnancy?
- What part will you play in your child's birth? What part would you like to play?
- What do you think being a "good father" means?
- How will having a child change your life?

Fathers:

- What part did you play in the birth(s) of your child(ren)? What were your feelings about this experience?
- What are the three biggest challenges you face as a father?
- What do you think a "good father" is?
- How has having a child changed your life?
- What advice would you give a new father?

Write a brief report indicating what you were trying to find out, describe your sample and how you interviewed the fathers and soon-to-be fathers, and then summarize similarities and differences between the two pairs of men. Relate what you learn to material on fathers' participation in childbirth from the text.

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