



Hormones & Behavior

Instructor Manual

Editors: Dr. Regan A. R. Gurung and Dr. Aaron Richmond

Contributing Authors: Dawn Albertson, Bethany Fleck, Travis Heath, Phil Kreniske, Linda Lockwood, Kristy Lyons, Aliza Panjwani, Janet Peters, Kasey Powers, Amanda Richmond, Anna Ropp, Jeremy Sawyer, Raechel Soicher, Sunda Friedman TeBockhorst, Courtney Rocheleau

This instructor resource manual is designed to help facilitate a lesson about hormones and behavior. This module reviews the role of hormones in development and behaviors observed in both humans and animals, including sex differentiation, aggression, and parenting. This module also reviews multiple research studies exploring hormone-behavior interactions in humans and animal models. Additional resources in this manual include recommendations for class structure, in class activities, discussion topics, and information about external resources available on the topic of hormones and behavior. The corresponding PowerPoint can be found on the Noba website.

Learning Objectives

Content Specific Learning Objectives

- Define the basic terminology and basic principles of hormone-behavior interactions.
- Explain the role of hormones in behavioral sex differentiation.
- Explain the role of hormones in aggressive behavior.
- Explain the role of hormones in parental behavior.
- Provide examples of some common hormone-behavior interactions.

Relevant APA Learning Objectives (Version 2.0)

- Describe key concepts, principles and overarching themes in psychology (1.1)

- Describe applications of psychology (1.3)
- Incorporate sociocultural factors into scientific inquiry (2.5)
- Interact effectively with others (4.3)

Abstract

The goal of this module is to introduce you to the topic of hormones and behavior. This field of study is also called behavioral endocrinology, which is the scientific study of the interaction between hormones and behavior. This interaction is bidirectional: hormones can influence behavior, and behavior can sometimes influence hormone concentrations. Hormones are chemical messengers released from endocrine glands that travel through the blood system to influence the nervous system to regulate behaviors such as aggression, mating, and parenting of individuals.

Class Design Recommendations

This lecture was designed to be taught in two, 45-minute class periods, though it may be adapted for one, 90-minute lecture. It is recommended the topic be taught in two lectures to provide time for the professor, and students, to review areas of concern regarding the basics of hormones before moving onto more complex ideas like. The first class should introduce hormones as chemical messengers and their role in sexual differentiation. The second class should focus on how hormones influence behavior in complex processes like mating, reproduction, aggression, and parenting.

Topic Outline

- Hormones as Chemical Messengers
 - Versus Neurotransmitters
 - Synthesis
 - Interacting with Cells
- Sex Differentiation

- Sexual Dimorphism
- Biological Processes
- Biology versus Society
- Parental Behavior
- Maternal versus Paternal care
 - Maternal care more common
 - Rats
 - Mating
- Hormones and Mothers
 - Pregnancy
 - Maternal Instinct
 - Maternal Aggression
- Aggressive Behavior
 - Limited resources
 - Androgens
 - Research Study
- Hormones and Behavior
 - Food and fluid intake
 - Social interactions
 - Salt balance
 - Learning and memory
 - Stress and coping
 - Psychopathologies

Module Outline

Hormones as Chemical Messengers

- **Versus neurotransmitters:** Both hormones and neurotransmitters are chemical messengers and have similar mechanisms of release from the cell. They also both bind to receptors to affect their target cell. Hormones are distinct from neurotransmitters in many ways. Neurotransmitters may only travel on preexisting neural pathways, but hormones may reach any cell supplied by blood. Neurotransmitters' effect is all-or-none, but hormones' effect is graded depending on the amount of hormone in the blood or receptors available. Hormones effect takes minutes to days, but neurotransmitters have an immediate effect. Neurotransmitters travel very small distances before reaching their target cell, but hormones may travel throughout the body. Some degree of voluntary control exists with the neurotransmitters, such that you may will yourself to move but you cannot will your brain to release estrogen.
- **Synthesis:** Endocrine glands synthesize hormones and are a series of glands located in the central and peripheral nervous system, including the pituitary gland, adrenal glands, thyroid, pineal gland, and hypothalamus. After being synthesized, the hormones are released into the blood to bind with receptors on target cells. Hormones are categorized according to their chemical structure, either steroid hormones or peptide/protein hormones
- **Interacting with Cells:** The functions of hormones include the regulation of sensory input, integration of cognition, and control of motor output. Examples include hormones increasing one's sensitivity to certain stimuli, affecting the rate of transmission between neurons, or influencing the muscles responsible for a certain behavior. The effect of hormones is to influence probability and is not causal. Examples include an increase in testosterone in response to a threat, a decrease in testosterone after team loses, as fan or team member, and even biological and behavioral changes in response to the anticipation of sex. Hormones are efficient and can serve multiple purposes. For example, the hormones responsible for gamete maturation also promotes mating behaviors, making it more likely the egg will be fertilized.

Sex Differentiation

- **Sexual Dimorphism:** Humans, and most other animals, have two sexes that differ physiologically, mentally, and behaviorally. Hormones affect these differences during

puberty, but also long before. Gonadal hormones, released prenatally or shortly after birth, have organizational effects on the developing brain and body. After the neurological pathways are established, hormones display activational effects to influence development and behavior. Masculinization refers to the exposure to androgens, prenatally or within the first week of life and at puberty, which influences brain development and, eventually, masculine behavior as an adult. Feminization, or simply lack of exposure to androgens prenatally or within the first week of life and exposure to estrogen at puberty, influences brain development and feminine behavior as an adult. In research studies, both male and female rats have been observed to experience observable behavioral feminization or masculinization in response to hormone exposure prenatally, regardless of the rat's sex.

- **Biological Processes:** Sexual differentiation is the process of becoming male or female. This is different from sex determination, which occurs at fertilization according to chromosomal sex. Occasionally, dysfunction in sex differentiation occurs resulting in chromosomal sexes different from typical XX or XY. With Turner syndrome, the second X chromosome is damaged or missing. These individuals appear female, but experience some dysfunction. 5 α -reductase deficiency is a disease where an individual is missing an enzyme, preventing the development of male genitalia until puberty despite being born male. Androgen insensitivity, or TFM, occurs when an individual is chromosomally male, but lack of receptors for androgens prevents masculinization and individual develops as female
- **Biology versus Society:** Humans and animals display differences according to sex. Toy preference evident among boys and girls, even at young age and in primate species (Vervet and Rhesus monkeys). Also, type of play differs between sexes in human and primate species.
- **Aggressive Behavior:** Aggressive behavior typically results when two or more individuals have a conflict of interest, usually in response to limited resources. Androgens are associated with aggressive behavior in several ways, including a correlation between plasma testosterone levels and aggressive behavior, the increase of androgens at puberty is also associated to an increase in aggression, males are typically more aggressive in many species, and castration lowers aggressive behavior. In a research study, male and female mice that were castrated or ovariectomized within 6 days birth show no behavioral difference when exposed to testosterone as adults, but mice that were castrated or ovariectomized and still exposed to testosterone before 6th day still display a response to testosterone as an adult. This study illustrates the organizational and activational effects of hormones.

Parental Behavior

- Parental behavior: Parental behavior refers to anything that contributes to the survival of a fertilized egg or offspring. The type of care differs between species and between parents, typically maternal care more common. Maternal behavior is easily observed in rats, where mother rats show an increase in approach behaviors and decrease in avoidance, but non-mother females and males display neophobia. Repeated exposure to rat pups can influence behavior so non-mothers and males may become desensitized and display an increase in maternal behavior, a process called concaveation.
- Hormones and Mothers: What is commonly known as, “the maternal instinct,” can actually be associated with hormone levels. Specifically, a drop in progesterone right after birth and high concentrations of estradiol, prolactin, and oxytocin. Circulating levels of progesterone may also control maternal aggression, which is more commonly observed in animal species but is also displayed by humans.

Hormones and Behavior: Due to the effect of hormones on both the peripheral and central nervous system, hormones have been observed to affect many other biological and behavioral functions, including food and fluid intake, salt balance, social interactions, stress and coping, and learning and memory. Hormones are also a factor in many psychological conditions, including depression, anxiety, eating disorders, postpartum depression, and seasonal depression.

Difficult Terms

5 α -reductase

Aromatase

Chromosomal sex

Demasculinization

Feminization

Gonadal Sex

Masculinization

Oxytocin

Parental Behavior

Progesterone

Progestin

Prohormone

Prolactin

Receptor**Sex determination versus sex differentiation****Target Cell****Lecture Frameworks**

Overview: This lecture framework is based on a 2-class-period lesson, though it may be adapted for one 90-minute lecture. This is not recommended because the activities chosen for this lecture work best when split between two lectures. If this cannot be accommodated, it is suggested students receive a short break in the middle of the lecture. Day one begins with an activity. Students complete an online quiz prior to class and bring results to discuss. Next, students learn about how hormones function as chemical messengers and the role of hormones in sexual differentiation. The lecture concludes with a CAT to identify areas of concern with students. Day two begins with the activity- The Mating Game- followed by a discussion about reproduction and parental behavior. Day two concludes with a discussion about aggression and other roles of hormones in behavior, with a short video on YouTube describing the biological changes experienced during intercourse.

First Day (45 minutes)

- **Hormones Quiz. A Warmup-Activity and Discussion (5 minutes):** Ask students to complete the hormones quiz (see “activities/demonstrations” below) and print results to bring to class. Discuss students’ results and false preconceptions surrounding hormones. Were students surprised by their results? How do they believe others would score on this quiz? Did students reference their textbook or external resources for any answers?
- **Direct Instruction(15 minutes): Hormones as Chemical Messengers**
 - Versus neurotransmitters
 - Similarities: Both are chemical messengers and have similar mechanisms of release from the cell. They also bind to receptors to affect cell
 - There are several differences: Neurotransmitters may only travel on preexisting neural pathways, but hormones may reach any cell supplied by blood. Neurotransmitters’ effect is all-or-none, but hormones’ effect is graded depending on the amount of hormone in the blood or receptors available. Hormones effect takes minutes to days, but neurotransmitters have an immediate effect.

Neurotransmitters travel very small distances before reaching their target cell, but hormones may travel throughout the body. Some degree of voluntary control exists with the neurotransmitters, such that you may will yourself to move but you cannot will your brain to release estrogen.

- Synthesis
 - Endocrine glands synthesize hormones, which are released into the blood to bind with receptors on target cells
 - Categorization- hormones are categorized according to their chemical structure, steroid hormones or peptide/protein hormones
- Interacting with Cells
 - Functions of hormones include the regulation of sensory input, integration of cognition, and control of motor output.
 - Example: hormones may increase one's sensitivity to certain stimuli, affect the rate of transmission between neurons, or influence the muscles responsible for a certain behavior
- Increase probability, not causal
 - Example: Increase in testosterone in response to a threat. Decrease in testosterone after team loses, as fan or team member. Biological and behavioral changes in response to the anticipation of sex.
- Multipurpose- hormones are efficient and can serve multiple purposes
 - Example: the hormones responsible for gamete maturation also promotes mating behaviors, making it more likely the egg will be fertilized
- Discussion (5 minutes)
 - Hormones cause changes in the rates of cellular processes or in cellular morphology.

- Ask students: What are some ways that these hormonally induced cellular changes might theoretically produce profound changes in behavior?
 - Discuss gene expression, cascading events, protein synthesis, and changes brain structure and function.
- *Note:* For the following section on sex differentiation it may be helpful to note that the idea of gender identity is a topic in popular discussion. While this section focuses primarily on biological aspects of sex differentiation there may be students who connect this topic with gender identity issues. Instructors may wish to be prepared with popular examples or clear statements about the connections and differences between these two topics.
 - **Direct Instruction of Sex Differentiation (15 minutes):**
 - Sexual Dimorphism- humans, and most other animals, have two sexes that differ physiologically, mentally, and behaviorally
 - Pre/post puberty
 - Organizational effects- effect of gonadal hormones, prenatally or shortly after birth, on brain and body development
 - Activational effects- effect of hormones on existing neurological pathways to influence behavior
 - Masculinization versus feminization
 - Masculinization- exposure to androgens, prenatally or within the first week of life and at puberty, which influences brain development and, eventually, masculine behavior as an adult
 - Feminization- lack of exposure to androgens prenatally or within the first week of life, and exposure to estrogen at puberty, influences brain development and feminine behavior as an adult.
 - Both male and female rats have been observed to experience observable behavioral feminization or masculinization in response to hormone exposure prenatally, regardless of the rat's sex.

- Biological Processes
 - Sexual Differentiation- the process of becoming male or female
 - Sex determination- occurs at fertilization according to chromosomal sex (XX or XY)
 - Dysfunction in sex differentiation
 - Turner syndrome- second X chromosome is damaged or missing. Female, with some dysfunction
 - 5 α -reductase deficiency- missing enzyme prevents the development of male genitalia until puberty, despite being born male
 - Androgen insensitivity (TFM)- chromosomally male, but lack of receptors for androgens prevents masculinization and individual develops as female
- Biology versus Society
 - Humans and animals
- **Activity: Classroom Assessment Technique (CAT)**—The Muddiest Point (Angelo & Cross 1993). See Activities/demonstrations for further instruction

Second Day (45 Minutes)

- **Pre-class instructions:** Prepare materials for The Mating Game (see “activities/demonstration” below) and review responses from, “The Muddiest Point” from day one. Identify areas of concern and review these points at the start of day two.
- **Warmup-Review (5 minutes):** Review areas of concerns identified in students’ responses to, “the Muddiest Point,” activity (See Activities/Demonstrations).
- **Activity and Discussion: The Mating Game** Students complete, “The Mating Game,” (see Activities/Demonstrations) as an introduction to mating, reproduction, and parenting.
- **Direct Instruction of Parental Behavior (17 minutes):**
 - Parental behavior- a behavior that contributes to the survival of a fertilized egg or

offspring

- Maternal versus Paternal care
 - Maternal care more common
 - Mother rats show increase in approach behaviors and decrease in avoidance. Non-mother females and males display neophobia
 - Concaveation or sensitization to fear increases maternal behavior
- Hormones and Mothers
 - Maternal instinct
 - Drop in progesterone after birth and high concentrations of estradiol, prolactin, and oxytocin
 - Maternal aggression
 - Progesterone
- Hormones and Behavior
 - Food and fluid intake
 - Social interactions
 - Salt balance
 - Learning and memory
 - Stress and coping
 - Psychopathologies- depression, anxiety, eating disorders, postpartum and seasonal depression
- **The Video Your Body During Sex (3 minutes):** This video discusses the biological changes experiences during intercourse, including the role of hormones and neurotransmitters.

- Link: <https://www.youtube.com/watch?v=mWWl6L1QeO8>
- **Activity: Classroom Assessment Technique (CAT)**—Analytic Memos (Angelo & Cross 1993). See Activities/Demonstrations

Activities & Demonstrations

Warm Up Activity - Hormones Quiz

- The purpose of this activity is to provide students with an idea of their current knowledge and false preconceptions regarding hormones.
 - Link: <http://www.funtrivia.com/playquiz/quiz2528371cf2a6...>
 - Time: 5 minutes outside class, 5 minute in class discussion
 - Directions:
 - Instruct students to follow complete quiz prior to class and print results for discussion in class.
 - Ask: How did students do? Did any false preconceptions about hormones influence students' results?
 - Ask: Were students surprised by their results? How do they believe others would score on this quiz? Did students reference their textbook or external resources for any answers?

The Mating Game Activity

- The purpose of this activity is to engage students and illustrate the relationship between mating, reproduction, and parenting behaviors.
 - Source: Moore, Holbrook, Meadows, and Taylor (2012). Go to this website to get the

PDF with full instructions: <http://abt.ucpress.edu/content/74/9/648.full.pdf+h...>

- Or get the full page PDF here: <http://abt.ucpress.edu/content/ucpabt/74/9/648.ful...>
- Here is a link to all the supplemental materials like the Excel spreadsheet for the instructor and gametes sheets: <https://sites.google.com/site/theclassroommatingga...>
- Time: This activity will take 15 minutes to prep and 20 minutes in class with discussion.
- Materials: Student instructions document, "Gametes" slides, class worksheet, instructor spreadsheet, 1" strips of colored paper and paper clips for "headbands"
- Directions:
 - *DO NOT hint to student that this activity will happen, the element of surprise is needed for the discussion.
 - Print "Gametes" slides (one copy for every 18 students in class) and student instructions document (one for each student). Distribute instructions to students. Separate slides containing gametes (slides 2-10, and 12-20) and pass out randomly to class. Gametes should be distributed without regard to the students' gender, such that some men will receive eggs and some women will receive sperm. Designate a headband color for male or female and distribute to indicate students' assigned sex. Students should color big dots on their headband to correspond with their "quality score" (1-5), the number found on each gamete, so that their score is easily visible to other students.
 - When everyone is ready, instruct students to mingle in a designated "breeding area." During this time, students should find a mate of the opposite sex to pair gametes. Once a male and female agree to "mate", the female must bring the pair to the instructor, located outside the "breeding area", who will use the excel spreadsheet provided to record the identification number and quality score from each gamete in the pair. This information is used to determine the "reproductive success" of each student during one mating season. After all females have run out of gametes, breeding season is over (about 5 minutes).
 - The excel spreadsheet provided allows the instructor to enter data as pairs are made, and calculations are automatically made with this information. This spreadsheet also automatically generates four plots showing the number of matings and total reproductive success points, separated by sex.
 - Ask: Did you feel any sort of stress response when this activity was first described? What physical symptoms did you experience? What other times in your life have you felt these symptoms? Discuss the role of hormones in the stress response.

- Ask: Did you notice any change in behavior by either sexes when “breeding season” began? Were any of these behaviors unique to one sex? How do you think stress impacted your behavior during the beginning, middle, and end of the breeding season? Discuss how stress may influence behavior.
- At this time, introduce the concept of parental investment, operational sex ratio, and sex roles.
 - *Parental investment*- time and resources each parent invests in offspring. This correlates to the number of offspring with each pregnancy and time spent rearing.
 - *Operational sex ratio*- ratio of each sex available to mate. This correlates to how selective one sex can be (e.g. more females= males can be selective, more males= females can be selective). Discuss
 - *Sex roles*- impact of each sex's role in parenting on selectivity during mating. This also correlates to the degree of selectivity of each gender.

CAT—The Muddiest Point (Angelo & Cross, 1993).

- Time: 5 minutes
- Materials: paper, pen/pencil
- Directions: Ask students to take a few minutes to write on a piece of paper, “the muddiest point” about today’s lecture, or any other concept they are still struggling to understand. Collect these papers as students leave class and review for day two.

CAT—Analytic Memos (Angelo & Cross, 1993).

- Time: 5 minutes in class, student finish at home
- Directions: Instruct students to write a one to two page response to the following issue:
- A new bill is being proposed that would make gender identification on legal documents restricted to whether an individual is genetically XX or XY. Write a letter to a representative explaining the issue with this bill and the biology responsible for gender development.
- Students may write this at home and turn in before next class period for credit. Responses should discuss chromosomal sexes in addition to typical XX and XY, such as XXY, XYY, XO,

as well as the difference between sex and gender and the role of hormones in the development of one's gender.

Video—Your Body During Sex (3 minutes):

- This video discusses the biological changes experiences during intercourse, including the role of hormones and neurotransmitters.

Additional Activities

Richmond, A., Carney, R., & Levin, J. (2011). Got neurons? Teaching neuroscience mnemonically promotes retention and higher order thinking. *Psychology Learning & Teaching*, 10, 40-45. doi:10.2304/plat.2011.10.1.40

- This article tested the efficacy of a mnemonic keyword for recalling difficult terms in neuroscience. This can be used in a class of any size to increase retention and critical thinking about hormones and behavior.

Case, K. (2014). The class interview: student engagement in courses covering sensitive topics. *Psychology Learning & Teaching*, 10, 52-56. doi:10.2304/plat.2011.10.1.52

- This article discusses the implications of discussing sensitive topics in the classroom setting. It also explores the benefits of using interview questions to gather general information about the students' background, interests and concerns about the subject prior to discussion. This would be a helpful resource for this module when discussing topics such as sex, gender, sexuality, mating, and aggression, because some students may feel uncomfortable.

Discussion Points

- Hormones cause changes in the rates of cellular processes or in cellular morphology. What are some ways that these hormonally induced cellular changes might theoretically produce profound changes in behavior?

- Discuss pregnancy, parental behaviors, puberty, aggression, etc. This is also a good discussion to bring up and review the process of gene expression and how this may affect behavior.
- A man visits his doctor because he is experiencing a lack of a sex drive. What may cause this behavioral disturbance?
 - Discuss hormone levels, enzymes, and receptors, and how these may all contribute to hormone dysfunction.
- What is the meaning of “differences” between sexes?
 - Discuss perceived differences between sexes and relate these differences back to a potential source, such as genetics, biology, hormones, environment, or even dysfunctions.
- Why is it inappropriate to refer to androgens as, “male hormones,” and estrogens as, “female hormones?”
 - Discuss sex differentiation, compare and contrast estrogens and androgens between humans and animals throughout development.

Outside Resources

Book: Adkins-Regan, E. (2005). *Hormones and animal social behavior*. Princeton, NJ: Princeton University Press.

Book: Beach, F. A. (1948). *Hormones and behavior*. New York: Paul Hoeber.

Book: Beach, F. A. (1975). Behavioral endocrinology: An emerging discipline. *American Scientist*, 63: 178–187.

Book: Nelson, R. J. (2011). *An introduction to behavioral endocrinology* (4th ed.). Sunderland, MA: Sinauer Associates.

Book: Pfaff, D. W. (2009). *Hormones, brain, and behavior* (2nd ed.). New York: Academic Press.

Book: Pfaff, D. W., Phillips, I. M., & Rubin, R. T. (2005). *Principles of hormone/behavior relations*. New York: Academic Press.

Video: Endocrinology Video (Playlist) - This YouTube playlist contains many helpful videos

on the biology of hormones, including reproduction and behavior. This would be a helpful resource for students struggling with hormone synthesis, reproduction, regulation of biological functions, and signaling pathways.

<https://www.youtube.com/playlist?list=PLqTetbgey0aemiTfD8QkMsSUq8hQzv-vA>

Video: Paul Zak: Trust, morality - and oxytocin- This Ted talk explores the roles of oxytocin in the body. Paul Zak discusses biological functions of oxytocin, like lactation, as well as potential behavioral functions, like empathy.

<https://www.youtube.com/watch?v=rFAdIU2ETjU>

Video: Sex Differentiation- This video discusses gonadal differentiation, including the role of androgens in the development of male features.

<https://www.youtube.com/watch?v=ciQjo7bj-uQ>

Video: The Teenage Brain Explained- This is a great video explaining the roles of hormones during puberty.

<https://www.youtube.com/watch?v=hiduiTq1ei8>

Web: Society for Behavioral Neuroendocrinology - This website contains resources on current news and research in the field of neuroendocrinology.

<http://sbn.org/home.aspx>

Evidence-Based Teaching

Case, K. A., Stewart, B., & Tittsworth, J. (2009). Transgender across the curriculum: Psychology for inclusion. *Teaching of Psychology*, 36, 117-121. doi:10.1080/00986280902739446

- This article examines the importance of inclusion and neutrality when discussing potentially sensitive topics such as gender. This is especially important when teaching about hormones, gender, sexuality, and identity.

Halpern, D. (2013). It gets crowded with an elephant and an ape in the room: Teaching about female and male cognitive differences and similarities. *Teaching of Psychology*, 41, 88-93. doi:10.1177/0098628313514187

- This article highlights the problems associated with teaching sex differences and proposed solutions to provide a safe and open environment to discuss sex and gender. An import

point to emphasize with students is the implications associated with research on sex differences, and the importance of cross cultural and biological studies. It is also important to be respectful of students' religious/cultural beliefs. Finally, teachers should be sure to include discussions of the similarities between the sexes, and any unstated fears and assumptions students may possess.

Rowland, D. L., & Wesselhoft, T. (1998). The study of biobehavioral rhythms in a psychology laboratory course. *Teaching of Psychology*, 25, 106-109. doi:10.1207/s15328023top2502_5

- This article discusses the results of a study measuring biological rhythms in students enrolled in a psychology laboratory course. This study may be replicated in a smaller class with adequate equipment, or could be discussed to demonstrate the interaction between hormones, behavior, and daily biological rhythms.

Links to ToPIX Materials

Gender and Sexuality Video

<http://topix.teachpsych.org/w/page/32407841/Gender%20and%20Sexuality%20>

Neuroscience Video

<http://topix.teachpsych.org/w/page/19981021/Neuroscience%20Video>

Sexuality Video

<http://topix.teachpsych.org/w/page/19981038/Sexuality%20Video>

Teaching with Trivia

<http://topix.teachpsych.org/w/page/99775791/Teaching%20with%20Trivia>

Tips for Effective Classroom Discussions

<http://topix.teachpsych.org/w/page/45062800/Tips%20for%20Effective%20Classroom%20Discussions>

Teaching Topics

Teaching The Most Important Course

https://nobaproject.com/documents/1_Teaching_The_Most_Important_Course.pdf

Content Coverage

https://nobaproject.com/documents/2_Content_Coverage.pdf

Motivating Students

https://nobaproject.com/documents/3_Motivating_Students_Tips.pdf

Engaging Large Classes

https://nobaproject.com/documents/4_Engaging_Large_Classes.pdf

Assessment Learning

https://nobaproject.com/documents/5_Assessment_Learning.pdf

Teaching Biological Psychology

https://nobaproject.com/documents/6_Teaching_Bio_Psych.pdf

PowerPoint Presentation

This module has an associated PowerPoint presentation. Download it at https://nobaproject.com//images/shared/supplement_editions/000/000/229/Hormones%20-&%20Behavior.pptx?1475608246.

About Noba

The Diener Education Fund (DEF) is a non-profit organization founded with the mission of re-inventing higher education to serve the changing needs of students and professors. The initial focus of the DEF is on making information, especially of the type found in textbooks, widely available to people of all backgrounds. This mission is embodied in the Noba project.

Noba is an open and free online platform that provides high-quality, flexibly structured textbooks and educational materials. The goals of Noba are three-fold:

- To reduce financial burden on students by providing access to free educational content
- To provide instructors with a platform to customize educational content to better suit their curriculum
- To present material written by a collection of experts and authorities in the field

The Diener Education Fund is co-founded by Drs. Ed and Carol Diener. Ed is the Joseph Smiley Distinguished Professor of Psychology (Emeritus) at the University of Illinois. Carol Diener is the former director of the Mental Health Worker and the Juvenile Justice Programs at the University of Illinois. Both Ed and Carol are award-winning university teachers.

Acknowledgements

The Diener Education Fund would like to acknowledge the following individuals and companies for their contribution to the Noba Project: The staff of Positive Acorn, including Robert Biswas-Diener as managing editor and Peter Lindberg as Project Manager; The Other Firm for user experience design and web development; Sockeye Creative for their work on brand and identity development; Arthur Mount for illustrations; Chad Hurst for photography; EEI Communications for manuscript proofreading; Marissa Diener, Shigehiro Oishi, Daniel Simons, Robert Levine, Lorin Lachs and Thomas Sander for their feedback and suggestions in the early stages of the project.

Copyright

R. Biswas-Diener & E. Diener (Eds), Noba Textbook Series: Psychology. Champaign, IL: DEF Publishers. Retrieved from <http://noba.to/4z3nfhbww>



Copyright © 2020 by Diener Education Fund. This material is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. To view a copy of this license, visit https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en_US.

The Internet addresses listed in the text were accurate at the time of publication. The inclusion of a Website does not indicate an endorsement by the authors or the Diener Education Fund, and the Diener Education Fund does not guarantee the accuracy of the information presented at these sites.

Contact Information:

Noba Project
www.nobaproject.com
info@nobaproject.com