



# Cognitive Development in Childhood

## Instructor Manual

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This module, *Cognitive Development in Childhood*, discusses how thinking develops through childhood. The interaction between Nature and Nurture covers several topics highlighting how the interactions are important. The module also covers how cognitive change occurs, through quantitative or qualitative changes and examples from Piaget's paradigms are used. Finally the module discusses applications to education and how understanding cognitive development has far reaching effects.

## Learning Objectives

- **Relevant APA Learning Objectives (2.0)**
  - Describe key concepts, principles, and overarching themes in psychology (1.1)
  - Develop a working knowledge of psychology's content domains (1.2)
  - Describe applications of psychology (1.3)
  - Use scientific reasoning to interpret psychological phenomena (2.1)
  - Engage in innovative and integrative thinking and problem solving (2.3)
  - Interpret, design, and conduct basic psychological research (2.4)
  - Incorporate sociocultural factors in scientific inquiry (2.5)
- **Content Specific Learning Objectives: Cognitive Development in Childhood**
  - Be able to identify and describe the main areas of cognitive development.
  - Be able to describe major theories of cognitive development and what distinguishes

them.

- Understand how nature and nurture work together to produce cognitive development.
- Understand why cognitive development is sometimes viewed as discontinuous and sometimes as continuous.
- Know some ways in which research on cognitive development is being used to improve education.

## Abstract

This module examines what cognitive development is, major theories about how it occurs, the roles of nature and nurture, whether it is continuous or discontinuous, and how research in the area is being used to improve education.

## Class Design Recommendations

Cognitive Development is ideally taught over two class periods, as there is some extra material that can be incorporated into this module for a more comprehensive understanding of cognitive development. This can also be taught over 1 class period. Outlines for each option are included. Please also refer to the Noba PowerPoint slides that compliment this outline.

### Two class periods:

1st class period (50 min – 75 min):

- Introduction to development
  - Talk about the different types of development. The three covered in the modules are cognitive, social, and aging.
- Nature vs. nurture
- Continuous or discontinuous development
  - Piaget

2nd class period (50 min – 75 min):

- Applications to educations
- Research methods with young children
  - Habituation
- Optional: Extra topics
  - Sociocultural theory (Vygotsky)
  - Information processing theory (Klar)

## One class period:

1st class period (50 min – 75 min):

- Introduction to development
  - Emphasis on cognitive development, talk about other types of development
- Nature and Nurture
- Continuous vs. discontinuous development
  - Piaget
- Applications to education
- Research methods with young children

## Module Outline

### Introduction

- Cognitive development is the development of thinking over the life-span. Thinking is

defined as higher-order processes such as problem solving and basic processes such as perception.

- Children's thinking changes dramatically as they age from infants to toddlers to school-age children.
- There are several types of theories of child development: stage theories (Piaget), sociocultural theories (Vygotsky), information processing theories (Klar).

## Nature and Nurture

- Nature is biology, what we are born with.
- Nurture is the social and physical environment into which we are born.
- The nature vs. nurture debate is often presented as "which one is it?" but really it is the interaction between the two that is important.
- Depth perception depends on being able to see the right patterns of light at the right time. A person needing corrective surgery may not see the patterns of light until later and depth perception will be off.
- Infants appearance and temperament (nature) elicit different responses (nurture) from those who interact with this. These responses affect cognitive development.
- There is also a choice made as to what is attended to, thus children have a role in shaping their own development.

## Does Cognitive Development Progress Through Distinct Stages?

- Development can be studied as continuous or discontinuous change. The growth of a tree is gradual and continuous, with a quantitative change of size measurable. A ladybug's life cycle is sudden and discontinuous, with rapid moments of qualitative change (a new type of creature).
- Jean Piaget gave us a stage theory that has been the basis for much of what we understand about children's cognitive development. Each new stage was entered when the child began to think in a fundamentally new way – when a qualitative change is observed.
  - Sensorimotor stage (birth - 2years): children understand the world through their perception and interaction with the world. They cannot solve the object permanence task before about 9 months.
  - Preoperational stage (2 years – 6 or 7 years): children can solve the object permanence

problem and use symbolic-representation. They are only able to focus on a single dimension and cannot solve the conservation task.

- Concrete operational stage (6 or 7 years – 10 or 11 years): Children can solve the conservation task and think logically. However, they fail at thinking systematically and cannot solve the pendulum task.
  - Formal operations stage (11 or 12 years – end of life): Children can think systematically and hypothetically and can solve the pendulum task. This stage tends not to emerge without formal education and we do not necessarily need this type of thinking to function in day-to-day life.
- Piaget has been challenged and new theories have emerged. By changing variables of Piaget's classic tasks - time between hiding and searching, using culturally specific objects and cultural experience – the ages at which children progress through the stages changes.
  - The debate as to continuous or discontinuous development is ongoing with no definitive answers.

## Applications to Education

- There are many applications of understanding cognitive development to education.
- In reading, phonemic awareness in kindergarten is a strong predictor of future reading ability.
- In math, numerical knowledge prior to entering school varies widely by socio-economic background. Family engagement in playing board games such as Chutes and Ladders. An experiment where children in low-income families played the game over two weeks, showed improved understanding of numerical concepts.
- A new area in cognitive development is linking brain maturation to changes in thinking.

## Difficult Terms

egocentrism

information processing theories

qualitative change

quantitative change

## Lecture Frameworks

### Overview

Talking about human development provides some interesting challenges. One on hand, many psychology majors want to 'work with kids'. On the other, the average college student thinks old age is eons away and finds little of interest in the later part of the lifespan. The good news is that there are some great attention-grabber activities in this unit. Students love to hear about the little cognitive tasks they can try out on kids around them. Yes, try this at home.

### First Class Period

- Discussion/warm-up (5-10 minutes)
  - At the beginning of any unit we like to get an idea of what the students know or think they know, as students will come to class with various levels of preparedness. Start by asking students about what development is and how psychologists could/do study development. Get a general idea of what they know and understand or misunderstand. We like to use one of the discussion questions from the end of the text as a starting point.
- Lecture – Refer to slides for the following:
  - To introduce cognitive development and the various theories: stage, socio-cultural, and information processing. In this module the focus is on stage theories.
  - To talk about nature and nurture. This can be brief if you have already covered it in biological psychology. The emphasis of nature and nurture is on how the two interact. Cover the examples in the text and ask students if they can think of other examples of nature and nurture interaction.
  - To discuss continuous and discontinuous development. Make sure students understand the differences in the two. The images in the text with the tree and ladybug make this point clear.
  - To introduce Piaget and the stages. This activity is to give students concrete examples of one way to measure each stage.
  - To demonstrate and show videos of classic tasks. Discuss what students observed about children's thinking in each example. Ask how what they observed differed from what they expected to see in the demonstration. *See "Activities/Demonstrations" for materials,*

*videos, and instructions.*

- Object permanence: hide a book or other object
- Three mountains task: use image or show video only
- Conservation: coins, crackers, or cups of water
- Hypothetical reasoning: one leg problem.

## Second Class Period

- Discussion/warm-up (5-10 minutes)
  - Ask students if they have any questions from previous class. To start the discussion, use another discussion question from text.
- Lecture – Refer to slides for the following:
  - To talk about applications to education, using the examples from the text. Ask students to come up with some other possibilities of how understanding cognitive development is important to education.
- Activity - Habituation activity
  - *See “Activities/Demonstrations” for materials and instructions*
- Discussion Extra Topic: Research methods
  - Ask students how you would set up experiments with children (reminding them that you have seen examples in videos and read about them in the text). Then ask about children who can't talk yet. We know how they react in a situation, but how do we know what they are thinking.
- Lecture/Discussion Extra Topics: *optional*
  - Sociocultural development (Vygotsky)
  - Information processing theories (Klar)

## Activities & Demonstrations

### Demonstration and Video of Piaget's classic tasks: In Class Activity

Piaget's stage theory is central to much of what we understand about children's cognition and is a starting point of many theories. Understanding these stages and the variations of the tasks used to measure them are crucial to students' analysis of the theory's implications.

This activity is open and can be done without the demonstrations; as all of your students will easily be able to solve the problems, they will see a bit of ridiculousness at being asked. But it can also be a way to start a discussion as the tasks grow in complexity en route to the formal operational stage, which will actually require some thinking.

*A note: the video links included are all live and working at the time of publication and have been used by us for several years. However, please check that they work before your class as YouTube or its users do occasionally take things down.*

Materials: Links to video clips and objects for each demo.

Object permanence task: hide a book or other object

- Show students a book. Hide the book behind a podium or desk. Ask the students if the book still exists.
- Students will know that obviously the book does not cease to be just because they can't see it. Talk about how infants will fail this task.
- Video: [https://www.youtube.com/watch?v=NjBh9ld\\_ylo](https://www.youtube.com/watch?v=NjBh9ld_ylo)
- Some students are interested in object permanence as a phenomenon in more intelligent animals. Here is a study on this phenomenon in dogs: [http://www.uky.edu/~zentall/pdfs/article object%...](http://www.uky.edu/~zentall/pdfs/article%20object%20permanence%20in%20dogs.pdf)

### Three mountains task

Use image or show video only

- Show IMAGE Ask the students to tell you what they see. Then show second IMAGE (opposite side) and ask student what they see. Then ask them what you see (if you were sitting on



the opposite side of the hypothetical table).

- Then talk about what children will likely answer based on what stage they are in.
- Video: <https://www.youtube.com/watch?v=OinqFgsIbh0&featur...>

## Conservation: coins, crackers, or cups of water

- Three graham crackers or 10 coins are easier to transport than three cups and water.
  - If graham crackers, give a student volunteer one cracker and you keep two crackers. Ask if you have the same amount. The student will say no. Then break the student's cracker in half and ask if now you have the same amount.
  - If coins, show two rows of five coins lined up equally. Ask a student volunteer if row A has more, row B has more, or if they are the same. Then spread one of the rows out to be longer than the other (still with five coins) and ask again.
  - If cups, have two cups of the same height and width with the same amount of water. Ask a student volunteer is cup A has more, cup B has more, or if they have the same. Then pour one cup into a different cup (either tall and then or short and fat – different from the first) and ask again.
- After one or all of these talk about what the students thought and what children in will answer depending on what stage they are in.
- Video – lack of conservation: <https://www.youtube.com/watch?v=GLj0IZFLKvg>
- Video – can conserve: <https://www.youtube.com/watch?v=gA04ew6Oi9M&featur...>

## Hypothetical reasoning: one leg problem

- Formal Operations – One leg scenario: Suppose that from this moment on, every human baby is born with only one leg. What would have to change?
  - Some things to think about: *One-legged babies are normal in every other way; overlap of a world with aging two-legged people and the younger one-legged people.*
  - Vandendorpe, M. M. (2008). Three tasks of adolescent identity: Cognitive, Moral, and social. In L. T. Benjamin, Jr. (Eds.), *Favorite activities for the teaching of psychology* (185-187). Washington D.C.: American Psychological Association.
- Discuss scientific procedure and systematic thinking.

- Video - Deductive reasoning: <https://www.youtube.com/watch?v=zjjdcXA1KH8>

## Habituation as a method for understanding cognition in young children: In-Class Activity

This activity provides a quick visual for how habituation works because students will react to the balloons popping. Discussing their reactions and feelings will help them transfer those feelings to what we can learn about infant thinking. The balloon part of the activity is based on an old magic trick and the discussion is from original research by Kellman and Spelke (1983).

This is another one of those activities we recommend practicing before class. The balloon with the tape will pop instead of deflate if the tape and pin aren't lined up, and a couple of tries on your own will give you a successful trial in class.

- **Materials:**
  - PowerPoint slide for the activity
  - 6 balloons blown up before class.
  - Use tape to make an "X" on one of the balloons
  - a push pin
- **Directions:** Start by asking about research methods and what kinds of methods you use with children. Ask how do you study infants and children who can't yet talk – how do we know what they are thinking when they can't tell us.
- Have six volunteers come to the front of the class. Give each volunteer a balloon. Make sure the tape X is showing on the last balloon. You will be able to see it, the class will probably not notice. Tell everyone to watch the reactions of their classmates.
- Walk down the line, popping the first five balloons. The students will jump or cringe at the balloon popping and as they very quickly habituate to what is coming will begin to anticipate the pop. For added fun, vary the interval at which you pop.
- When you get to the last balloon push the pin at the center of the tape X. The last balloon should not pop but slowly deflate. Students will anticipate another pop and prepare to cringe or jump or cover their ears, but they will have a new reaction when the pop doesn't come.
- Ask students about their reaction and how the popping made them feel. How did they

react or feel when the last balloon didn't pop. Ask them what they observed about the reactions of classmates. Ask what they think watching reactions like this in infants can tell us about their thinking.

- Discuss Kelman and Spelke's (1983) research. Show the results from this paper. Talk about what these researchers found and what conclusions can be made.

Kellman, P. J., & Spelke, E. S. (1983). Perception of partly occluded objects in infancy. *Cognitive psychology*, 15(4), 483-524.

Basic activity also written up here- [http://www.devpsy.org/teaching/infant/habitation....](http://www.devpsy.org/teaching/infant/habitation...)

## Additional Activities

Fernald, P. S. & Fernald, L. D. (2008). Early motor and verbal development. In L. T. Benjamin, Jr. (Eds.), *Favorite activities for the teaching of psychology* (180-181). Washington D.C.: American Psychological Association.

- This is a hands-on activity that works in almost any class size. Students break into small groups and each group gets a set of motor and verbal development milestones. The goal is to correctly order them. If using small groups it can be a race to see who can correctly order the list first. Instead of small groups you can also have volunteers to hold each milestone and listen to the class a la The Price is Right to order the milestones. It's a fun activity that can get the class moving.

Nichols, J. D. (2002). Schema theory: A new twist using Duplo models. *Teaching of Psychology* 29 (2) 150-151.

## Supplementary Materials

Other video demonstrations for developmental psychology

- Dimensional Change Card Sort Task: <http://www.youtube.com/watch?v=tXZau5VIlvU>
- Rouge Self Awareness Test: <http://www.youtube.com/watch?v=cTP01Wbsh0E&feature...>
- Deloache Shrinking Room: <http://www.youtube.com/watch?v=vt6Zu4oJRnM>

- Shopping Cart Self Awareness Test: <http://www.youtube.com/watch?v=k-rWB1jOt9s&feature...>
- Gender Roles: <http://www.youtube.com/watch?v=pWc1e3Nbc2g>
- Visual Cliff: <http://www.youtube.com/watch?v=eyxMq11xWzM>
- Infant Reflexes: <http://www.youtube.com/watch?v=gyVLD0hI0XY&feature...>
- Neonatal imitation: <http://www.youtube.com/watch?v=l0N6mIpoN3M>

Gopnik, A. (2011, July). Alison Gopnik: What do babies think? [Video file]. Retrieved from <http://www.ted.com/talks/view/lang/en//id/1241>

A Ted talk running 18:29 about infant and child cognition. “ ‘Babies are like the R&D division of the human species,’ says psychologist Alison Gopnik. Her research explores the sophisticated intelligence-gathering and decision-making that babies are really doing when they play.”

## Outside Resources

Book: Frye, D., Baroody, A., Burchinal, M., Carver, S. M., Jordan, N. C., & McDowell, J. (2013). *Teaching math to young children: A practice guide*. Washington, DC: National Center for Education Evaluation and Regional Assistance (NCEE), Institute of Education Sciences, U. S. Department of Education.

Book: Goswami, U. G. (2010). *The Blackwell Handbook of Childhood Cognitive Development*. New York: John Wiley and Sons.

Book: Kuhn, D., & Siegler, R. S. (Vol. Eds.). (2006). Volume 2: Cognition, perception, and language. In W. Damon & R. M. Lerner (Series Eds.), *Handbook of child psychology* (6th ed.). Hoboken, NJ: Wiley.

Book: Miller, P. H. (2011). *Theories of developmental psychology* (5th ed.). New York: Worth.

Book: Siegler, R. S., & Alibali, M. W. (2004). *Children's thinking* (4th ed.). Upper Saddle River, NJ: Prentice-Hall.

## Evidence-Based Teaching

Klinzing, D. G. (2006). A parent interview course assignment. *Teaching of Psychology*, 33 (3)

202-204.

- Students use a questionnaire to interview their parents and write a paper about different topics in child development. A reflective questionnaire given after the papers were turned in, but before they were graded allowed the researcher to examine the effectiveness of the assignment.

## Suggestions from the Society for Teaching's Introductory Psychology Primer

Brown, C.M. (2013). Developmental. In S.E. Afful, J. J. Good, J. Keeley, S. Leder, & J. J. Stiegler-Balfour (Eds.). *Introductory Psychology teaching primer: A guide for new teachers of Psych 101*. Retrieved from the Society for the Teaching of Psychology web site: <http://teachpsych.org/e-books/intro2013/index.php>

## POSSIBLE ASSESSMENTS (Out of Class)

APA's Division 7 (Developmental Psychology) Web Site (<http://ecp.fiu.edu/APA/div7>). For this assignment, students will go to the Web site, browse, and then write a one- to two-page summary of what they found of interest on the Web site, and what they learned about developmental psychology by browsing. (LO: 1.2a(4), 2.2, 6.4b)

**Journal Article Scavenger Hunt.** For this assignment, students will choose a topic of interest (related to developmental psychology) and then use PsycINFO to locate three empirical journal articles – each article must be from a different journal (for example, *Developmental Psychology*, *Child Development*, *Infant and Child Development Journal*, etc.). Students then write a summary of each of the three journal articles (paying close attention to the method and results of each article) and describe what each of the articles tells us about the students' topic of choice. (LO: 1.2a(4), 2.2, 3.1, 6.4b)

**Web Site Evaluation.** For this assignment, students choose one organization from a list provided (example organizations include March of Dimes, Autism Speaks, La Leche League

International, etc.). The students then use Google to find the organization's Web site. After closely examining the site, the students respond to the following questions: (1) From the list you have been provided, which organization did you choose? Why did you select this particular organization? What drew you to it? (2) Based on a close examination of the Web site, what does this organization do, specifically, to encourage children's development and well-being? Is this organization invested in children's physical, cognitive, or social development? How so? (4) What are a few strengths of the artistic layout of the site? What are a few weaknesses of the artistic layout? Is the site easy to navigate, or difficult? How so? (5) In your future, do you think you might ever use this site as a source of developmental psychology information? Why, or why not? (LO: 3.1, 6.4b)

**The Interaction of Nature and Nurture.** For this assignment, students will identify and describe, in a short paper, three essential features of who they are. They will then describe how they think these three features are due to both nature and nurture, citing specific examples. (LO: 1.2a(4), 1.2d(1), 3.1, 4.4, 9.1)

## ACTIVITIES & TECHNIQUES (In Class)

**"Six Things to Never Say to or Ask a Developmental Psychologist."** This is an introduction to developmental psychology that can occur on the first day. The activity dispels myths that many people hold regarding who developmental psychologists are and what developmental psychologists do. This is a fun, informative activity that will introduce students to developmental psychology and help give them a better understanding of what developmental psychology is (and is not) about. (LO: 1.2d(1), 2.2, 3.)

- "You must love children!" (Why it's a myth: Developmental psychology is not about children only. Rather, it is about the lifespan – here, you can go over the periods from prenatal to late adulthood.)
- "Can you give me parenting advice?" (Why it's a myth: Developmental psychology is about so much more than parenting. Life span development is the study of how people grow, change, and stay the same over the course of their life, with focuses on three topical areas: physical, cognitive, and social.)
- "It must be fun to play with kids all day. Developmental research must be a blast!" (Why it's a myth: Research in developmental psychology is diverse, including observations, interviews, fMRI, longitudinal, cross-sectional study, etc., and the research focuses on all age groups.) •

- “So, is it nature or nurture?” (Why it’s a myth: Developmental psychologists recognize that almost everything about us can be explained by an interaction between nature and nurture; neither nature nor nurture alone is sufficient to explain who we are.)
- “Our time as a baby is the most important, right?” (Why it’s a myth: Every life period is important in its own way. This would be a good time to introduce the ongoing debate in developmental psychology over the importance of early life experiences versus later life experiences, and to present the idea of sensitive and critical periods.)
- “Why bother studying development? Aren’t we all the same?” (Why it’s a myth: Each of us belongs to a cohort, or people who were born around the same time and in the same place as us. This is a good time to introduce cohort effects and how they make for different developmental ecologies.)

**“Who Would Have Said It?”** To really know developmental psychology, you have to know about the “key players.” In this activity, students are presented with a list of statements and a list of many of the “key players” of developmental psychology, and they match each statement with its correct “key player” (see Appendix A). This is a way to introduce students to many of the most well-known people in developmental psychology, while giving them a beginning understanding of what each person’s theoretical perspective. (LO: 1.2a(4), 1.2d(1))

**“What are the Myths of Developmental Psychology?”** Using Scott Lilienfeld’s (2009) book, *50 Great Myths of Popular Psychology: Shattering Widespread Misconceptions about Human Behavior*, quiz the students on their knowledge of developmental psychology. On either PowerPoint slides or a handout, list some (or all) of the myths provided in the developmental psychology section of Lilienfeld’s book and ask the students to respond to each with “true” or “false.” Some of the myths in the book: Playing Mozart to an infant boosts their intelligence, adolescence is inevitably a time of psychological turmoil, most people experience a midlife crisis in their 40s or early 50s. Lilienfeld’s section on human development lists over 20 myths and their explanations. This can be an eye-opening activity for students, as they are often surprised to learn that they have believed some (or all) of these myths. (LO: 1.2a(4), 1.2d(1), 2.2, 3.1)

## PowerPoint Presentation

This module has an associated PowerPoint presentation. Download it at

[https://nobaproject.com//images/shared/supplement\\_editions/000/000/269/Cognitive%20Development%20in%20Childhood.ppt?1416598448](https://nobaproject.com//images/shared/supplement_editions/000/000/269/Cognitive%20Development%20in%20Childhood.ppt?1416598448).



## 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.

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