

CHAPTER 2 **CULTURE AND HUMAN NATURE**

LEARNING OBJECTIVES

By the end of this chapter, students will be able to:

- 2.1. Discuss evidence of culture in different members of the animal kingdom
- 2.2. Understand how prestige bias facilitates cultural learning among humans
- 2.3. Differentiate between imitative learning versus emulative learning
- 2.4. Describe the role of theory of mind in cultural learning among humans
- 2.5. Define the process called the ratchet effect
- 2.6. Explain the ratchet effect in the context of cumulative cultural learning
- 2.7. Generate examples of the ratchet effect
- 2.8. Discuss how group size (large and small) affects cumulative cultural learning
- 2.9. Discuss the role of brain evolution in cultural learning
- 2.10. Understand the costs and benefits of larger brains
- 2.11. Critique the major theories that explain how primates' brains became big

MULTIPLE CHOICE

1. Why is there NOT much cumulative culture among chimpanzees?
 - a) Chimpanzees have even more theory of mind than humans.
 - b) Chimpanzees have poor working memory.
 - c) Chimpanzees are incapable of cultural transmission.
 - d) Chimpanzees are not a social species.
 - e) Chimpanzees are not very good at imitative learning.

ANS: E DIF: Moderate REF: Is Culture Unique to Humans? □ Theory of Mind □ Language
Facilitates Cultural Learning □ Cumulative Cultural Evolution
OBJ: 2.1 MSC: Understanding

2. Which of the following statements is FALSE about animals and culture?
 - a) Humans appear to be the only species that uses symbolic coding.
 - b) Culture is found in several species of primates, but not in other animals.

- c) There are behaviors common in chimpanzees in one location that are absent from chimpanzees in another location.
- d) Chimpanzees show good emulative learning but poor imitative learning, compared with humans.
- e) Aside from humans, no other species shows evidence for much cumulative culture.

ANS: B DIF: Moderate REF: Is Culture Unique to Humans? □ Theory of Mind □ Cumulative Cultural Evolution OBJ: 2.1 □ 2.4 □ 2.6 MSC: Understanding

3. If a child wants to be a great ice hockey player and chooses to learn from Wayne Gretzky as the prestigious model, what aspect(s) of Wayne Gretzky is the child most likely to imitate?
- a) Wayne Gretzky's playing style during an ice hockey game
 - b) Wayne Gretzky's hairstyle
 - c) idolizing the same person Wayne Gretzky idolized as a child
 - d) Wayne Gretzky's off-ice workout program
 - e) everything that Wayne Gretzky does, both related and unrelated to hockey

ANS: E DIF: Easy REF: Cultural Learning
OBJ: 2.2 MSC: Analyzing

4. When humans engage in the prestige bias, they also tend to copy everything that a prestigious model does, because humans
- a) engage in emulative learning.
 - b) just love to learn.
 - c) engage in imitative learning.
 - d) have large neocortices.
 - e) have a small encephalization quotient.

ANS: C DIF: Moderate REF: Cultural Learning
OBJ: 2.3 □ 2.4 MSC: Understanding

5. A team of scientists observes that a new species (Species X) tends not to copy exactly how a model uses a new tool; instead, species members are very adept at figuring out on their own how to best use the tool. Conversely, another new species (Species Y) does tend to copy exactly how a model uses a new tool, paying attention to the behavioral strategies of the model. Based on this observation, what trajectory should we expect each species's respective cultural development to be like?
- a) Species X will likely not have cumulative culture and Species Y will likely have cumulative culture.
 - b) Species X will likely have cumulative culture and Species Y will likely not have

cumulative culture.

- c) Both species will likely have cumulative culture.
- d) Neither species will likely have cumulative culture.
- e) The scientists' observations have no relationship to accumulation of culture.

ANS: A DIF: Difficult REF: Theory of Mind ▯ Cumulative Cultural Evolution

OBJ: 2.3 ▯ 2.4 MSC: Understanding

6. Homer sharpens a rock and uses it to shave. Schick adds a handle to the rock for better grip. Gillette then changes the rock to a titanium blade for durability. The progression of improvements made to the shaving utensil is an example of
- a) cultural adaptation.
 - b) emulative learning.
 - c) the eureka effect.
 - d) cultural bootstrapping.
 - e) the ratchet effect.

ANS: E DIF: Easy REF: Theory of Mind ▯ Cumulative Cultural Evolution OBJ: 2.3 ▯ 2.5

MSC: Understanding

7. Which child(ren) below demonstrate(s) the existence of theory of mind?
- a) a child who hides his toys so his mother will not find them
 - b) a child who likes to ride the family dog like a rodeo bull
 - c) a child who assumes that everyone knows everything she knows
 - d) all of these children
 - e) none of these children

ANS: A DIF: Easy REF: Theory of Mind

OBJ: 2.4 MSC: Applying

8. An infant of Species X sees a model use a new tool to achieve a goal. Which of the following scenarios best demonstrates that the infant is engaging in emulative learning?
- a) The infant tries to determine the model's intent in using the tool in a specific way.
 - b) The infant tries to determine what it is about the tool that allowed the model to achieve the goal.
 - c) When given the tool, the infant figures out on her own how to use the tool to achieve the same goal.
 - d) When given the tool, the infant mimics exactly how the model used the tool to achieve the goal.
 - e) The infant stares blankly at the model.

ANS: C DIF: Easy REF: Theory of Mind

OBJ: 2.4 MSC: Applying

9. An infant of Species X sees a model use a new tool to achieve a goal. Which of the following demonstrates that the infant is engaging in imitative learning?
- a) When given the tool, the infant figures out on his own how to use the tool to achieve the same goal.
 - b) The infant tries to determine which of the model's actions was most relevant in using the new tool to achieve the goal.
 - c) When given the tool, the infant mimics exactly how the model used the tool.
 - d) The infant stares blankly at the model.
 - e) The infant tries to determine what it is about the tool that allowed the model to achieve the goal.

ANS: C DIF: Easy REF: Theory of Mind

OBJ: 2.4 MSC: Applying

10. Which of the following statements is true regarding chimpanzees living in the wild?
- a) They do not show conclusive evidence for a theory of mind.
 - b) They communicate with a vocabulary of about 60 recognizable words.
 - c) They bring others to locations so that they can observe things there.
 - d) They point to outside objects.
 - e) All of the statements are true.

ANS: A DIF: Moderate REF: Theory of Mind

OBJ: 2.4 MSC: Understanding

11. Emulative and imitative learning can be contrasted in that
- a) in the short term, imitative learning leads to better solutions than emulative learning.
 - b) chimpanzees can perform well at tasks involving imitative learning, but not at tasks involving emulative learning.
 - c) emulative learning does not require imitating a model's behavioral strategies.
 - d) emulative learning is a necessary precondition for cultural accumulation.
 - e) 2-year-old children tend to solve tasks with emulative learning of behavioral strategies, whereas 1-year-olds do not.

ANS: C DIF: Moderate REF: Theory of Mind

OBJ: 2.4 MSC: Analyzing

12. A child observes a model using a new tool to crack open an acorn. The child does not copy exactly what the model does, nor does the child understand that the model wanted

to crack acorns. The child simply sees that the tool can be used to crack acorns and tries to figure out on his own how to use the tool to crack acorns. What is the child exhibiting?

- a) simple mimicry
- b) observational learning
- c) emulative learning
- d) theory of mind
- e) imitative learning

ANS: C DIF: Moderate REF: Theory of Mind

OBJ: 2.4 MSC: Understanding

13. Which of the following (historically inaccurate) examples best demonstrates the process of the ratchet effect?

- a) Ke\$ha brushes her teeth with a bottle of whiskey, but Lady Gaga gives her a tube of toothpaste because it cleans teeth better.
- b) Wolverine and Thor independently create the first hammers. Wolverine's hammer is simply a rock, whereas Thor's hammer has a metal head and a long handle.
- c) Wayne Gretzky demonstrates how to use a hockey stick to shoot pucks, and everyone then tries to figure out how the stick can be used to shoot pucks.
- d) Marx creates a new political ideology, Lenin builds on that ideology, and Stalin further expands on it.
- e) Rafael Nadal demonstrates how to use a tennis racquet to hit a ball, and everyone mimics Rafael's movements with his or her racquet.

ANS: D DIF: Moderate REF: Cumulative Cultural Evolution OBJ: 2.6 MSC: Applying

14. You and a small handful of people have split off from a large and technologically advanced society to settle on another island. According to Henrich's mathematical model, what will most likely happen to the development of cultural technology in your splinter group?

- a) The cultural technology of your group will likely ratchet up due to a concentrated effort among this handful of people.
- b) The cultural technology of your group will remain the same.
- c) The cultural technology of your group will exceed the technological complexity of the original society.
- d) The cultural technology of your group will likely devolve due to a lack of skilled models.
- e) Splitting from a larger group has nothing to do with the development of cultural technology.

ANS: D DIF: Easy REF: Cultural Learning

OBJ: 2.8 MSC: Applying

15. According to Henrich's mathematical model, why would complex cultural knowledge deteriorate, as was the case in eighteenth-century Tasmania?

- a) An influx of outsiders into a population dilutes the population's cultural knowledge.
- b) If malnutrition occurs, the neocortex ratio needed for the ratchet effect cannot develop.
- c) Immigration creates confusion as to what qualifies as cultural knowledge.
- d) Shrinkage in the population leads to a lack of skilled models for people to copy.
- e) It is in the nature of cultural evolution that some cultural ideas fall out of favor in time.

ANS: D DIF: Difficult REF: Cultural Learning

OBJ: 2.8 MSC: Remembering

16. How does one find an animal's encephalization quotient (EQ)?

- a) It is a complex conversion from an animal's intelligence quotient.
- b) It is the ratio of an animal's brain weight to the brain weight predicted for a comparable animal with the same body size.
- c) It is the ratio of an animal's brain weight to its body size.
- d) It is the ratio of the volume of an animal's neocortex to the volume of its brain.
- e) It is the difference between the volume of an animal's brain and the volume of its neocortex.

ANS: B DIF: Easy REF: You and Your Big Brain

OBJ: 2.9 MSC: Remembering

17. Among three newly discovered species of primates, Species A's diet is based fully on fruits, Species B's diet is based fully on food that requires extractive foraging methods, and Species C lives in highly social complex groups. Which species probably has the largest EQ?

- a) Species A
- b) Species B
- c) Species C
- d) All three species have the same EQ.
- e) The answer cannot be determined with the available information.

ANS: C DIF: Moderate REF: You and Your Big Brain □ What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.9 MSC: Applying

18. After studying four species of Martian animals that have the same body size, the

scientists obtained the following data:

Which
(no

Species	Brain weight (g)	Neocortex volume (cm ³)
A	120	120
B	86	23
C	134	67
D	95	125

species has the largest
encephalization quotient?
calculator needed)

- a) A
- b) B
- c) C
- d) D
- e) The answer cannot be determined with the available data.

ANS: C DIF: Difficult REF: You and Your Big Brain

OBJ: 2.9 MSC: Evaluating

19. On Planet X, you observe that a primate-like species is undergoing rapid evolution, with their brains having grown significantly in volume. Based on the textbook's discussion about a similar process that took place in human evolution, what physiological changes to this alien species would you NOT expect to accompany this growth in brain volume? Assume that body size has not changed.

- a) decreased muscle mass
- b) shorter fingers and limbs
- c) diminished energetic demands elsewhere on the body
- d) increased encephalization quotient
- e) shortened digestive tract

ANS: B DIF: Moderate REF: Humans Versus Chimpanzees OBJ: 2.10 MSC: Analyzing

20. A 2.5-year-old human child, a chimpanzee, and an orangutan are presented with the same problem-solving task—they must figure out how to use a tool to reach the top of a cabinet and nudge a wooden block that will knock over a banana. Based on Hermann and colleagues' findings, which of the three participants will outperform the others?

- a) the human child
- b) the chimpanzee
- c) the orangutan
- d) None will be able to complete the task.
- e) They will all perform equally well.

ANS: E DIF: Easy REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.9
MSC: Applying

21. After studying four species of newly discovered primates that have the same body size, the scientists obtained the following data:

Species	Brain volume without neocortex (cm ³)	Brain surface area (cm ²)	Neocortex volume (cm ³)
A	80	120	90
B	25	86	84
C	66	134	67
D	22	95	84

Rank order the species by their expected social group size, from greatest to smallest, according to the social brain hypothesis. (no calculator needed)

- a) D > B > A > C
- b) A > B > D > C
- c) C > A > B > D
- d) B > D > A > C
- e) The answer cannot be determined with the available data.

ANS: A DIF: Difficult REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.9
MSC: Analyzing

22. You examine four newly discovered primate species that have the same body size and obtain the following data:

Species	Brain volume without neocortex (cm ³)	Brain weight (g)	Neocortex volume (cm ³)
A	80	120	90
B	25	95	84
C	66	70	67
D	22	86	84

Based on what can you infer given what

these observations, NOT reasonably is discussed in the textbook?

- a) Species B has the second-largest encephalization quotient.
- b) Species C deals with the lowest levels of social complexity.
- c) Species D and C have, respectively, the largest and the smallest neocortex ratios.
- d) Species A has the largest neocortex ratio.
- e) Species D and B have the same volume of neocortex.

ANS: D DIF: Difficult REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.9
MSC: Analyzing

23. Which of the following is NOT direct evidence for the social brain hypothesis?

- a) Humans outperform other primates in social problem-solving tasks.
- b) More social species of whales and birds have larger brains.
- c) Humans have a large encephalization quotient.
- d) Less social animals have fewer cognitive skills.
- e) As predicted by the neocortex ratio, the average human social group size in subsistence societies is around 150 members.

ANS: C DIF: Moderate REF: What Is the Evolutionary Advantage of a Large Brain?
OBJ: 2.9 □ 2.11 MSC: Evaluating

24. Which of the following statements is FALSE?

- a) Primate species that rely heavily on fruit in their diets have larger neocortex ratios than primate species that do not rely much on fruit.
- b) Primates have larger brains as a function of their body weight than most other mammals.
- c) Primate species with large social networks have larger neocortex ratios than those with smaller social networks.
- d) Human brains require more caloric energy than the brains of most other species.

e) All of the statements are true.

ANS: A DIF: Easy REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.10

MSC: Remembering

25. What theory is best supported for why primates evolved such large brains?

- a) They tend to eat foods that are rich in protein, which can support expansive neural development.
- b) They tend to eat fruit, and need to be clever enough to remember where the fruit trees were that would be ripe at each point in the season.
- c) They tend to eat foods that require ingenuity to extract, such as nuts and termites.
- d) They tend to live in large social groups, which requires intelligence to function effectively.
- e) The number of males and females is unequal, so individuals need to outsmart their competitors to attract mates.

ANS: D DIF: Easy REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.10

MSC: Analyzing

26. After measuring the neocortex ratio of two species, it was determined that Species A has a ratio of 0.25, whereas Species B has a ratio of 0.20. Based on the evidence discussed in the textbook, which of the following can one most likely conclude about these two species?

- a) Species A's diet contains more fruit than Species B's diet.
- b) Species B has higher intelligence than Species A.
- c) Species A uses more extractive techniques to get food than Species B.
- d) Species B lives in a smaller social group than Species A.
- e) Species A has a larger brain relative to its body size than Species B.

ANS: D DIF: Easy REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.11

MSC: Analyzing

27. According to Dunbar, why would larger social groups be associated with the evolution of larger brains?

- a) Larger groups provided more protection for survival, allowing for evolution of larger brains.
- b) Smaller groups tended to be too cohesive and unwilling to adopt new ideas, leading to stagnant brain evolution.
- c) Smaller groups were more vulnerable to predation and defeat in warfare, preventing the evolution of larger brains.

- d) Larger groups were more successful in hunting, and the additional food led to the evolution of larger brains.
- e) Larger groups had greater social complexity, driving the evolution of larger brains to handle such complexity.

ANS: E DIF: Easy REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.11
MSC: Evaluating

28. According to the social brain hypothesis, which of the following is true?

- a) The large brains of primates allow them to have larger societies.
- b) Evolution favored primates who did well in maintaining social relationships.
- c) The neocortex ratio in primates limits population groups to 150 members.
- d) Students who study social sciences are mentally healthier than those who do not.
- e) The neocortex ratio in primates allows for population groups to exceed 150 members.

ANS: B DIF: Moderate REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.11
MSC: Remembering

29. Which of the following is true of the relationship specifically between human brains and group size, according to the social brain hypothesis?

- a) Human brain size is not related to group size but rather to humans' diet.
- b) The neocortex ratio in humans gives them the capacity to keep track of about 150 relationships.
- c) The smaller the group size, the faster the brain deteriorates into goo.
- d) Humans with larger brains have an affinity for larger groups.
- e) Living in larger social groups tends to lead to larger neocortex ratios.

ANS: B DIF: Moderate REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.11
MSC: Remembering

30. After studying four species of Neptunian animals, the scientists obtained the following data:

Species	Brain volume without neocortex (cm ³)	Neocortex volume (cm ³)
A	45	90
B	80	84
C	20	67
D	82	84

According to Dunbar's social brain hypothesis, which species should have the largest social groups? (no calculator needed)

- a) A
- b) B
- c) C
- d) D
- e) The answer cannot be determined with the available data.

ANS: A DIF: Moderate REF: What Is the Evolutionary Advantage of a Large Brain? OBJ:

2.11

MSC: Evaluating

SHORT ANSWER

1. You are trying to determine whether Mimi, a young child, engages primarily in imitative or emulative learning. Design a study that will allow you to figure it out.

ANS: Answers will vary. DIF: Moderate

REF: Theory of Mind OBJ: 2.3 MSC: Creating

2. Define the ratchet effect and generate an example for it (excluding the example of the hammer in the textbook).

ANS: Answers will vary. DIF: Easy REF: Cumulative Cultural Evolution OBJ: 2.7 MSC:

Creating

3. There are three explanations posited to explain how primates developed such big brains. Name the three explanations and generate a study design that tests these competing explanations.

ANS: Answers will vary. DIF: Moderate REF: You and Your Big Brain □ What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.11

MSC: Creating

4. David posits that, because nuts require ingenuity to harvest them, animals that rely on a diet of nuts will require more complexity in mental abilities, thus leading to the evolution of a larger brain. Evaluate whether David's assertion makes sense based on existing evidence.

ANS: Answers will vary. DIF: Moderate

REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.11 MSC: Evaluating

5. You measured the brain of an animal species and found that it was 30 cm³. The brain itself weighs 40 grams. You want to artificially enhance the mean group size for this animal species. To do that, only the _____, and not other parts of the brain, needs to increase in size.

ANS: Neocortex DIF: Moderate REF: What Is the Evolutionary Advantage of a Large Brain? OBJ: 2.11 MSC: Analyzing