**Parental Habituation in Coyotes: An Animal Behavior Case Study and Introduction to Dr. Christopher Schell**

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**Course Information:**

Department: Biology

Level: Lower Undergraduate

Course type: Lecture

Students: Majors (science and pre-health)

Number of Students: 30

Delivery mode: This lesson was taught in an online synchronous course but can be adapted to other teaching modalities.

**Summary:**

This lesson presents an animal behavior case study on parental habituation in coyotes and serves as a bridge to a unit on ecology, while introducing students to an urban ecologist.

**Overview:**

The parental habituation in coyotes research paper presents an approachable case study in animal behavior that also provides a review of vertebrate animals, a bridge into a unit on ecology, and a brief introduction to urban ecology. The lesson provides an opportunity for students to explore methods used in animal behavior research, analyze graphs, and compare a theoretical model to actual results. The scientist spotlighted, Dr. Christopher Schell, is a young, male, black scientist involved in urban carnivore research. The lesson can be shortened or expanded, depending on the class time available, by incorporating fewer/more questions and/or group work. The lesson presented here took approximately 35 minutes. The materials needed include the PowerPoint (provided – can easily be modified to meet teaching needs), student access to the internet to read interviews and news articles about Dr. Schell, and the research paper2 for the instructor to review in advance of the lesson.

**Learning objectives:**

**At the end of this lesson students will be able to:**

**Quantitative learning objective(s).**

1. Describe the methods used in the study to assess parental and offspring behavior.
2. Interpret the graphs presented in the research paper.
3. Identify dependent and independent variables in the research.
4. Compare research results to theoretical models.

**Content learning objective(s)**

1. Apply terms or concepts from class to the research. Students will self-select a term from the units on animal behavior (during the lesson) and ecology (on the exam) to apply to the case study.
2. Describe the importance of urban carnivore studies (as relates to understanding the relationship between science and society1).

**Social justice and/or diversity/equity/inclusion learning objective(s)**

1. Describe characteristics of scientists that include inclusive descriptors.
2. Identify systemic factors that affect how and by whom science is conducted1.

**Lesson sequence:**

This list follows the order of the slides in the PowerPoint.

1. Slide 2: Introduce this lesson as a bridge between animal behavior and ecology, while spotlighting a scientist. [Note: a 10-minute activity to review key animal behavior concepts from previous lessons is not included in the PowerPoint].
2. Slide 3: Introduce Dr. Christopher Schell.
3. Slide 4: Introduce Grit City Carnivore Project (GCCP). Present the importance of ecological studies conducted in urban areas, the use of camera traps, and the importance of collaboration in science. Point out the variety of data that Dr. Schell collects.
4. Slide 5: Students choose a news article to learn more about Dr. Schell. 5 minutes to read the article and then report back with three interesting points. Students report out in a round-robin style, with each student reporting one unique thing they learned. Pair-share, small group reports, or other approaches can be used for larger classes. During this discussion, students can be prompted to provide characteristics of Dr. Schell that describe him as a scientist and factors that affect how he conducts science if these are not brought up during the students’ sharing.
5. Slide 6: Introduce the parental habituation coyote case study. [Note: Instructors will need to read this paper in advance.]
6. Slide 7: Present Figure 1 on the theoretical models of potential scenarios of parental habituation and offspring risk-taking. If time, ask students to look at the diagram and write an explanation of each model. Students can do this individually, in pairs, or small groups. Alternatively, assign each model (a, b, c) to a different group or group of students.
7. Slides 8 & 9: Present research questions and methods used in the study, using Figure 2 from the paper.
8. Slide 10: Present Results – Figure 3. Ask students to identify the independent and dependent variables and to write a short statement summarizing the results. Call on volunteers to share their statements. Pair-share or small groups can also be used for this activity.
9. Slide 11: Present Results – Figure 4. Ask students to write a short statement summarizing the results (individual, pair-share, or small groups).
10. Slide 12: Share quotes from Dr. Schell’s conclusion and research significance.
11. Slide 13: Ask students to compare the results to the theoretical models (individual, pair-share, or small groups).
12. Slide 14: Application: Ask students to choose one of the application questions: (1) how the case study helps them understand an animal behavior concept already covered in class OR (2) what question they would ask if they were to continue this study. Students respond in chat (online course) or verbally in groups, pairs, or to class. Alternatively, half of the students (last name A-M) can respond to the first question and half (last name N-Z) can respond to the second question.
13. Slide 15: Exit question: Students respond to the question on changes in their perception of what it means to be a scientist3. [In an online course, students can respond in the chat. For in-person classes: students can respond on note cards or half-sheets of paper.]

**Pre-lesson activities:**

A unit on animal behavior was presented in the class sessions prior to this lesson.

**Post-lesson activities:**

On the exam, students are given Figure 3 and asked to respond to these questions:

Dr. Christopher Schell conducted a study to examine how coyotes become more used to the presence of humans.

* In 1-3 sentences, describe the main conclusion depicted in the graph (Figure 3).
* In 1-3 sentences, describe the methods Dr. Schell used to conduct this study.
* In 1-3 sentences, describe one way in which this research relates to or expands your understanding of concepts discussed in the ecology unit of our course.

**Implementation notes:**

* To cover all the content and include activities, instructors will need to keep a close eye on the time.
* Presenting the research paper in sections made the research and results more readily accessible to introductory-level students.
* Student comments on the exit question indicated they were interested in the connections Dr. Schell makes between his urban ecology research and race.
* The questions in the PowerPoint can be adapted to connect to other topics in an introductory biology course.

**References and additional resources:**

1Clemmons, A.W., J. Timbrook, J.C. Herron, and A.J. Crowe. 2020. BioSkills guide: Development and national validation of a tool for interpreting the *Vision and Change* core competencies. *Life Sciences Education* 19(4): 1-19. <https://doi.org/10.1187/cbe.19-11-0259>

2Schell, C.J, J.K Young, E.V. Lonsdorf, R.M. Santymire, and J.M. Mateo. 2018. Parental habituation to human disturbance over time reduces fear of humans in coyote offspring. *Ecology and Evolution* 8: 12965-12980. [<https://doi.org/10.1002/ece3.4741>](https://doi.org/10.1002/ece3.4741)

3Schinske, J.N., H. Perkins, A. Snyder, and M. Wyer. 2016. Scientist spotlight homework assignments shift students’ stereotypes of scientists and enhance science identity in a diverse introductory science class. *Life Sciences Education* 15(3):1-18. 2017 online publication. <https://doi.org/10.1187/cbe.16-01-0002>

News Article Links:

<https://www.tacoma.uw.edu/news/article/urban-ecologistsuperhero>

<https://magazine.washington.edu/feature/ecologist-christopher-schell-sees-himself-in-the-science/>

Dr. Schell’s Lab Website:

<http://faculty.washington.edu/cjschell/wordpress/>