ESSAY

IBI* SERIES WINNER

Exploring the Evolution of Human Mate Preference

The Evolution of Human Mate Preference, an IBI prize–winning module, uses inquiry to elucidate strategies used by males and females to maximize reproductive fitness.

Valerie Foster†

A colleague once told me that, during lectures, 60% of the time college students are thinking about sex. Although attempts to find the source of this statistic resulted in its description as "apocryphal" (*1*), most educators will agree that maintaining student interest during lecture is challenging, and dedicated readers of this series are well aware of the benefits of replacing lecture with inquiry-based instruction (*2*). Asking college students to design experiments to investigate human analyzing data, and communicating ideas in a scientific paper or poster. Although some may argue that the development of these skills should begin at the upper division or graduate levels, lower-division students, when given frequent formative assessment and appropriate scaffolding (*2*), are quite successful with this module.

The evolution of human mate preference is an inherently ill-structured problem and, as such, is well suited for a problem-based learning approach (*3*). Mate preference in strategies that male and female animals use to maximize their lifetime reproductive fitness (*4*). Together, we have an uncensored brainstorming session on the differences in mate preferences between men and women.

After reading about sexual selection in their textbook and taking a basic knowledge quiz, students are assigned a primary research article on human mate preference to read. Although any paper of interest will work, Wedekind *et al*. (*5*) is often used because the paper is short and demonstrates

Pasadena City College students investigate a hypothesis. Biology majors use creative methods to evaluate the premise that male vocal pitch affects visual preferences of females (pictured clockwise from left: Catherine Velasco, Ashly Ho, Anthony Chen, and Brady Hu).

Fellow students serve as test subjects. James Trinh and his group (not pictured) are interested in determining if females place more value on visual or personality traits (pictured clockwise from left: Isis Janilkarn-Urena, Amanda Lopez, Sharon Gautama, and James Trinh).

mate preference engages them in the process of science by appealing to their natural interest in the subject. The Evolution of Human Mate Preference module has been used in a lower-division majors' biology course at a community college. This multiday module gives students experience with researching the primary literature, formulating a testable hypothesis, conducting an experiment, humans varies substantially with respect to type of trait preferred (e.g., visual, auditory, olfactory, or personality), the interaction between traits, age, time in ovulation cycle, and gender. Furthermore, it is complicated by our advanced cognitive abilities and cultural influences. Students have no difficulty finding a hypothesis of interest see the photos.

This module is taught after students have been introduced to natural selection and other types of microevolutionary mechanisms. Additional interest in the topic is generated by showing videos that contrast intersexual and intrasexual selection and conducting a discussion about the different an evolutionary benefit of olfactory preference. Because students will be designing their own experiment and writing a paper for the summative assessment, I ask them questions about the scientific process used by the authors and the general format of a primary research article. Students answer these questions as they read the article and we discuss them together.

During class, students conduct their own search of the primary literature to develop a hypothesis of interest and to design an experiment to test it. Although students work in groups of three to four for this module, they must turn in individual proposals

†Natural Sciences Division, Pasadena City College, 1570 East Colorado Boulevard, Pasadena, CA 91106, USA. E-mail: vsfoster@pasadena.edu

*IBI, *Science* Prize for Inquiry-Based Instruction; www.sciencemag.org/site/feature/data/prizes/inquiry/.

CREDITS: VALERIE FOSTER

Published by AAAS

(see supplementary materials). It has been my experience that the quality of the proposals predicts how students will progress through the rest of the module, which will be important for anticipating issues of classroom management. For example, students who choose an interesting hypothesis and follow the directions on the proposal form usually need minimal assistance during later stages. If students with similar needs are grouped together, class time can be used more efficiently because groups that are farther behind in their inquiry will usually need consultation after more independent groups have had their consultations with the instructor.

Student groups must agree on a hypothesis and experimental design (most use surveys, although any method that can be done in a safe and timely manner is acceptable); they can decide to use one person's idea, combine ideas, or take a completely new direction. A few examples of hypotheses students have chosen include males prefer demure over assertive females, female preference for visual traits in males is augmented by low vocal pitch, and females prefer males whose occupations involve risky, but altruistic, behavior. Pilot studies are conducted with a small sample size (usually n = 30) so that students can evaluate the efficacy of their design and make adjustments before launching into the final experiment (n = 100). At this step of the module, many students cannot agree on methodology or identify flaws in their design. During the pilot, they may decide to compare two experimental approaches in order to decide which is best to use for the final experiment. Instructors should emphasize that trial and error are natural components of the scientific process.

Before students begin to analyze their data, an Excel workshop is given to illustrate the basic use of a spreadsheet, graphs, and descriptive statistics so that students are able to make sense of a large data set and to communicate their results in a clear manner. Most of the groups understand how they will use the data to evaluate their hypotheses, but some will need help with unexpected results. Instructors need to reassure students that it is acceptable if results do not support the hypothesis, but stress that they should not make excuses in the discussion section of the paper. Rather, they need to explore alternative explanations. Although students are encouraged to collaborate during all steps, including data analysis, writing the paper should be an individual effort.

Frequent formative assessment allows for appropriate scaffolding throughout any problem-based learning activity and is imperative to its success. It is easy for students to feel lost and veer in the wrong direction. Regular communication from the instructor minimizes frustration with the open-ended nature of the problem-based learning process and allows for student-specific guidance in a timely manner (*6*). In this module, formative assessment happens mostly through instructor consultation during the individual literature research and proposal phase, the development of the small group pilot study, evaluation of the pilot results, and final data analysis. Most students will have specific questions and feel comfortable engaging with the instructor, but instructors should make a point to approach students who tend to be shy or may have difficulty grasping new concepts and to ask them questions about their process. Peer critiques can be incorporated when students share their pilot ideas or after writing a first draft of the paper. Metacognitive questions are useful at any stage during or after the module (see supplementary materials). If many students are having issues understanding the same aspect of the project, a mini-lecture or discussion may be appropriate.

Learning challenges can crop up at each stage of this module. Regarding literature searches, students vary in their ability to use effective keywords and may need guidance to choose those that lead to manageable results. In addition, students may need assistance with the jargon used in the sexual selection literature. It is difficult for students to develop a novel hypothesis (see supplementary materials for suggestions). Encouraging them to be creative and prohibiting the replication of published methodology develops their critical thinking skills. Students also need assistance on how to use the literature to support their ideas. I often ask students to think of their hypothesis as a position and the literature as support. Additionally, the experimental design proposed by students might not test their hypothesis adequately. In this case it is advisable to ask students leading questions so that they can identify and solve their own issues.

This module can be modified for adoption in courses such as nonmajors' biology, upper-division evolution, or anthropology. A nonmajors' course usually requires a more guided process with less emphasis on being able to communicate scientifically. Testing a single hypothesis as a class and analyzing the results together actively engages students in the topic of evolution and teaches them critical thinking skills. For an upper-division course, a statistical analysis may be required, and in an anthropology course, a debate may be conducted about the impact of evolutionary versus cultural influences on human mate preference. Application of this module to large lecture sections will be challenging for a single instructor. To provide adequate consultation, the class may have to be split into smaller sections of 30 students. Online interactions could be used if limited class time precludes quality consultation. Finally, the summative assessment can be a group scientific poster instead of an individual paper.

About the author

CREDIT: GIL GOODY

Valerie Foster is an associate professor at Pasadena City College where she primarily teaches majors' biology. She earned her Ph.D. at the University of California, Irvine, studying the evolution of parental care and sexual selection in zebra finches. Her interest in problem-based learning began as a teaching assistant in graduate school and developed over the years with the support of her colleagues and dean at Pasadena City College.

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Acknowledgments: I thank my Dean, D. Douglass, for his moral and financial support; R. DiFiori for many creative discussions; and several other Pasadena City College faculty for giving me new perspectives during collaborative teaching moments. I also appreciate the early pedagogical opportunities that D. Gallow and R. Berkelhamer provided me at University of California at Irvine.

Supplementary Materials
www.sciencemag.org/content/342/6162/1060/suppl/DC1

10.1126/science.1230005