# Using Student-generated Press Releases in a Vertebrate Physiology Course to Enhance Scientific Communication Skills

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**Abstract**: This article describes an activity designed to hone students' lay communication skills. After carefully analyzing journal articles that highlight specific aspects of vertebrate physiology, students generate "press releases" to summarize experimental results and suggest potential applications of the research. By producing succinct, jargon-free summaries of current research, along with creative connections between the research and potential real-world applications, students develop skills that allow them to communicate more effectively with the general public.

**Key words**: Press releases, communication skills, primary literature

## Introduction

Davis & Elkins College (D&E) is a small, private liberal arts college that emphasizes small class sizes and strong faculty-student interactions. In the Department of Biology and Environmental Science, students are introduced to the critical analysis of primary scientific literature as early as the sophomore year, and the importance of data interpretation is stressed throughout the curriculum. By the end of the senior year, we expect our majors to be able to interpret scientific data and assess the merit of published research according to evidence presented.

While the ability to analyze primary literature is critical, it may not be sufficient to prepare students for interactions with the lay public. According to Millar and Osborne (1998), one of the necessary outcomes of formal science education is the ability to "understand, and respond critically to, media reports of issues with a science component." Misconceptions regarding vaccinations, genetically modified organisms, and climate change abound. Scientists, current and future, need to address these misconceptions. What can be done to reduce the epistemic distance between scientists and the public? The answer may be communication. Scientists need to communicate information to non-scientists in a way that is understandable, but not condescending.

Vertebrate Physiology is an elective course for biology majors at D&E. The course surveys physiological mechanisms common to all vertebrate animals and introduces functional adaptations essential to each vertebrate class. The course is divided into five sections: respiration, metabolism, temperature regulation, osmotic regulation, and biomechanics. The laboratory portion of the course incorporates analysis of current research articles from the primary literature, typically one paper per section. In recent years, in addition to standard analysis of research data, I have required students to generate "press releases" that summarize experimental results for the general public. The press release is more than just a filtered abstract. It is meant to spark interest in readers, to inform readers of recent scientific efforts, and to demonstrate how the research might potentially affect readers. Generation of a good press release requires some creativity, distinct from standard scientific writing.

## Assignment

The assignment begins with the formal analysis of a journal article, using very specific guidelines (Table 1). Subsequently, students are instructed to generate a jargon-free summary of the paper that would be appropriate for non-scientists. They are then tasked with making that summary appealing to the general public by turning it into a short press release that includes potential real world applications of the published research. Press releases are read aloud in class, and students collectively decide which one(s) would most effectively engage a non-scientific audience. See Table 2 for an example of an effective press release.

In 2015 and 2018, the last two times I taught the course, I used the same five research articles to highlight the five distinct physiological sections. The respiration paper specifically dealt with pulmonary gas exchange in foxhounds after high-altitude residence during maturation (McDonough et al., 2006). Blood volume, lung function at rest, and lung function during exercise were measured, and the authors concluded that short exposure to high-altitude during maturation improves long-term lung function into adulthood. In their press releases, many students linked the research outcomes to potential impacts on human athletic training, including the dominance of Kenyan distance runners and the placement of the U.S. Olympic Training Center in Colorado Springs, CO.

The metabolism paper described the effect of high incubation temperatures on energy metabolism in softshell turtle embryos (Sun et al., 2015). The

| Component | Description |
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| **Citation** | Author's last names and first initials, year of publication, title of article, name of journal, volume number, issue number, first-last page numbers. |
| **Knowledge Gap** | What biological question does the research address? In other words, what was known and unknown prior to this research? What is the significance of the current study? This information is generally found in the Introduction. |
| **Overall hypothesis** | A statement of explanation regarding the research question. A hypothesis may not be clearly stated. It may have to be inferred based on the procedures used to address the research question. |
| **Prediction** | An "If…, then…" statement. If the hypothesis is supported, what results are expected? |
| **Methods** | What was measured or determined? Summarize the approach in your own words. |
| **Results** | What new information was produced? Summarize the results in your own words. |
| **Conclusion** | What do the authors make of the data? Are their conclusions valid? Do the data support the hypothesis? Is there any other possible interpretation? |
| **Future studies** | A good paper may generate more questions than it answers. What is the next question researchers in the field should address? |

**Table 1**. Instructions for analyzing journal articles (based on an instrument created by Dr. Catherine Gardiner, University of Northern Colorado).

authors isolated mitochondria and assayed metabolic enzyme activity, concluding that embryos can adjust mitochondrial respiration and enzyme activity in response to developmental temperature. Several student press releases considered the impact of global warming on turtle populations, while others focused on potential conservation efforts in zoos and wildlife refuges.

The temperature regulation study investigated muscle oxygen consumption at low temperatures in frogs of the genus Xenopus (Seebacher et al., 2014). After isolated muscle mechanics and oxygen consumption were analyzed, it was concluded that the metabolic cost of muscle performance increases as temperature decreases. Most students immediately saw the application to human athletic performance. They focused on the benefits of warming up muscles prior to competition, especially in cold weather.

The osmotic regulation article addressed the adrenocortical stress responses of invasive cane toads in a desert environment (Jessop et al., 2013). Researchers recorded the effects of hormone manipulation on the toads' stress responses, dehydration levels, and survival rates. Ultimately, they

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| With global warming on the rise, it is natural to assume that some species are being negatively impacted. Wei-Guo Du and colleagues studied turtle eggs incubated at low, medium, and high temperatures. They found that eggs incubated at higher temperatures were better at maximizing oxygen intake and efficiently using it to make energy. As the temperature increased, so did the eggs' metabolic rates. These results suggest that turtle embryos incubated at higher temperatures may actually have an advantage. However, the study also indicated that hatchling turtles that were acclimated to lower temperatures had a more efficient metabolism than those acclimated to higher temperatures. While global warming may not adversely affect turtles at the embryonic stage, it could still produce metabolic consequences after they leave the comfort of their eggshells. |
| Before competition, athletes are advised to take time to warm up their muscles, especially in colder conditions. Most athletes know that it helps to prevent a pulled muscle, but they may not know that it can actually improve the energy efficiency of their muscles. Lower temperatures increase the tension in muscles, making it more difficult for contraction. Seebacher and colleagues studied the relationship between temperature and muscle power in frogs of the genus *Xenopus*. They measured speed, muscle contraction/relaxation time, oxygen consumption, and power generated. They then used the data to calculate the energetic cost of work at cold and warm temperatures. They found that the total cost to perform the same amount of work is much higher at colder temperatures than at warmer temperatures. Frogs at lower temperatures required more oxygen, generated less power, and exhibited lower speeds. Athletes could experience similar results if they do not properly warm up their muscles prior to competition in cold weather. |
| Malaria is a life-threatening disease that is carried by mosquito vectors in certain hot climates, like those found in sub-Saharan Africa. One way to decrease the number of malaria infections is to decrease the vector population. This might be done by introducing an invasive species of mosquito predator, like frogs or toads. However, introducing a species to a new environment may fail if the species is unable to adapt. Amphibians can be susceptible to desiccation in hot environments. A study conducted by Tim Jessop and his colleagues demonstrated that cane toads (*Rhinella marina*) have adapted a mechanism to reduce water loss and overheating in the hot-dry climate of Australia. Although the exact pathway is still unclear, the researchers found that these toads have regulated their stress response hormones in a way to prevent desiccation and overheating in the harsh climate. The experimental groups of toads, which had their stress hormones either upregulated or downregulated, were far less successful than the unaltered toads. Since these toads have begun to adapt to the hotter climates, they could prove to be an effective new predator for malaria spreading mosquitos. |

**Table 2.** Press release examples.

determined that adrenocortical hormones reduce evaporative water loss and increase survival. Some students saw an opportunity to combat malaria in sub-Saharan Africa by dispatching an army of dehydration-resistant cane toads to prey on mosquito vectors. While the introduction of an invasive species can potentially be disastrous, it suggests that students were thinking creatively.

Finally, the biomechanics study examined the potential connection between incline running in galliform birds and the evolution of flight (Dial, 2003). Adult birds, fully capable of aerial flight, employed wing-assisted incline running to reach elevated refuges in both natural and laboratory settings. The author indicated that the specific angle of the wing-stroke generated aerodynamic forces oriented toward the substrate to enhance hindlimb traction. Students gravitated to the notion that incline running may have been practiced by feathered dinosaurs, an idea suggested by the author, leading to the gradual evolution of flight in birds. A few students suggested clever applications for robotics, including a winged window-washing robot, based on the aerodynamic and inertial forces associated with the wing-stroke cycle.

The Vertebrate Physiology course historically has a small number of students, usually fewer than 10. The last three times I taught the course, in 2012, 2015, and 2018, I conducted an informal survey of students to assess the value of the press release activity. Of the 21 total responses I received, 19 were very positive, often describing the activity as being "fun," "interesting," or "a great way to keep us thinking about physiology" (Table 3). The only two negative comments came in 2012, when some of the research articles I assigned to illustrate physiological adaptations involved the use of human subjects. The dissenters were pre-veterinary students who indicated that they had signed up to focus on non-human vertebrates. It was a good point. We have a separate course in Human Physiology.

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| "I enjoyed the press release exercises. They really helped me understand the relevance of the research." |
| "Writing press releases forced me to think about the potential impact that scientific research can have." |
| "Research articles can be difficult to read and comprehend. Considering the practical aspects of the work makes it seem much more interesting and relevant." |
| "Reading the research papers demonstrated to me the type of work being done in the field of animal physiology. Writing the press releases allowed me to consider the potential applications of the work." |
| "Writing for the general public is much more fun than writing for lab reports. It's also a great way to keep us thinking about physiology and the impact it has on everyday life." |

**Table 3.** Comments from students.

We remain committed to our emphasis on primary literature in the department. The ability to dissect a journal article, interpret its results, and assess its merit, is an absolute necessity for biology graduates. However, we are also committed to improving our students' communication skills. We want them to be able to communicate with the general public, as well as the scientific community. Vertebrate Physiology students have demonstrated that they can generate succinct, jargon-free summaries of current research. Furthermore, due to the creative connections they make between current research and potential applications, their press releases are interesting, insightful, and relevant to lay readers.

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