Undergraduate teaching and learning in animal breeding and genetics

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Summary

Animal breeding and genetics is an essential component of undergraduate animal sciences curricula. Departments of animal science or agriculture often have few, if any, faculty trained in animal breeding. Thus, developing and maintaining current curricular materials is an overwhelming task for instructors. We propose to organize an international consortium of undergraduate animal breeding and genetics instructors. Instructors of undergraduate animal breeding and genetics courses in animal science and agriculture departments throughout the world would benefit from collaborative interactions, and discussions of curricular resource needs. Such interactions would facilitate defining core concepts and learning objectives that should be common to all students of animal breeding and genetics, as well as development of shared resources. Creation of a consortium for animal breeding and genetics instructors would allow for innovative curricular development, improvements in course delivery and assessment, and ultimately improved rates of achieving student learner outcomes in animal breeding and genetics courses throughout the world. The development of a consensus-driven curriculum would better prepare animal breeding and genetics students for career positions in industry as well as entry into animal breeding and genetics graduate programs.

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Introduction

The undergraduate animal science curriculum in animal sciences departments throughout the world includes courses in animal breeding and genetics, and thousands of students take such courses every year. In most animal science departments at land-grant universities in the USA, animal breeding and genetics is one of the smallest discipline groups. In many institutions, faculty positions in animal breeding are left un-filled when senior faculty retire. In fact, many universities have only one faculty member trained in animal breeding. Many non-land-grant four-year institutions with agriculture or animal science programs have animal breeding and genetics courses taught by faculty with no training in animal breeding and genetics. Faculty with limited knowledge of animal breeding or no close colleagues at their institutions have no organized and credible set of resources available to assist them in planning and teaching their classes. Furthermore, even when a faculty member is trained in animal breeding, they face a daunting task to develop course materials.
Enrollments in Animal Science departments are increasing and demographics of students are changing (Buchanan, 2008; Lyvers-Peffer, 2011). In addition, Brit et al. (2008) described a vision for animal science departments of the future and concluded that departments will share more resources across state and national boundaries, and duplication of efforts will be reduced. Time demands on faculty continue to increase. Many faculty teaching animal breeding and genetics have expressed their frustration at being the only trained animal breeders in their departments. The lack of opportunity for collaboration is very difficult (especially for younger faculty) not only in developing a research program, but also in teaching required undergraduate courses. By their nature, genetics and animal breeding are very quantitative subjects, and many students struggle with mastering the concepts. At many institutions, young faculty have no teaching mentors to assist them in learning how to help students learn these difficult subjects. Many smaller four-year universities have someone trained in nutrition or physiology teaching the animal breeding course, and it is even more challenging for these instructors to develop and deliver material that helps students understand the topics. Regardless of a faculty member’s background training or the number of faculty within a department with animal breeding expertise, whenever a faculty member begins teaching a course for the first time, there is a lag in developing effective materials. It typically takes an individual several years to establish their course, a time period during which dozens or hundreds of students will be enrolled in their classes. Similarly, even for experienced instructors, there is an ongoing challenge to keep course materials and teaching approaches current. This is especially true in a rapidly evolving field such as animal breeding and genetics, where new technologies such as genomically-enhanced breeding values and sexed semen are continually being developed and adopted.

Animal Breeding and Genetics Instructor Consortium

We propose to organize an international consortium of undergraduate animal breeding and genetics instructors. Instructors of undergraduate animal breeding and genetics courses in animal science and agriculture departments throughout the world would benefit from collaborative interactions, and discussions of curricular resource needs. Such interactions would facilitate defining core concepts and learning objectives that should be common to all students of animal breeding and genetics, as well as development of shared resources, incorporating a wide variety of materials and flexibility to accommodate different instructional models. Examples of curricular materials include but are not limited to: modules on specific species or topics, mini-lectures from academic or industry scientists, topic-based slide sets, exercises/problem sets (for instructor download and/or on-line for students), lists of on-line references such as Extension/industry publications, links to resources such as selection simulation software, and an instructor discussion listserv and/or blog page. In addition, an on-line discussion forum would facilitate sharing of ideas for such things as strategies for large class sizes, or methods for assessing student achievement.

The consortium would provide tools for instructors who are newly appointed to teach animal breeding and genetics course(s) and must develop materials, as well as experienced instructors desiring updated information and new approaches to incorporate into their courses. In addition, the effort would significantly benefit faculty who have little training in the discipline or no teaching mentors at their own institutions. Genetics and breeding is a discipline that many students find very challenging, so creating teaching tools has the potential to impact literally thousands of students per year at all kinds of institutions across the world. An additional benefit
might be that a better experience in undergraduate animal breeding could encourage an increased number of high achieving undergraduate students to be interested in pursuing advanced degrees in animal breeding and genetics, and/or to pursue employment opportunities in this rapidly advancing field.

To gauge interest among animal breeding and genetics faculty in gathering to discuss the future of undergraduate animal breeding education, we reached out to the animal breeding community through the Animal Genetics Discussion Group. Within just a few days, a total of 18 faculty responded that they would be interested in attending a meeting on this topic. These faculty represented a diverse set of institutions, from large land-grant universities to small colleges primarily dedicated to undergraduate education. Interest extended beyond US borders; faculty from Canada, Europe, and Africa also expressed interest in meeting to discuss undergraduate animal breeding education. This enthusiastic response provides evidence for the widespread need for collaboration and shared curricular materials among animal breeding and genetics instructors.

**Conclusion**

The quantitative nature of animal breeding and genetics courses presents a unique challenge to both the instructors trying to find an effective way to convey the information, and the students trying to master the subject. Creation of a consortium for animal breeding and genetics instructors would allow for innovative curricular development, improvements in course delivery and assessment, and ultimately improved rates of achieving student learner outcomes in animal breeding and genetics courses throughout the world. For the future success of our discipline, it is essential that we engage talented young students, and this is only possible if they are exposed to animal breeding and genetics early in their education, through interaction with enthusiastic instructors. The development of a consensus-driven curriculum would better prepare animal breeding and genetics students for career positions in industry as well as entry into animal breeding and genetics graduate programs.

**List of References**

