

# Best Practices for Teaching Equine Reproduction in an Online Learning Environment: A Delphi Study



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## Abstract

The purpose of this study was to describe the best practices for teaching equine reproduction in an online environment. A Delphi method was used to reach a three-round consensus of suggested best practices employed for teaching lecture- and laboratory-type topics, as well as recommended assessment techniques. The expert panel was formed by an exhaustive worldwide search for instructors currently teaching an online equine reproduction course. Consensus resulted in the following best practices for teaching equine reproduction lecture-type topics: assignments, multiple exams over the course of the semester, lectures that mirror the textbook in logical order, PowerPoint presentations with pictures, quizzes, summary notes, videos, and vocabulary lists. For laboratory-type topics, local area work experience was the sole best practice result. Best practices for student assessment were quizzes and vocabulary lists. Practitioner recommendations centered on assisting faculty in becoming stronger online instructors. Some recommendations included participating in professional development workshops, becoming involved in communities of practices, and exploring other disciplines' successful methods of online instruction. Research recommendations included repetitions of this study involving a larger participant population and a broadened examination of best practices for all laboratory-based animal science disciplines.

## Introduction

New technologies and methods are continually discovered and implemented in all areas of animal science; from new feed technologies to new products and practices related to livestock production and reproduction. One means of successfully sharing these innovations are through classes and seminars offered at colleges and universities. These classes are important to the advancement of the horse owner and breeder population's knowledge and creation of new ideas. There is a limitation, however, in that a large part of the population may not be able to access this new information based on geographical location or time availability. Regardless of the equine-based subject matter topic, information should be accessible for the benefit of every student.

Instructors worldwide recognized this need by shifting the learning paradigm from traditionally delivered courses to online instruction (Schmidt and Miller, 2005). As early as 1999, research in the animal science genre indicated an increase in popularity, and need, for computer-based educational programs as a means of educating students and the public (Barnes et al., 1999). However, concerns with courses that are traditionally offered as "lecture with laboratory" in a face-to-face format, such as is sometimes the case in animal science, arise when discussions turn to online delivery options. Quality of instruction, limitations on learning, and limitations with student interaction are just a few of the criticisms identified by faculty with

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teaching post-secondary science-based courses in an online environment (Miller, 2008). Miller identified and debunked six myths surrounding delivery of science-based online courses, thus leaving little excuse for the supposed obstacles.

Why should animal science faculty be concerned with making subject matter more widely available in an online environment? In 1998, there were more than one million horses reported in Texas, which represented 15% of all horses nationwide (Gibbs et al., 1998) and, as an effect of the 109th Congress' American Horse Slaughter Prevention Act (2006), these numbers have increased greatly in the current decade (Durfee, 2009). People own horses for many purposes including recreational use, income, transportation, and pets (Endenburg, 2010). By making equine science information more available to the public, increased awareness and knowledge may be distributed to the growing population of equine owners, helping them make educated decisions about what is best for each horse. These decisions may include daily feed requirements for a horse, safe and appropriate methods of equine reproduction, limitations and restrictions on a horse through evaluation of conformation, as well as posing any other essential inquiries concerning the health of the equine industry.

Currently, new technologies are presented via seminars, symposia, research journals, and popular publications developed and implemented by professionals and universities. Texas A&M University (TAMU), in College Station, TX, like many other universities across the country, annually offers a plethora of workshops designed to meet specific needs regarding the equine industry (TAMU, n.d.). Courses are designed to increase education for students of all ages and disciplines; however, these methods are limited as they are offered only once or twice each year and in specific locations. Limited delivery relegates courses as geographically inaccessible to many. Similarly, potential participant concerns surrounding the cost of attending a seminar, publicity and awareness of the seminar, and even determining interest in attending all pose problems. One alternative, printed material such as magazines and journals eliminate the travel and costs of seminars and symposiums; however, topics are limited by publication space and one-way, passive delivery methods.

Students continue to desire online course offerings in all disciplines, so colleges and universities strive to meet such demand (Song et al., 2003). Computer-based courses in animal science are still a relatively new, upcoming technology that may be a contributing factor in reaching a population less capable of

attending seminars or symposia, yet who prefer more active means of learning than research journals (Zirkle, 2003).

Bing et al. (2011) focused on identified challenges when designing an online veterinary anatomy class. Veterinary anatomy is a key element in all courses of animal science and typically requires long hours in the laboratory combined with hands on evaluation. The purpose of this study was to determine if animal anatomy could be taught through a distance education style as effectively as a face-to-face laboratory. Following a pretest-posttest design, results indicated no significant difference in the test scores between the distance education students and the face-to-face students. These results support the conclusion that animal science material can be taught effectively in a distance education format (Bing et al., 2011).

Equine science courses traditionally require extensive hands on experience. There are few programs offering online resources for information about horses. The development of eXtension HorseQuest in 2010 began the discovery of ways to offer equine information online (Greene et al., 2010). eXtensions HorseQuest was developed to engage the expertise of equine specialists at the national level, and to provide continuous trusted information nationwide (2010). Programs such as this are leading the online charge in bringing equine education to the masses.

Equine reproduction is the basis of all equine production (Samper, 2009). There are many methods and technologies developed to make the reproduction process as efficient as possible. Equine reproduction education is important for those who desire to operate a successful breeding program business, as well as for those seeking to breed a backyard horse. When horse owners and producers have the most current and appropriate knowledge and skills, equine reproduction improves because those producers are making better and more informed decisions (Charles Sturt University, n. d.). Today's educational professionals must not only make this information available, but they must also administer it in a format understood by the student. As instructors in animal science, generally, and equine reproduction, specifically, strive to meet the needs of a changing demographic audience, the problem remains that instructors may lack perspective beyond traditional delivery methods to assist students in acquiring both the knowledge and the skills necessary for success, while still delivering from a distance.

The purpose of this study was to identify the best practices for teaching equine reproduction in an online environment. The objectives specific to this study were to:

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1. Describe the demographics of faculty currently teaching equine reproduction in an online environment.
2. Compile the best practices for teaching equine reproduction lecture-type topics in an online environment.
3. Compile the best practices for teaching equine reproduction laboratory-type topics in an online environment.
4. Compile the best practices for student assessment in an online equine reproduction class.

## Methods

To meet the purpose and objectives of this study, a Delphi method was employed and administered with the assistance of Dillman's Tailored Design Method (2000) for administering online questionnaires. The Delphi method was designed for a controlled debate, independent of personalities, and maintained anonymity (Gordon, 1994). Experts in the inquired discipline are identified and asked to participate in a number of sequential questionnaires. Each subsequent questionnaire assembles upon the response of the preceding round (Henson, 1997). Opinions are synthesized at equal weight by researchers then distributed to the expert panel for further analysis and feedback until consensus is reached.

To determine the panel of experts for this study, identification of all programs offering courses in equine reproduction was first necessary. An exhaustive search of accredited colleges and universities worldwide offering animal science programs (N=102) was completed through a web search (CollegeBoard, n. d.; National Center for Education Statistics, n. d.). From that list, the search was further narrowed to include equine science specializations. Fifteen individual postsecondary institution websites were then searched and departments whose webpages indicated equine science coursework offerings received electronic communication inquiring about equine reproduction online courses. Eleven institutions internationally responded that an online equine reproduction class was part of the institution's curriculum and provided current instructor names and contact information. Those instructors, therefore, comprised the initial panel of experts for this study. Approval was sought from Tarleton State University's Institutional Review Board to conduct the study. The protocol was deemed exempt from the approval process.

The identified equine instructors teaching online equine reproduction were then asked to participate in the inquiry regarding the best practices for teaching equine reproduction in an online environment. Eight

current professionals responded with agreement to participate as an expert panelist in the study. Initial contact through electronic email followed via the guidance of Dillman's Mail and Internet Survey Tailored Design Method (2000). Using the Tarleton State University's Qualtrics Survey Software, the panel of eight experts was asked to respond to the following three open-ended questions, as well as demographic questions:

1. Describe the best instructional practices you utilize for teaching traditionally lecture-type topics in online equine reproduction courses. Describe as many practices as you deem appropriate.
2. Describe the best instructional practices you utilize for teaching laboratory-type topics in online equine reproduction courses. Describe as many practices as you deem appropriate.
3. Describe the best assessment practices you utilize for assessing student performance in online equine reproduction courses. Describe as many practices as you deem appropriate.

As described by Gordon (1994), the number of respondents is typically small, so Delphi studies are not intended to construct statistically significant results. Four of the eight instructors chose to complete the instrument, providing for a 50% response rate. Following the distribution, reminders were sent six, ten, and 14 days after the initial participation request. As recommended by Dillman, researchers should send as many as three requests for participants. However, in this study four requests were sent as a means to exhaust all efforts to gain participation. As noted by Bardecki (1984), there is usually a steady decrease of participants following the initial survey round and 44%-55% was deemed acceptable. This study maintained 100% participation throughout the study.

From the responses of round one, a list was comprised of all practices submitted by respondents. The second questionnaire was designed with a Likert-type scale, rating each practice from 1 to 4 where 1 = strongly disagree and 4 = strongly agree. Round two was distributed for consideration and review. Experts were also allowed to list any additional methods or ideas deemed appropriate. In review of the data, items yielding a mean of 3.25 or greater, with no disagreeing scores by respondents, were selected for convergence in the final round. Traditionally, a mean of 3.5 or greater is selected (Melnick, 1999; Trexler and Parr, 2006; West, 1988); however, for this panel comprised of only four participants, researchers chose items yielding a mean of 3.25 or greater, with no disagreeing scores (one or two) by the respondents to be included in the final round.

The final round sought convergence of opinions concerning the best practices for teaching equine reproduction. The panel members were asked to indicate simple agreement or disagreement with each of the 11 statements. As noted from McCampbell and Stewart (1992), Delphi studies usually reach a consensus in the final round.

**Results**

With respect to the demographic questions, the expert panel consisted of four full-time faculty members across a diverse age group. One respondent (25%) was in the 46-55 range, two (50%) were in the 56-65 range, and one (25%) was in the 66 and older range. Respondents indicated teaching experience at the post-secondary level for 10 to 30 or more years, where 50% had no teacher certification background, 50% previously taught secondary courses, and 25% earned teaching certification for the secondary level.

Delivery platforms previously taught by the instructors, and respondents could respond to more than one choice, were traditional face-to-face courses (75%), strictly online courses (75%), and blended (face-to-face with online components) courses (100%). Respondents were also asked to indicate their faculty assignments regarding teaching and/or research appointments. Of the choices, two respondents were assigned to teaching only, one had an equal division between teaching and research, and the final respondent was assigned to a 60% teaching and 40% research position. Courses taught annually ranged from two respondents who taught three online courses (50%) and two who taught eight online courses with intent across all respondents to increase that number in subsequent semesters. The number of students enrolled in the respondents' online classes ranged from 45 to more than 100 students annually.

To address objectives two, three, and four, three open-ended questions were sent to the eight panelists in the first round. Four respondents replied in the first round and sustained participation in the study throughout all three rounds. Dalkey (1969) indicated a minimum of 13 usable responses required for the Delphi method; however, as only eight institutions worldwide offered equine reproduction science through online delivery, the researchers were able to maintain consistent 50% participation from initial point of contact.

An *a priori* determination was made to retain all items with a mean greater than or equal to 3.25, with no disagreeing responses, for inclusion in round three. Nine of the thirteen items from question one were retained (Table 1), one item from question two was

retained (Table 2), and two items from question three moved into round three (Table 3).

Respondents in round one returned thirteen suggested teaching methods as best practices for teaching traditional lecture-type equine reproduction topics in an online course (Table 1). Mean scores from Round 2 are also displayed in Table 1.

**Table 1. Expert Panelist Responses for Teaching Lecture-Type Topics in Equine Reproduction Online Courses**

| Lecture- Type Topic                            | Round 1 <sup>1</sup> (f) | Round 2 <sup>2</sup> (M) |
|--|--------------------------|--------------------------|
| Assignments                                    | 3                        | 3.75                     |
| Lectures that mirror textbook in logical order | 1                        | 3.75                     |
| PowerPoint                                     | 3                        | 3.75                     |
| PowerPoint with pictures                       | 2                        | 3.75                     |
| Quizzes  | 1                        | 3.5                      |
| Summary notes                                  | 2                        | 3.5                      |
| Vocabulary lists                               | 2                        | 3.5                      |
| Videos   | 2                        | 3.5                      |
| Exams (Multiple over course of semester)       | 1                        | 3.25                     |
| Assignments with strict deadlines              | 1                        | 3.25*                    |
| Required textbook                              | 1                        | 3.25*                    |
| Workbooks                                      | 1                        | 3.25*                    |
| Final exam                                     | 1                        | 3.00*                    |

Note. \*Item received at least one response of “disagree” or “strongly disagree”.  
<sup>1</sup>Round 1 in Tables 1-3 included open ended questions  
<sup>2</sup>Round 2 in Tables 1-3 included Likert-type scale responses of 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree

In examining the initial 13 methods, there was a wide range of techniques implemented between professionals. One respondent indicated that the selected methods may not be the best available, but those were the best methods about which the respondent was most familiar. This response may be an indication that equine reproduction information formatted for online use may not be currently available in a user-friendly design, as well as that equine reproduction online faculty may be better equipped if they examine other disciplines for innovative teaching techniques.

Panelists responded with four techniques considered useful for teaching traditional laboratory-type topics in an online equine reproduction course (Table 2).

**Table 2. Expert Panelist Responses for Teaching Laboratory-Type Topics in Equine Reproduction Online Courses**

| Lecture- Type Topic              | Round 1(f) | Round 2(M) |
|----------------------------------|------------|------------|
| Work Experience in local area    | 1          | 3.50       |
| Field trips                      | 1          | 3.00*      |
| PowerPoint with pictures         | 1          | 2.75*      |
| No Laboratory component included | 1          | 1.75*      |

Note. \*Item received at least one response of “disagree” or “strongly disagree”.

Three of the four members of the panel stated that, at the time of the study, a laboratory portion of the course was not offered; however, respondents opined that one would be highly valuable in online courses. PowerPoint presentations are to be considered an option, but they may eliminate hands on experiences.

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Local area work experience was the only method agreed upon by respondents for teaching laboratory-type topics. Comments indicated that field trips and work experience, while desirable, are often not feasible due to high enrollment or geographical location.

Six items were deemed appropriate for assessing student performance. These practices included online exams, video assessments, essays, online discussions, short answer, and quizzes; all items garnered a frequency of one. Only two items were carried through to the third round.

**Table 3. Expert Panelist Responses for Assessing Student Performance in Equine Reproduction Online Courses**

| Lecture- Type Topic | Round 1(f) | Round 2(M) |
|---------------------|------------|------------|
| Quizzes             | 1          | 3.50       |
| Short answer exams  | 1          | 3.25       |
| On-Line exams       | 1          | 3.25*      |
| On-Line discussions | 1          | 3.00*      |
| Essays              | 1          | 3.00*      |
| Video Assessments   | 1          | 3.00*      |

Note. \*Item received at least one response of “disagree” or “strongly disagree”.

Online discussions, essays, and video assessments all yielded a mean response of 3.00 with one additional comment added by a respondent indicating too much difficulty in setting criteria for online discussions.

The third round was developed from responses to the second round questionnaire. Using a dichotomous rating scale of yes or no, all participants were asked to provide an indication of simple agreement or disagreement with all listed items presented as the preeminent practices for teaching equine reproduction through an online environment. All four of the panel members responded to this round (100%). Consensus was reached in the third round regarding best practices of teaching and assessing equine reproduction in an online format (Table 4).

For traditional lecture-type topics, the methods that reached consensus were PowerPoint with pictures, lectures that mirror textbook in logical order, assignments, vocabulary lists, quizzes, summary

**Table 4. Best Practices for Teaching and Assessing Equine Reproduction Online Courses**

### Best practices

- Lecture-type topics
- Assignments
- Exams (multiple over course of semester)
- PowerPoint with pictures
- Quizzes
- Summary notes
- Videos
- Vocabulary lists
- Practices for laboratory type topics
- Local area work experience
- Practices for student assessment methods
- Quizzes
- Short answer essays

notes, videos, and multiple exams taken over the course of the semester. The only online method of teaching laboratory-type topics deemed adequate by all of the respondents was mandatory local area work experience; requiring students to reach out to local breeding operations as a means of gaining hands on experience with current technologies in the equine breeding industry. For assessing student progress through the duration of the course, the acceptable practices included quizzes and short answer questions. This was consistent with the earlier inclusion of multiple exams over the course of the semester.

## Discussion

The purpose of this Delphi study was to gain consensus from an informed panel of experts on the best practices for teaching and assessing students enrolled in equine reproduction in an online environment. Jones and Hunter (1996) distinguished two natures of agreement. One form would be the extent to which the participant agrees with the item of consideration, the other is the extent to which the participants are in agreement with one another. An overall consensus was achieved for the recommended practices for lecture- and laboratory-type instruction, and assessment of student progress. Four respondents listed as many practices and methods as they deemed necessary for teaching an online equine science course.

According to Bawane and Spector (2009), when determining critical roles for online faculty, being a teacher, first and foremost, is most desired. Even though the respondents in this study may be older than the assumed age of most faculty teaching online, literature indicates their experience teaching is highly valued (2009). This experience noted, however, caution should be exercised when generalizing the results of this study to the entire population of equine science instructors as exposure to and experience with technology (Rogers, 2003), willingness to adapt educational innovations (Loucks et al., 1998), and efficient engagement in online courses (Arbaugh, 2010) may not be practices reflected by this particular panel of experts.

Illustratively, panelists indicated that assignments, multiple examinations over the course of the semester, PowerPoint with pictures, quizzes, summary notes, videos, and vocabulary lists should be utilized. Inclusion by the respondents of examinations as a teaching technique was contradictory to the teaching and learning literature whereby assessment (examinations) assumes mastery of the content (Mager, 1997). So as not to hinder responses, though, examples of teaching techniques were not provided, but a follow-

up questionnaire regarding inclusion of examinations as a teaching technique may be warranted for future research.

Another contrary finding was that lectures that mirror textbook in logical order was one of the highest rated teaching methods, while a similar item indicating use of a required textbook was ranked near bottom. Instructors may be choosing to use other methods, such as personally developed notes or study guides based on multiple text or electronic sources for students to follow, instead of relying on a single textbook. Dickson et al. (2005) reported that 75% of students who completed a textbook study guide, rather than simply reading a textbook, performed significantly better on examinations than those who did not; providing support that some form of study manual is beneficial to the performance of the student.

Another unforeseen result was the lack of support for assignments with strict deadlines as it would seem strict deadlines would be important for the overall success and completion of the course. Mason and Weller (2000) implied that working in an online environment requires increased self-discipline as compared to traditional face-to-face instruction. If that is true, why was 100% agreement not reached regarding this practice? Could it be that assignments with strict due dates would require a more organized instructor, or that the assignment is considered for the students' benefit and not the teacher? Another consideration was that some online courses are self-directed and designed for the student to work at his or her individual pace.

Local area work experience was the only item to reach the required agreement for online laboratory type instruction. Miller (2008) stated that the delivery of science-based courses might be problematic as science courses offered face-to-face typically include laboratory components for hands on learning. Real life implementation of laboratory-learned techniques is put into action for everyday use. Not being able to visually and tangibly apply those techniques for practice can be considered detrimental to the learning process; however, structured laboratory-type settings may be considered impossible for distance education students. The basis for the development of courses being offered online is for people to have the opportunity to take college courses with little disruption in daily life, and giving the public access to education they would otherwise not receive based on geographical location, social status, and career (Miller 2008).

The panel unanimously disagreed with the statement that no laboratory component should be included in the course, yet had no agreement on how

that instructional component should be implemented. Some solutions may include requiring students who are not in a geographically convenient location to make self-directed field trips to local breeding operations; obliging the student to venture out to farms to observe and participate in practices that are currently implemented in breeding operations. This could also allow the students to ask questions and gain understanding of techniques. Methods implemented by Bing et al. (2011) determined that there was no significant difference in scores between students who were taught an anatomy lab through an online environment versus those who learned face-to-face. Laboratory sessions were taught through detailed video demonstrations via Blackboard Vista and Adobe Dreamweaver. Assignments and quizzes were given following the videos to assess the understanding of the videoed material. Successful formats such as these could be implemented in equine reproduction laboratory assignments.

Essays, short answer tests, and multiple choice examinations are the traditional means of assessing student performance (Kaye and Hawkrigde, 2003). In this study, short answer and quizzes were the highest rated means of assessment. Considering this was a study employing professionals in higher education, the lack of support for a final examination and multiple examinations over the course of a semester for assessing student performance in an online equine reproduction course was unexpected. Biggs' (1999) study further proffered that examinations are the most common forms of assessing student learning. Respondents in this study were favorable toward these methods; however, 100% agreement of this practice was not achieved. As faculty move toward embracing other means of teaching, this result may indicate a realization that alternative methods must be developed as a means of authentic assessment for students studying, at a distance, to be active practitioners of equine reproduction.

On-line discussions failed to achieve consensus in the third round, implying that instructors believed this was a valuable tool, but were not necessarily sure about structure and assessment. One respondent added a comment in the second round: "It is difficult to set criteria for online discussions." Through online discussions, students are required to interact with peers regarding ideas and thoughts. This forced participation is an advantage for online environments as face-to-face classes may allow some students to sit quietly, while others dominate discussion topics.

Discussions require planning and criteria prepared before hand, ultimately putting more responsibility

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on the instructor. As distance delivery software is maturing, more programs exist to make such rubrics easier to develop. Software, such as Blackboard Vista, makes interaction between students more available with chat rooms and discussion boards. Workshops offered to instruct faculty in the use of such software is key in the success of online interaction (Miller, 2008).

Video assessments and essays were ranked the lowest of the assessment practices. This begs the query: Are these methods too time consuming for the instructor? The age of the participants ranged from 45- to more than 65-years-old, indicating that these instructors may be well-practiced in chosen methods and unwilling to change teaching format. Half of the expert panel of this study had 50% research appointments, which may limit the time and effort necessitated for assessing online class involvement.

Many of the suggested teaching and assessment practices are reflective of materials and methods commonly used in a face-to-face teaching and learning environment. Several other innovative methods, such as structured groups, social media (Twitter chats), and virtual simulations (Second Life), among others, were omitted from inclusion by the panel of experts. While this may be reflective of the panelists' age, it may also result from a lack of awareness of and experience with alternative teaching methods for an online course. Networking with other professionals is critical for continued use, integration, and adaptation of any educational innovation (Hall and Hord, 1987). Teaching online courses is not exempt from that need for professional interaction.

Communities of practice are defined as "*groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly*" (Wenger et al., 2002, p. 4). Professional organizations such as the North American Colleges and Teachers of Agriculture (NACTA), and the American Association for Colleges of Teacher Education (AACTE) support the improvement of teaching at the collegiate level. Through directed communities of practice, support can be administered for college level educators. Developing programs and workshops may aid in increased understanding of methods to online instruction. Open Courseware is a program that increases the professional development between universities by sharing (Schmidt and Miller, 2005). Developed by MIT, Open Courseware allows for the sharing of information among universities for anyone who logs on to view it (Rappa, 2003). Schmidt and Miller (2005) explored the interest of universities in becoming involved in sharing information and

reported nearly 50% of participating administrators expressed interest; thus, making Open Courseware a possible link for making online instruction methods and courses more accessible.

Equine reproduction is a relatively new innovation with respect to online delivery. As offerings in this subject matter area increase, the pool of potential instructional experts will also grow. For further research, repetition of this study should be done involving a larger participant population.

Perhaps by broadening the topic studied from equine reproduction to equine science or all laboratory-based agricultural science courses, more insight may be gained. Studies across all agricultural disciplines involving a traditional laboratory component should be completed, targeting student and faculty satisfaction, as well as possible new methods of instruction.

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