Original Article

Comparison of Veterinary Student Self-Perception of Comfort and Abilities in Independent Learning with Quality of Online/Virtual Course and Student Performance

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Abstract

Background: Students expressed concern about having been forced to move toward more online or virtual learning starting in March 2020 with the coronavirus disease pandemic. Our hypotheses were the following: if a course is well designed, success in the course is not dependent on student comfort level. If a course is not well designed, student comfort level is a significant factor, and those students who are more comfortable with independent learning may outperform students who are less comfortable in courses offered virtually. **Materials and Methods:** Student performance, as demonstrated by examination scores, was compared with their comfort as independent learners and with the quality of online/virtual course offerings. Data analysis consisted of descriptive statistics and a linear mixed model. **Results:** Student performance was directly associated with comfort level, with those students who were less comfortable performing less well. Student discomfort with independent learning of online/virtual coursework could not be mitigated by increasing course quality in this study. **Conclusions:** Students may benefit from understanding what about independent learning makes them uncomfortable and directly addressing it. Instructors can do much to improve the learning experience in online courses by following published best practices. It may well be that many of the reported negatives of online learning will ease with time as students and instructors become more accustomed to independent learning paradigms.

Keywords: E-learning, independent learning, instructional design, student comfort levels, teaching and learning

Introduction

As the coronavirus disease (COVID) pandemic eases, schools have evaluated what changes in teaching required by the pandemic should be maintained in the future. One author reported better attendance at teaching sessions and better engagement of students when virtual learning was predominant.[1] However, in a study of almost 1400 veterinary students from 92 countries, 96.7% believed that COVID-19 had affected their academic performance, with 47.5% stating that they were greatly affected.[2] Common concerns described included loss of engagement and ability to maintain interest, decreased interaction with instructors and other students, lack of communication, and development of a sense of loneliness or isolation.[2]

In an attempt to determine how best to meet student learning and personal needs while building a more hybrid curriculum, a study was completed in the fall of 2020 to evaluate student comfort with independent learning and to compare that with course quality. Our hypotheses were the following: if a course is well designed, success in the course is not dependent on student comfort level. If a course is

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Table 1: Courses evaluated and online quality scores (highest possible score is 100)

Course year	Course title	Credits	Online quality score
1	Integrated Physiology	6.5	89
1	Microscopic Anatomy I	2	92
1	Preventive Medicine	4	100
1	Immunology	2	97
2	Agents of Disease II	5	91
2	Systemic Pathology	5	94
2	Clinical Pathology I	2.5	100
2	Public Health	2	91
2	Small Animal Medicine I	2	95
2	Large Animal Medicine I	2	97
3	Small Animal Surgery II and Anesthesia	3	99
3	Large Animal Surgery II	2	100
3	Veterinary Imaging II	2	93
3	Comparative Theriogenology	3	90
3	Small Animal Medicine III	5	91
3	Large Animal Medicine III	4.5	88
3	Veterinary Toxicology	2	83

not well designed, student comfort level is a significant factor and those students who are more comfortable with independent learning may outperform students who are less comfortable in courses offered virtually. The overall goal was to drive improvement in course offerings in the College of Veterinary Medicine.

Materials and Methods

This study was approved by the Institutional Review Board of the University of Minnesota (IRB protocol #00010595). Students in years 1–3 of the veterinary curriculum were solicited for voluntary participation in the study. Students were asked to complete a survey at the beginning of the fall semester about how they preferred to learn that generated a score denoting their comfort with online work [Appendix 1]. A response of "a" was scored as 1 point, "b" as 2 points, and "c" as 3 points, leading to a minimum possible score of 8, a maximum possible score of 24, with a lower score denoting greater comfort taking online courses. A second survey was completed by the same students at the end of the fall semester, asking how many online courses they had taken before entry to veterinary school, whether they had completed a centrally offered course about succeeding in online education at any point before or during the semester, their general comfort level with online coursework, and whether completing the online comfort survey changed their study habits over the semester.

A set of courses from the fall semester for years 1–3 was evaluated against a rubric to generate an online "quality" score for each course, with higher score associated with higher quality.[1] Courses included were those that were at least two credits, did not have a significant laboratory or discussion component, and were offered primarily online. The final percentage of points earned in each course was recorded for each student.

To summarize the data, means and standard deviations were used for numeric variables, and counts and percentages for categorical variables. To assess the effect of class quality on student performance, we fit a linear mixed model with class year, quality score, comfort score, and the quality/comfort interaction as fixed effects, with random effects for student and course, and random slopes for quality within students and for comfort within course. The random slopes allow for students to have different responses to course quality and for courses to have different effects depending on student comfort, and the interaction between quality and comfort allows course quality to mitigate lower student comfort level.

Results

For completion of surveys at both the beginning and end of the fall semester, 38 students participated from the class of 2022 (a response rate of 36%), 37 from the class of 2023 (35%), and 54 from the class of 2024 (51%). This pattern of response is common in our college, with the greatest response from the first-year class at the time data were collected. The percentage of respondents by gender reflected the class as a whole for all three classes. Courses that met the study criteria and associated online quality scores are shown in Table 1.

The mean (± standard deviation) student independent learning comfort score was 14.3 ± 2.3 for the class of

[1]Specific Review Standards from the QM Higher Education Rubric

Table 2: Number of online courses taken prior to veterinary training by class

Number of online courses taken prior to veterinary training	0	1–5	6–10	>10
Class of 2022	9	26	2	1
Class of 2023	4	25	6	2
Class of 2024	3	41	6	4

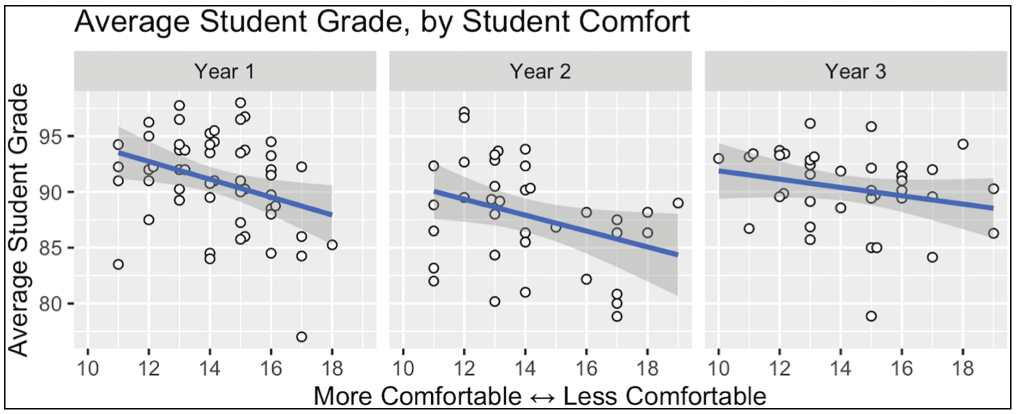

Figure 1: Student grade by online comfort score

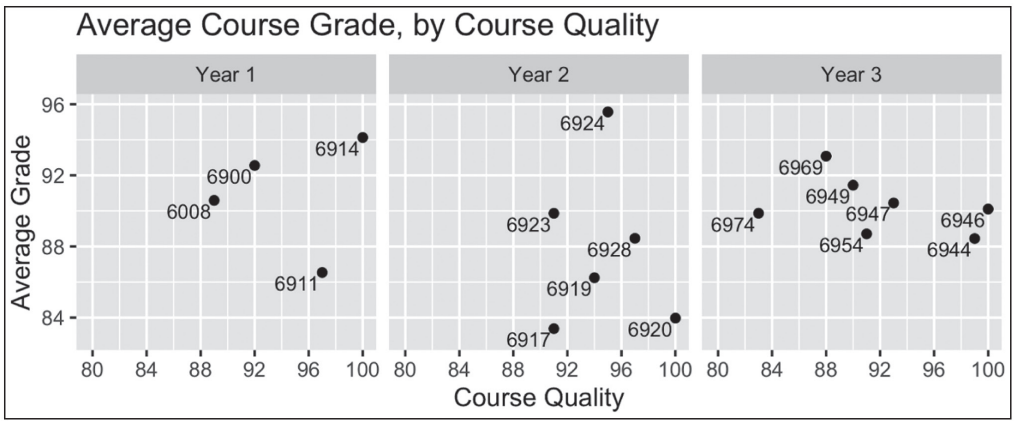

Figure 2: Average student grade by course quality score. Four digit numbers denote individual courses

2022, 14.0 ± 2.2 for the class of 2023, and 14.2 ± 1.8 for the class of 2024.

The number of online course students had taken before beginning veterinary school is shown in Table 2. Few students had completed the centrally offered course about how to succeed in online courses; two students from the class of 2022 had completed the course (5% of participants), one student from the class of 2023 (3%), and eight students from the class of 2024 (15%). Students generally reported some ambivalence about online coursework with 33.1% reporting that they felt that they were well able to master the content and keep up with the deadlines, 43.4% reporting worry about mastering the content but no concern about deadlines, 13.1% feeling well able to master the content but worried about meeting deadlines, and 6.9% worried both about mastering the content and meeting deadlines. When asked if taking the comfort survey early in the semester had altered their study habits, 81% responded that it had not, and only 4% of respondents were able to identify how completing the survey had specifically helped them focus on study skills important to the completion of online work.

Student performance was directly associated with comfort level, with those students who were less comfortable performing less well ($P = 0.004$) [Figure 1]. Each 1 point decrease in comfort was associated with a 0.6 percent age decrease in final grade.

We did not find evidence that the poorer performance of students who were less comfortable was mitigated by increasing the quality of the course offerings ($P = 0.15$ for the quality/comfort interaction) [Figure 2].

General comments from students who completed the survey were both positive and negative, with the primary

positive of online learning being the flexibility afforded by online learning (29% of respondents) and the negatives being needed for a social component of learning with peers and instructors/loneliness (32%), difficulty with the online formatting for some disciplines or instructors (12%), difficulty maintaining motivation and focus in the online environment (9%), difficulty managing the high volume of content (7%), difficulty keeping track of numerous deadlines (7%), and inability to easily separate regular life from school life when it is all happening in one's home (2%).

Discussion

Evidence from this study failed to support the hypothesis that a well-designed course will be associated with student academic success even if that student is not personally comfortable with independent learning.

Provision of virtual courses has benefits for the institution, the instructors, and the learners. The institution benefits from being able to capture students who are not physically in the same location and to spread the reputation of the institution geographically. The institution may be able to hire instructors who live well away from the brick-and-mortar campus. The use of virtual tools for learning also removes concerns about the lack of ability to teach in-person due to weather events or other happenings that may make in-person attendance unsafe. Instructors can be more flexible with their availability if they have an option to provide teaching asynchronously or to teach synchronously from a different physical location than that of their institution.

Studies vary regarding the quality of education as determined by student academic success. In general, studies show that either traditional or online instruction may permit students to excel in specific areas but that overall student performance does not vary between the two types of instruction.[3,4] Both traditional and online learning have pros and cons and which is used should be determined based on content and needs of instructors and learners. Examples include understanding the value of prerecorded lectures, which can be created and posted at any time and are readily available for student review, versus teaching by synchronous lectures using conferencing software, which permit students to see and hear the instructor's presentation, complete with facial expressions and body language, to see demonstrations, and to ask questions in real-time.[5]

The student experience with online learning in this study is consistent with that reported in the literature. Commonly reported positives for online learners are flexibility, more time for personal needs such as exercise and sleep, ready access to online materials for review, and savings in time and money when no commute is required.[2,6-9] One study reported that students in a veterinary physiology course so much expected to have some kind of online materials present that they preferentially sought out online information instead of talking to their instructor.[10] Commonly reported negatives for online learners are loss of real-time feedback and sense of community, time management, technical problems or lack of access to hardware or software.[2,7,11-14]

One of the concerns brought forward by students in this study was the amount of content expected to be mastered during the semester in question. High amount of content is a concern no matter what teaching paradigm is being used, as veterinary curricula have not increased in duration over time, whereas the amount of information has grown significantly. Online coursework may include some required sessions (e.g., synchronous lecture or Q&A sessions via conferencing software) and time for independent learning. It is vital that time for independent learning be included in the student calendar. Students generally do schoolwork during regular work hours if they are permitted to do so, but because students have varied outside commitments and self-care needs, it would be inappropriate to expect all independent student work to be completed in the evenings and on weekends if we also expect students to maintain high levels of mental, physical, and emotional well-being.[13-15]

Completing learning online requires students to demonstrate high levels of discipline, including time management and intrinsic motivation to drive engagement and learning.

Discipline is difficult for instructors or administrators to teach a student but the college can create virtual course offerings in ways that help foster discipline in learners. Examples include transparency in course design and student responsibilities; creation of a learning community through discussion forums, Q&A sessions, group work, and virtual office hours; and instructor focus on needs of individual students to the extent that is possible.

Student discomfort with independent learning was not mitigated by increasing course quality in this study. Students may benefit from understanding what makes them uncomfortable and directly addressing it, for example, by proactively participating in social aspects of the course to offset isolation.[14] Instructors can do much to improve the learning experience in online courses by being transparent about components of the course, enhancing interactions between students and teachers, and providing readily accessible resources, assignments, and quizzes for independent learning modules to help students see their level of understanding increase over the course.

One limitation of this study was the use of an assessment tool that evaluated student comfort with independent learning as a proxy for comfort with online/virtual learning. It is possible that factors associated with the use of a learning management system or other concerns about technology-based learning may also have impacted

students. Similarly, a limitation was inability to determine if poorer performance was due solely to the online format or if students who performed less well in this set of courses in this semester generally would have struggled for other reasons. Finally, the overall relatively high "quality" scores for the courses evaluated automatically make it more difficult to identify a significant difference. While recognizing this challenge, the authors were pleased to see that few courses evaluated had very low quality scores.

Conclusion

It may well be that many of the reported negatives of online learning will ease with time, as instructors gain the needed time and training to properly transition their courses and change work processes to better meet standards of online instruction, and students get the time to determine how best to learn from home without distraction and screen fatigue.[11] Future research may include repeating this study when the students in the veterinary curriculum all had completed undergraduate training during or after the COVID-19 pandemic and had been exposed to much more online and virtual learning as the norm in their training.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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Appendix 1: Online Comfort Survey

1. Being in a classroom and/or socializing with fellow students is:
   a. Not important to me
   b. Somewhat important to me
   c. Very important to me
2. I find classroom discussions:
   a. Rarely helpful
   b. Sometimes helpful
   c. Always helpful
3. When learning new material independently, I usually feel:
   a. Confident in my ability to both comprehend the material and, if needed, to seek assistance
   b. Somewhat uneasy, but will seek assistance if needed
   c. Very anxious
4. When instructors handout directions for assignments, I prefer:
   a. Trying to follow them on my own, than asking for help as needed
   b. To approach the instructor for help as needed, even when I am uncomfortable doing so
   c. Immediate assistance
5. I usually:
   a. Finish things ahead of time
   b. Finish things in time for class
   c. Finish things are they are due
6. When asked to learn technologies new to me:
   a. I look forward to learning new skills
   b. I need help learning new technology skills
   c. I worry about learning new skills
7. As a reader, I would most often classify myself by the following statement:
   a. I usually understand the text after one reading and without help.
   b. I sometimes need to re-read the text several times.
   c. I need to re-read the text multiple times and still require help in understanding it.
8. As a writer, I would not often classify myself by the following statement:
   a. I express ideas clearly and succinctly.
   b. I sometimes express many ideas before I express my main point.
   c. Sometimes I get in heated debates in online forums.