

# Evaluation of the Effects of Online Case Studies in an Equine Nutrition Course on Student Performance, Procrastination and Satisfaction<sup>1</sup>

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## Abstract

An on-line discussion board was used to foster interactive learning communities with discussion-based approach to solving case studies (CS) in an undergraduate equine nutrition course. Students (n=48 in 2011 and n=40 in 2013) were required to post pertinent discussion three or more times and then demonstrate comprehension of the case study topic through a group presentation in class. In 2011, students were given one week to complete the first two CS. In an attempt to curb procrastination, a split deadline approach was used in the third and final CS in 2011 and in both CS in 2013 where students were required to complete half of the CS posts within the first week of a two-week deadline. Student performance on CS was positively correlated with performance on homework ( $P < 0.001$ ), quizzes ( $P = 0.0001$ ) and examinations ( $P = 0.0097$ ). Further, the incidence of early posts increased from 37.89% to 52.12% when moving from a single to a split deadline ( $P = 0.0375$ ). Upon completion of these CS, students reported that information covered by CS was applicable to the real world and is essential for horse owners ( $P < 0.0001$ ). Enhanced active learning was evident based on correlations of CS scores with other course assessments and favorable responses from students.

## Introduction

Technology is advancing rapidly, infiltrating almost every aspect of our lives, especially education. There continues to be a rise in the number and popularity of college courses offered online across the country with 32% of United States' students are taking at least one online course (Allen and Seaman, 2013). This evolution

of educational technology can also be seen in the increasing amount of online interaction in viewed in traditional lecture-based courses (Allen and Seaman, 2013). Universities are encouraging and often requiring professors to integrate technology in their teaching with the goal of enhancing learning and promoting student engagement within and outside of the classroom. Educational technology may allow more students to participate as classwork can be done on students' schedules (Xu and Jaggars, 2014), which may ultimately provide flexibility and opportunities for the student.

## Contested Views on Technology in Education

The introduction of technology allows students to interact with course material by allowing them to expand topic searches, further discussion opportunities with both professors and peers and create an interactive atmosphere (Barnes et al., 1999). Students now can obtain additional information, complete online assignments and interact in expanded discussion with professors and peers with regards to the course. Educational technology might help students better engage in their courses with the anticipated outcome being better performance, reflected by grades and material comprehension.

The integration of technology in coursework offers the possibility of expanded group collaboration. Since most students have access to computer resources on and off campus, they can easily engage with their group members through online discussion areas (Xu and Jaggars, 2014). Some research indicates that students perform better in small group settings (Springer et al., 1999) educational technology may afford increased

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student engagement with their groups beyond traditional face-to-face meetings, thus making group work more accessible.

Despite the push for an increase of online classes, they may not be suitable for every student. The expansion of educational technology in the classroom may actually contribute to student procrastination (Bork and Rucks-Ahidiana, 2013). Some research suggests that online assignments can increase procrastination as assignments can slip into the “out of sight out of mind” paradigm (Elvers et al., 2003; Allen and Seaman, 2013). This dilatory behavior might be attributed to the lack of assignment due date reminders and/or further explanation or discussion of assignments by the professor (Bork and Rucks-Ahidiana, 2013). The findings of Bork and Rucks-Ahidiana (2013) paradoxically suggest that procrastination may be due to the use of educational technology, particularly course management systems (CMS), that in fact propose to facilitate better communication and collaboration between instructors and students. The integration of technology in coursework, therefore, requires students to assume greater responsibility for and ownership of their work, especially through discussion-based assignments. While faculty should provide frameworks and expectations for online engagement, student engagement and self-direction are paramount.

In addition to the findings of Bork and Rucks-Ahidiana (2013) that technology may contribute to students’ procrastination, the rapid introduction of technology at all levels of education is far from uncontroversial. Curriculum theorist William Pinar (2011, 2012), for example, sees a “hidden curriculum” in the use educational technology, which he argues has reconfigured education institutions into “cram schools, where so-called skills replace academic knowledge, decontextualized puzzles preparing for employment in jobs without meaning” (2011, p.11). Pinar’s (2011, 2012) analysis elicits the question: to what are students really attending as teaching and learning become increasingly technologically mediated? This concern lies in the focus on skills associated with the technology itself and by extension the purpose(s) that truly underlie the integration of technology into education. Are students, for example, being trained through “educational” technology in the skills deemed of most value for workforce development rather than on their subjective positions and desires in education?

Bowers (2000) writes that the addiction to computers in education has helped accelerate the commodification, inherent in capitalism, of knowledge, teaching, learning, teachers and students and has reconfigured wisdom and knowledge as decontextualized information. Giroux (2012) critiques technology as complicit in reframing pedagogy as “narrowly defined skills and practices” that position teachers as a “subaltern class” and the purpose of education as the training of students purely to facilitate the global economic competitiveness of the U.S. (p.76). Finally, Lasch (1979) implicates the proliferation of technology in the emergence of a disconnected society characterized by anomie, hyper-individualism,

narcissism and immersion purely in the present with little if any engagement with historical context. Pinar (2012), channeling Lasch (1979), concludes that those with a financial interest in addicting education institutions to technology claim that technology is a “boon to schooling, not a threat”. But as curriculum theory appreciates, constructing academic knowledge as “information” erases remembrance as it converts contemplation into test-controlled attention (p.143).

### **Case Studies and Best Practices in Blended Education**

Of relevance to this study, a large-scale meta-analysis conducted by the U.S. Department of Education (2010) found that:

- Effect sizes indicated greater benefit in which online instruction was collaborative or instructor-led than instruction in which students worked independently.
- Effect sizes were larger in cases where online and face-to-face conditions varied in terms of curriculum materials, instructional approach and instructional medium.
- Support mechanisms for groups, such as guiding questions, generally influence the way students interact, but not the amount they learn.

The meta-analysis (U.S. Department of Education, 2010) further concluded that the studies included did not demonstrate the superiority of online instruction as a medium. Rather, studies suggesting advantages associated with blended learning indicate that such advantages may be attributable to a combination of online and classroom conditions that differed in time spent in learning, curriculum and pedagogy. Finally, the report cautions against inferring causality in the context of reported effect sizes because of the dearth of large-scale randomized controlled studies available. Still, research has identified certain practices that should inform blended course design.

The importance of course planning and design is crucial to all teaching, including online and blended formats. For example, Fill (2010) notes the importance of the development of meaningful learning activities, which consist of three elements: a) establishing the learning context; b) learning and teaching approaches; and c) the specific learning tasks, which include pedagogical techniques, resources, learner and teacher roles and assessments. Likewise, McGee and Reis (2012) conclude that blended learning environments require a well-aligned instructional design; formal and informal course interactions; process-driven, product-oriented and project-based instructional approaches; use of technology directly related to established learning outcomes; a variety of assessment strategies; and clear communication. Particularly important to this study, Vaughn (2007) concludes that the element of communication is particularly important in online and blended formats because his findings indicate that although students perceive

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greater time flexibility in hybrid courses, they initially experience difficulties related to time management and assuming greater responsibility for their learning.

Further salient to this study, research indicates that the use of peer learning (Boud, 2001) such as simulations and case studies can be effective in establishing the type of blended learning environment suggested by McGee and Reis (2012). Peer learning should be “mutually beneficial and involve the sharing of knowledge, ideas and experience between the participants,” which moves “beyond independent to interdependent or mutual learning (Boud, 2001, p.3). Research in disciplines such as medicine (McGaghie et al., 2010; Wayne et al., 2008), Nursing (Cant and Cooper, 2009) and higher education (Boud, 2001; Tribe, 1994) indicates that peer learning deepens understanding and positively impacts learning outcomes through shared experience. Specific benefits include additional gains in knowledge, critical thinking ability, satisfaction and confidence (Cant and Cooper, 2009) as well as active engagement with learning processes and concepts (Boud, 2001; Tribe, 1994).

This study was conducted over a two-year period in an undergraduate equine nutrition course. Study objectives were three-fold. The first objective was to determine if performance on online case studies (CS) was correlated with performance on clicker-quizzes, homework assignments and examinations. The second objective was to evaluate if a split deadline, where students were required to complete half of the CS posts within the first week of a two-week deadline, for case studies would reduce the amount of procrastination. The final objective was to gauge class satisfaction and overall performance in relation to the case study assignments. We hypothesized that performance on case studies would translate into higher exam, quiz and homework grades. We also hypothesized that the split deadline would result in a higher frequency of early posts and that students would recognize the real-world application of CS material.

### Procrastination Defined

For the purposes of this study, we use the psychological definition of procrastination (Kotler, 2009; Steel, 2007) as a gap between intention and action in which procrastinators delay performing an important task in favor of performing a less important, yet apparently more rewarding task. Procrastination actually represents a complex set of behaviors, as Steel (2007) found in a meta-analysis of over 550 studies related to procrastination. Rather than finding the propensity to procrastinate in any one source, Steel (2007) concludes that procrastination emerges from the interaction of four variables:

- A person's expectancy of success at a task;
- The perceived value of a task;
- A person's need for and sensitivity to the delay of immediate gratification; and
- A person's impulsiveness.

According to Vancouver (as cited in Kotler, 2009),

Steel's (2007) findings provide significant insight into how the interrelated variables of time, expectancy of task success, task value and distractibility, relate with how deadlines impact the desire to achieve certain goals and complete certain tasks. Steel's (2007) findings are salient to this research because the factors he discerned from his meta-analysis could help educators and students understand procrastination and lead to interventions that might result in better student outcomes. This is particularly important in the context of the proliferation of technology, online and blended instruction in which students increasingly study, both individually and in groups, outside of a traditional classroom setting.

## Methods

### Course Background

Data were collected in 2011 (n = 48 students) and 2013 (n = 40 students) during an equine nutrition course designed for second or third year students as a required part of the curriculum for equine minors, yet open to all students. In addition to content-related course objectives, a further objective of the course was to use technology to enhance active learning in an undergraduate equine nutrition course. Specifically, technology was used to enhance the formative stages of learning through the creation of online discussion boards to foster interactive learning communities with a discussion-based approach to solving case studies and through the incorporation of student response system (SRS) clicker-quizzes with instant feedback.

### Student Assessments

Equine Nutrition (AS 220) at South Dakota State University is composed of four major grading components: homework, quizzes, examinations and case studies. Homework assignments are designed to provide students with opportunities to evaluate diets or feed analyses and practice course material. Student response system (SRS) clicker quizzes assess student understanding of course materials such as readings and lecture notes. Examinations are comprised of a variety of selected response items, such as multiple choice and true/false questions, with a heavier emphasis on constructed response assessment items such as fill-in-the-blank, short answer and essay items. The goal of examinations was the assessment of student understanding of course curricular aims, which includes the ability to apply course material in addressing real-world scenarios. Case studies were designed to assess students through providing authentic opportunities to demonstrate their understanding of knowledge and concepts gained from coursework through application of course content to real-world scenarios. The case study component is completed online through South Dakota State's CMS Desire2Learn (D2L). The D2L portal is designed to promote online engagement and provides several benefits for managing the course. The discussion area allows students to correspond in

the privacy of their own groups, communicate with the instructor and share materials needed to complete the case study. The system allows the instructor to view what students wrote and to whom and what time they posted. The time indicator assists the instructor in deciphering which posts are or are not submitted by the prescribed deadline. D2L also allows the professor to see every individual's contribution to the project to ensure fair grading and to promote honesty in the classroom.

### **Case studies**

Students were randomly assigned to groups of four or five students to complete the case studies. The groups were required to communicate and solve real world industry-applicable problems, or case studies, through the discussion area on D2L. Each case study posed a critical thinking problem that required the students to analyze limited information about a specific horse or feedstuff in order to find a solution. Case study topics included equine nutritional diseases, dental health, nutritional requirements and toxic plants. The students were required to utilize lecture material, class readings and additional resources to solve the assigned case study within two weeks. Grading was composed of two components: individual participation and group discussion and solution. Individual participation encompasses timeliness of posts, contribution to discussion and meeting minimum posting requirements. Group grading is based on correctly solving the problem and an in-class presentation.

Data were collected over two AS 220 sections: Fall 2011 and Fall 2013. The 2011 class was required to complete three case studies, two worth 10 points and one worth 30 points. The 2013 class was required to complete two case studies worth 30 points each. Deadlines for the two sections also differed. The first two case studies from 2011, worth 10 points each, had one deadline at the end of week two; one 30-point case study had a first deadline at the end of week one and another at the end of week two. Each of the two 30-point case studies in the 2013 class had two deadlines; the first deadline was at the end of week one and the second at the end of week two. The students were incentivized to complete at least half of the required 2-3 posts by the first deadline through placing a point value on doing so. In order to evaluate the effect of a split deadline on student procrastination, "early" posting was considered to be the first 120 hours or five days of the prescribed week, whereas "late" posting was considered to be the last 48 hours prior to the deadline. Both "early" and "late" posts were submitted on time. These terms are used here and throughout as temporal tendencies within the allotted assignment time; "later" posts reflecting a procrastination type behavior of completing work right before the deadline. Data were gathered through D2L for both 2011 and 2013.

### **Student Surveys**

South Dakota State University Human Subjects Committee IRB approval was obtained (IRB-1402018-EXM) for the student survey. Construction of the survey questions focused on two themes related to the research questions: a) students' perspectives on the group work aspect of the course case studies; and b) students' perspectives on how well they perceived the case studies impacted their understanding of course material. Students responded to 20 questions based on a 1-10 Likert-type Scale in which "1" represented "no" or "disagree" and "10" represented "yes" or "strongly agree." In constructing the survey questions, the authors carefully considered instrumentation bias including the use of unstated criteria; inapplicable questions; use of examples in questions; overgeneralizations; over-demanding recall; over-specificity; the use of overemphasis; ambiguity; double-barreled questions; and leading and loaded questions (see Alreck and Settle, 2004, pp. 95-101). We further focused on the survey's content validity, which is indicated, "if the items in the tool sample the complete range of the attribute under study" (DeVon et al., 2007, p.157). Due to the small scale of the project, colleagues knowledgeable in survey design and the phenomenon under study reviewed the survey in the context of the research questions and provided feedback in order to ensure content validity associated with the constructs of group collaboration and learning through case studies.

At the end of each course, in addition to the university's standardized course evaluation, we administered our survey to each student to gather feedback on their enjoyment in completing the case studies, student reported effort on class activities, how students perceived the case studies prepared students for exams, their perceived relevance of case study information and their perceptions of the group aspect of completing the case studies. These survey responses were not factored into the final grade. Students' responses were recorded for each question in order to calculate correlation coefficients between survey responses.

### **Statistical Analysis**

All statistical analyses were performed in SAS 9.3 (SAS Institute, Cary NC). Pearson correlation coefficients were used to determine case study associations in other assessment components. Multiple contrast tests comparing single versus split deadlines for 2011 and 2013 were performed using the contrast option in PROC GLM. Survey data association outcomes were determined by the use of correlation coefficients and  $\chi^2$  tests.

### **Results and Discussion**

The grade analysis from 2011 and 2013 combined data revealed that there were correlations between case studies and examinations ( $P = 0.0097$ ), quizzes ( $P = 0.0001$ ) and homework grades ( $P < 0.0001$ ). However, the strongest correlation was between case study grades and homework grades. Table 1 illustrates the correlation matrix of grades for combined 2011 and 2013 sections



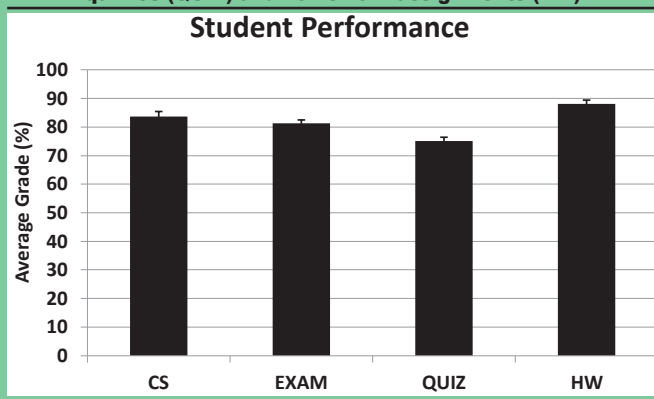
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and average performance on CS, homework, quizzes and examinations are represented in Figure 1. These correlations provide evidence that the critical thinking based case studies are indicative of overall class performance. Presentation and assessment of content was provided through multiple modalities in the present study. Student performance on each method of assessment was correlated; thus, content repetition can be beneficial to the overall performance of students. These educational outcomes suggest that the course design comports with Fill's (2010) description of meaningful learning activities consisting of learning context, instructional approaches and well-defined learning tasks. The results further suggest a well-aligned instructional design as defined by McGee and Reis (2012). Finally, the results appear to support Boud's (2001) findings indicating the mutual benefits derived from well-structured peer learning, specifically the movement from independent to interdependent learning.

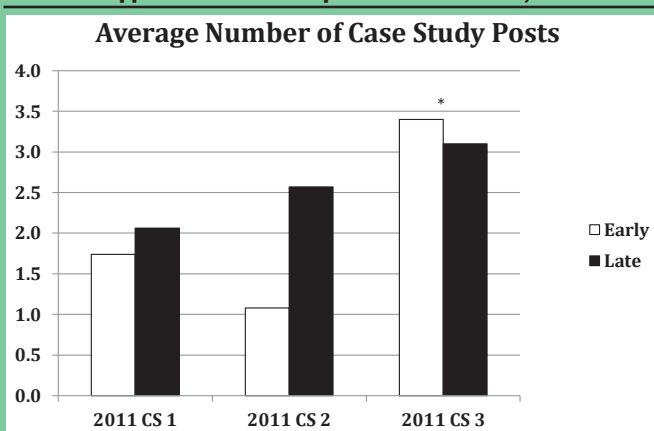
**Table 1. Pearson correlation coefficients of student performance<sup>1</sup>**

	CS		Exam		Quiz		HW	
	r	P-Value	r	P-Value	r	P-Value	r	P-Value
CS	-	-	0.2726	0.0010	0.3974	0.0001	0.6408	<0.001
Exam			-	-	0.3993	0.0001	0.5086	<0.001
Quiz					-	-	0.5940	<0.001
HW							-	-

**Figure 1: Students performance is depicted as average grades (%) for students on case studies (CS), examinations (EXAM), quizzes (QUIZ) and homework assignments (HW).**



**Figure 2: The average number of early and late posts for CS1, 2, and 3 in 2011 are represented. \*The proportion of early posts as a percent of overall posts was greater in the split deadline approach in CS3 compared to CS 1 and 2, P < 0.0001.**



Students completed their assigned posting in a timelier manner when a split deadline was used (Table 2). Figure 2 shows the difference between the single deadline and split deadline approach for the case studies in 2011. The incidence of early posts increased from 37.89% of total posts in a single deadline requirement to 52.12% of total posts in the split deadline assignment ( $P < 0.0375$ ). Of particular interest, the average number of posts per student in 2011 increased significantly from 3.7 to 6.5 ( $P < 0.0001$ ) when the assignment transitioned from a single deadline to a double deadline format. The required posts remained the same for the deadlines however the split deadline CS was worth triple the points. The trend of early posting continued to an even greater extent in 2013 with the frequency of early posts in the 2013 CS being greater than in the final CS of 2011 ( $P < 0.0493$ ; Figure 3). The split deadline format and the increase in number of points potentially both contributed to the increased in student effort on activities as indicated by early responses and overall number of responses. By requiring students to complete half of their assignment before the final deadline and by increasing point value, the assignment did not fall into the "out of sight, out of mind" paradox. This seems to be especially critical due to the fact this assignment could become as such, as it is completed not in the classroom but online.

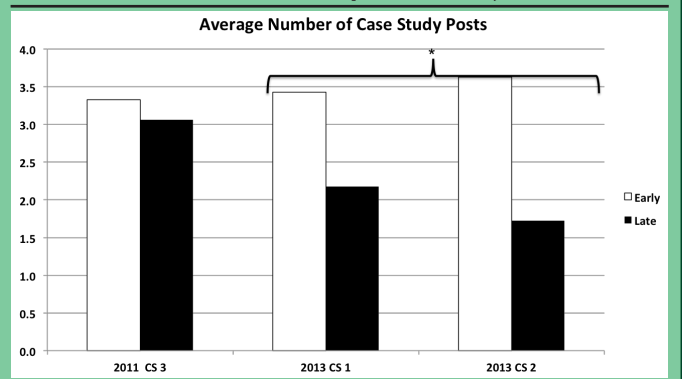
Consistent with Steel's (2007) four variables in his construct of procrastination, the implementation of the split deadline and the point valuation may have increased the students' perceived value of the task. Such incentives may be serve as a type of intervention through which to increase timely participation in tasks, specifically in a blended instructional format. Further, Vaughn's (2007) findings about the importance of communication and well-aligned instructional design (McGee and Reis,

**Table 2: Frequency of early posts in single and split deadline case studies.**

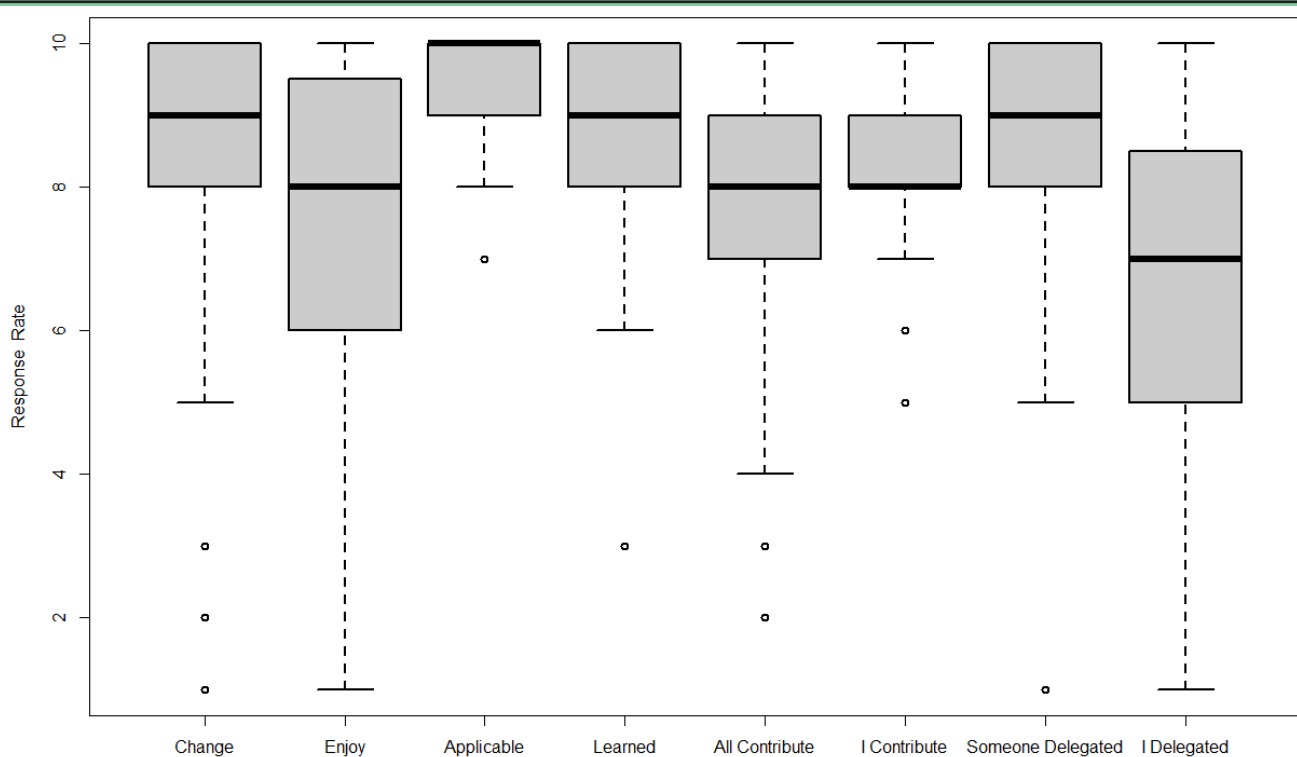
	Case Study						Contrast <sup>a</sup>	
	2011		2013		I	II	III	
Early	46%	30%	52%	61%	68%	0.0493	0.0132	0.1295

<sup>a</sup>P-values reported are of Contrast I (CS1 and CS2 vs CS3 of 2011), Contrast II (CS3 of 2011 vs CS1 and CS2 of 2013) and Contrast III (CS1 vs CS2 of 2013). CS1 and CS2 of 2011 reflect single deadlines, whereas CS3 of 2011 and CS1 and CS2 from 2013 reflect split deadlines.

**Figure 3: The average number of early posts was increased in the 2013 case studies compared to 2011, \*P < 0.02.**



**Figure 4: Students responded on a scale of 1-10 (1 strongly disagree, 10 strongly agree) as to the following statements: I realize that CS are worth enough to change my grade in the class by almost one letter grade (Change); I enjoyed solving CS (Enjoy); In general, the topics covered in the CS are applicable in the real world (Applicable); Regardless of whether or not I enjoyed the CS, I have learned relevant information that is essential for horse owners and nutritionists (Learned); My teammates all contributed to our discussion (All contribute); I contributed a lot of quality information and ideas to the group (I Contribute); Someone in my group has been good at delegating tasks (Someone Delegated); I personally was the one who delegated tasks (I Delegated).**



2012) may also provide important interventions in cases where students experience difficulties in time management and taking responsibility for their learning and in online and blended formats. It may even be useful to discuss Steel's (2007) procrastination model with students in order to help develop their metacognition.

The final objective was to evaluate student satisfaction and self-assessment regarding the CS (Figure 4). Students reported having worked hard because the cases were worth one letter grade. Students, knowing how case study performance significantly affected their overall grade, believed that they worked harder and performed better in the class as a whole. Student reported enjoyment of solving CS, belief that case studies covered material applicable to the real world and belief that information learned was relevant and is essential for horse owners and nutritionists were significantly correlated ( $P < 0.0001$ ). Over 94% of students ranked the information being relevant an eight, nine or ten and none of the students ranked the applicability of this information to the real world less than a seven. Most students enrolled in this class are interested in horses thus, this real world connection potentially makes the material more engaging, especially with the applicability of lecture knowledge to case study and real world situations. These results appear consistent with the findings of Cant and Cooper (2009) that peer learning through simulations and case studies benefit students through additional gains in knowledge, critical thinking ability,

satisfaction and confidence and peer learning's fostering of active engagement with learning processes and concepts (Boud, 2001; Tribe, 1994).

Group dynamics and personal contributions were scored on a scale of 1-10 with 1 being yes or agree and 10 being no or disagree (Figure 4). Students reflected on whether all team members contributed to solving the CS and whether they believed that they personally contributed quality information and ideas to the group. Students were further asked to assess if someone in their group was good at delegating tasks and if they specifically were the one who delegated those tasks. Frequency of responses (1-10) to these group and personal reflections were varied as expected.

### Summary

This research yielded several important findings. Utilizing case studies enhanced student reported enjoyment within an undergraduate equine nutrition course. Further, the split-deadline approach yielded an increase in student activity. The content repetition that case studies supplied allowed students to continually apply information from lecture as well as self- and group-guided topical research in order to gain content mastery that can be transferred to other assessment components of the class. Split deadlines positively impacted student performance and output in regards to online assignments, perhaps influencing the degree of student effort. Ultimately, student feedback confirmed

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that the CS provided applicable and pertinent information relevant to their education in equine nutrition. As a result of this research, future research into issues of procrastination and engagement in peer learning through case studies in a hybrid course environment using the four variables identified by Steel (2007) could contribute to further understanding of student behavior, particularly in the context of course design, learning activities and assessment and student self-knowledge.

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