Veterinary Students' Use of Crib Sheets in Preparing for Learning and Reducing Stress

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Abstract

The purpose of this exploratory study was to determine actual and perceptional differences in utilizing crib sheets for a Virology course in veterinary sciences. The objectives guiding the study were to describe the exam scores of Virology course students, describe the differences amongst exam scores of Virology course students and to describe perceptions of the use of crib sheets for Virology exams by students. The researchers found exams allowing the use of a crib sheets had higher averages than exams that did not allow crib sheet use. Student perceptions of crib sheet use were that it helped them to reinforce, remember and retain course material. Students also indicated they would prefer to use the crib sheet on other exams in Virology and in additional courses. Finally, the stress levels reported by students were lower during exams that allowed them to use a crib sheet.

Introduction

May and Casazza (2012) discovered college students pursuing a degree in the hard sciences experienced a higher level of perceived stress than soft science majors. Students enrolled in veterinary school are faced with many academic challenges of the hard sciences. The curriculum has become overloaded as colleges attempt to teach everything to every student (Bushby, 1994; Radostits, 2003). Competencies currently expected from veterinary medicine students upon graduation include: multispecies clinical expertise, one health knowledge: animal, human and environmental health and an increasing number of professional competencies (NAVMEC, 2011). It is almost impossible to learn the skills and competencies necessary to be confident in the content because of the ever-increasing knowledge base of veterinary medicine (Radostits, 2003). With the short time span of veterinary school and the considerable amount of information they are expected to retain, stress and anxiety can occur in students. Grade competition, exam preparation and amount of content to memorize are all academic stressors in college students (Abouserie, 1994). Specifically for veterinary medicine students, workload, grades and assessments were reported most frequently as sources of stress (Williams et al., 2005). Similarly, the top three stressors of veterinary medicine students identified by Kent-Arce (1991) are: exams, number of exams and types of exams; an inability to absorb all of the information; and final exams.

College students may not be consistently using effective coping strategies to manage their stress (Bland et al., 2012). Gelberg and Gelberg (2005) found the majority of veterinary medicine students were not even aware of their stress levels or their impact. Students with high levels of exam anxiety are typically lower performing than their peers (Benjamin et al., 1981). All students, regardless of their predisposition to exam anxiety, are negatively affected in both performance and motivation by highly evaluative classrooms (Hancock, 2001). With the increased stress placed on students, especially with high stakes exams, it is important the field find ways to reduce exam anxiety and stress. The veterinary medicine student population could risk burn out as a result of information overload and an emphasis on rote learning (Rex, 1993). Development of coping skills to positively handle stress is encouraged for veterinary medicine students in a recent report of the NAVMEC (2011). Managing stress can improve student performance in learning skills and problem solving (Gelberg and Gelberg, 2005). Moving past regurgitation and emphasizing understanding would benefit the profession. Exams focusing on understanding rather than recall can increase retention and help alleviate exam anxiety (Yu et al., 2010).

Crib sheets or cheat sheets could be one way of reducing exam anxiety in veterinary medicine students. A crib sheet is simply a sheet of notes created when preparing for an exam by a student to aid them in taking

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the exam (Raadt, 2012). Crib sheets have been found to increase student learning and reduce exam anxiety in the classroom (Erbe, 2007). There are different ways to implement crib sheets in the classroom to make them more effective. Some techniques could include requiring handwriting as opposed to typing and limiting the size of the crib sheet (Raadt, 2012). For many students, it is not the actual crib sheet itself that is helpful during the exam, but the act of making it themselves. "*Preparing the cheat sheets proved to be sufficient for learning what was on the test. This was the major difference between handing out information composed by me and having the students find their own*" (Erbe, 2007, p. 9). Exams requiring application or analysis were especially conducive to crib sheets because the students couldn't simply copy them (Erbe, 2007). In this way, exams do more than simply measure students learning, they actually contribute to student learning (Halamish and Bjork, 2011; Jacobsen, 1993).

Studies conducted by Raadt (2012) and Skidmore and Aagaard (2004) found students who used crib sheets improved their exam performance. Drake et al. (1998) determined crib sheets reduced text anxiety by providing security, meeting individual student needs, helping them prioritize and solve problems, think critically and freed them from excessive memorization so they could focus on learning the material. Dickson and Bauer (2008) conducted a study on undergraduate students in a psychology course and according to the students, making a crib sheet helped 91.8% of them learn the material and 87.8% improve their exam scores. Gharib et al. (2012) argued in various psychology courses, open book and cheat sheet exams were effective teaching tools, did not decrease retention and could even be superior to traditional closed book exams. Various college disciplines have made use of crib sheets in the classroom. Veterinary medicine may benefit from trying this technique. Are there ways to reduce exam anxiety without minimizing knowledge retention in veterinary medicine education?

Methods

The purpose of this exploratory study was to determine actual and perceptional differences in using a crib sheet for a Virology course consisting of veterinary medicine students. The following objectives and hypotheses were developed to meet the purpose:

1. Describe the exam scores of Virology course students
2. Describe differences amongst exam scores of Virology course students
3. Describe perceptions of the use of crib sheets for Virology exams by students

To accomplish objective 2, the following non-directional hypothesis was developed:

H1: There is a statistically significant difference between exam scores when Virology students used crib sheets and when they did not.

The population of the study was veterinary medicine students at the University of Missouri enrolled in a Virology course. The sample (n = 118) was students enrolled in the fall 2012 semester; the accepting sample, or those agreeing to participate, was 114 (96 %). Students were in their second year of the veterinary medicine program with an expected graduation date of 2015. Entering classes of veterinary medicine students at the University of Missouri are characterized by an average undergraduate GPA of 3.77 and an average GRE score of 1122. Upon admission to the veterinary medicine program, 97 of the students were females and 23 of the students were males from the graduating class of 2015. The University of Missouri Institutional Review Board approved the study protocol and all participants provided written informed consent prior to participation in the study.

For this study, some exams were permitted to have crib sheets and other exams were not. In particular, exams 1, 3 and 5 utilized crib sheets and exams 2 and 4 did not utilize crib sheets. The crib sheets were one half of one sheet of 8.5 x 11 inch (216 x 279 mm) paper on which students were permitted to write any information they deemed useful for the exam on one side. The exams were presented in a computerized multiple choice format.

To assess the perceptions of the students in regard to their use of the crib sheets, items were developed based upon the students use and, as literature described, in relation to helpfulness and stress. A panel examining face and content validity reviewed the items. There were eight items which utilized a Likert-type scale of 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Data were collected in several ways. The data from the perceptions instrument were collected by one of the researchers in class without the instructor present, as to avoid coercion. The researcher also discussed the study and collected consent forms. The data from the exams were collected as a normal part of the class. Only the scores from those agreeing to participate in the study were used. The administration of exam 4 allowed for error due to a technical issue resulting in possible test-wiseness, thus exam 4 was removed from all of the analyses. The researchers acknowledge this as a limitation of the study because only one exam not utilizing crib sheets was factored into the analysis.

Data were analyzed using different statistical tools. For the descriptive statistics, which included the exam scores and the perception items, means and standard deviations were calculated. Exam scores were converted to percentages for ease of comparison. To compare exam scores, repeated measures ANOVA was calculated with the p value set at the .05 level a priori. A Bonferroni posthoc analysis was utilized to isolate the exams with statistical differences.

Results

When calculating the mean scores of the exams, Exam 1 was found to have the highest mean at 91.32% (SD = 4.72), while Exam 2 had the lowest mean of 84.80% (SD = 8.02). Table 1 summarizes the findings. A repeated-measures ANOVA was calculated to determine if statistical difference existed from exam to exam amongst the sample. When testing for the assumption of sphericity, it was found that the sample did not meet the assumption. Therefore, the Greenhouse-Geisser correction was found to be the most appropriate correction for the violation of the assumption (Field, 2009). From the analysis, a statistical difference ($F = 27.55$; $p < .001$) was found amongst the exam scores (Table 2). Therefore, the null hypothesis stating there is no difference among students' exams scores is rejected.

Table 1. Exam Score Means and Standard Deviations (Percentages)

Exam	Mean	Standard Deviation
Exam 1	91.32	4.72
Exam 2	84.80	8.02
Exam 3	86.63	6.85
Exam 5	90.61	5.33

Table 2. Repeated Measures ANOVA with Greenhouse-Geisser Correction between Exams

Source	Sum of Squares	df	Mean Square	F
Exams	3268.33	3.60	908.86	27.55***

***$p < .001$

Differences between exams were analyzed using the Bonferroni posthoc test because the overall repeated-measured ANOVA indicated differences. Bonferroni is an appropriate posthoc when sphericity is not assumed (Field, 2009). From the posthoc analysis, it was found Exam 1 scores differed with Exams 2 and 3. Exam 2 scores differed with Exams 1 and 5. Exam 3 scores differed with Exams 1 and 5. Exam 5 scores differed with Exams 2 and 3. Table 3 summarizes the findings. Therefore, in the incidence of Exam 2 and 1 the null hypothesis was rejected, in the incidence of Exam 2 and 5 the null hypothesis was rejected and in the incidence of Exam 2 and 3 the null hypothesis was accepted.

When investigating perceptions regarding the use of the crib sheet, means and standard deviations were calculated and summarized in Table 4. The students in the sample agreed the crib sheet was useful, indicated by their disagreement with the statement, I did not find the crib sheet useful (M = 1.57, SD = .72). More specifically, they agreed the crib sheet helped them to retain course information (M = 3.80, SD = .78), their stress levels were lower during exams utilizing the crib sheet (M = 4.30, SD = .98), they would prefer to use the crib sheet in all Virology exams (M = 3.96, SD = .99) and in other courses (M = 4.16, SD = .98) and the crib sheet was helpful in reinforcing and remembering course material (M = 3.90, SD = .85) The students in the sample were neutral regarding if they felt they relied on the crib sheet more than they should have during exams (M = 3.12, SD = 1.07) and if they did not use the crib sheet during the exams because the preparation of the sheet helped them to remember (M = 2.86, SD = .94).

Table 4. Means and Standard Deviations Regarding Perceptions of Crib Sheet Use by Students (n = 114)

Item	Mean	SD
My stress levels were lower during exams that allowed the crib sheet.	4.30	.98
I would prefer to use the crib sheet in all of my other courses.	4.16	.98
I would prefer to use the crib sheet for all of my exams in Virology.	3.96	.99
I found the crib sheet was helpful in reinforcing and remembering course material.	3.90	.85
The crib sheet helped me in a way that I feel I will retain the course information longer.	3.80	.78
I relied on using the crib sheet more than I should have during the exams.	3.12	1.07
I did not use the crib sheets during the exam because the preparation of the sheet helped me to remember.	2.86	.94
I did not find the crib sheet useful.	1.57	.72

Note. Scale was: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

Discussion

Exams where the use of a crib sheet was permitted (1, 3 and 5) yielded higher average scores than exams where a crib sheet was not permitted (2). This is consistent with Raadt (2012) and Skidmore and Aagaard (2004) who found improvements in exam performance with use of crib sheets. The first and last exam of the semester (1, 5) had the highest averages and both allowed use of crib sheets. Exam 2 had the largest variation of scores out of all five exams, signifying the use of crib sheets may help to reduce exam score variation among students. Exam 3 did utilize a crib sheet; however it was statistically different than the other two Exams with crib sheets (1, 5). Instead Exams 2 and 3 did not differ, despite Exam 2 not utilizing a crib sheet. The low scores for Exam 3 could be due to the placement of the exam during the semester or the content difficulty of the exam. The researchers recommend a future study be conducted taking into account the content difficulty and sequence of exams when determining which will involve crib sheets to eliminate as many confounding variables as possible.

Virology students in the sample agreed their stress levels were lower with exams permitting crib sheets, which echoes the findings of Drake et al. (1997) and Erbe (2007) among others. Considering the academic stress resulting from exams

Table 3. Bonferroni Posthoc Test Analyzing Differences between Exams

(I) Exam	(J) Exam	Mean Difference (I-J)	Std. Error	95% Confidence Interval for Difference	
				Lower Bound	Upper Bound
1	2	6.52*	.78	4.29	8.75
	3	4.69*	.60	2.97	6.41
	5	.71	.55	-.87	2.30
2	1	-6.52*	.78	-8.75	-4.29
	3	-1.83	.77	-4.03	.37
	5	-5.80*	.78	-8.05	-3.56
3	1	-4.69*	.60	-6.41	-2.97
	2	1.83	.77	-.37	4.03
	5	-3.98*	.70	-5.99	-1.96
5	1	-.71	.55	-2.30	.87
	2	5.80*	.78	3.56	8.05
	3	3.98*	.70	1.96	5.99

reported in veterinary medicine students (Williams et al., 2005) this was an encouraging find. The students neither agreed nor disagreed that they did not use the sheet because the preparation helped them to remember the content. This neutral stance could be because the majority of students utilized the crib sheet during the exam regardless of how much the preparation helped or didn't help them to comprehend and retain the material. Students in the sample found the crib sheet useful, which was demonstrated by both their disagreement with the statement: "*I did not find the crib sheet useful and their agreement that the crib sheet was helpful in reinforcing and remembering course material and retaining the course information longer.*" Students were neutral on whether they felt they relied on the crib sheet too much. This could be because some did depend on it instead of learning the material and others used it as a study tool. Another possible explanation could be the students didn't know how much was too much use, therefore more of their perception scores centered on the neutral mark.

Overall, recommendations for practice include implementing crib sheets into more veterinary medicine courses to aid in student learning and achievement and to decrease stress and exam anxiety. With the increasing amount of information students are expected to master (Radostits, 2003) to become successful veterinarians, crib sheets could be one solution to the information demand in a high stakes testing setting. One of the recommendations of the NAVMEC report (2011) is to reduce stress in veterinary medicine students, which has been found by this study and others in various disciplines to occur with crib sheet use. The profession could benefit from additional studies to support these claims by examining various veterinary medicine courses for similar findings. Future research should also examine the long-term effects of exam aids to determine how much knowledge is actually being retained with the use of crib sheets. In addition, to mitigate the fact that students were tested over different content from test to test, a longitudinal approach would be beneficial. The researchers recommend a follow-up study be conducted to compare results of students using a crib sheet for Exam 1 in one year to students not using a crib sheet for Exam 1 in the following year.

Summary

Based upon the findings of this study it can be concluded the use of crib sheets in veterinary medicine education may lead to increased exam scores. Additionally, students perceived decreased stress when utilizing crib sheets and indicated crib sheets assisted them in reinforcing and remembering the course material. With the increase in amount of course material veterinary medicine students are expected to master and the pressure of high stakes testing, crib sheets could be the answer to student learning and achievement while continuing to decrease exam anxiety. Future studies in veterinary medicine exploring the long term effects of exam aids to determine actual knowledge retention are encouraged.

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