

The Association of Grade Reporting Method, Student Performance, and Student Motivation on a Veterinary Clinical Rotation

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Abstract The purpose of this study was to investigate factors influencing student motivation for learning and performance on a small animal internal medicine (SAIM) rotation, with a particular emphasis on the impact of the type of grade reporting system utilized. Veterinary students rotating through 3-week SAIM rotations at the University of Georgia between March 4, 2013 and May 1, 2014 were randomized to receive either conventional pass/fail (CONV) or proxy discriminating letter grades (PROX) as their interim and final individual performance evaluations. Additionally, each student was asked to complete a motivation self-assessment questionnaire on the last day of the rotation to determine which factors contributed to their performance accomplishments and learning strategies during the rotation. A total of 157 students completed the SAIM rotation during the 14-month period, and 107 students completed the questionnaire. There was no difference in scores on interim or final performance evaluations between CONV and PROX groups. Results of questionnaire responses suggested that the type of grade reporting system utilized infrequently impacted student motivation to exceed performance standards and did not influence specific learning techniques employed during their clinical rotation. Ultimately, the value placed on patient care, client relations, and future professional success were the most commonly reported motivating factors by the clinical students.

Keywords: *intrinsic motivation, extrinsic motivation, clinical rotation, clinical teaching, grading*

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1. Introduction

Clinical rotations are the culminating experience of an arduous curriculum in veterinary medicine. After three years of didactic instruction, students in the authors' institution spend a total of 14 months on clinical rotations, in 3-week blocks of time, rotating through diverse disciplines. Clinical rotations are generally perceived as exciting and valuable, but can also be demanding and fatiguing. [1,2] Hours are long, cases are complex, and client, as well as faculty, expectations of student performance are high. As instructors in this curriculum, the authors strive to help students achieve their maximum academic and professional potential, and to maintain a high level of motivation throughout their clinical rotations. An understanding of strategies to maintain motivation would enable faculty to coach students who are struggling to remain fully engaged with this rigorous experience.

Motivation is frequently described as having "intrinsic" or "extrinsic" goal orientation, with intrinsic motivation

referring to engagement with a task for inherent interest or enjoyment, and extrinsic motivation referring to performance of a task to obtain some independent outcome. [3,4,5] Several authors have documented that a combination of intrinsic and extrinsic motivation is often seen in the educational setting. [4,6,7] Intrinsic motivation is critical in cognitive, social, and physical development in that an individual's curiosity drives progress independent of any physical reward. [6] Intrinsically motivated students are more likely to participate willingly in activities to improve their skills. [7] Studies have shown that feedback and evaluations affected intrinsic motivation: positive appraisals enhanced intrinsic motivation, whereas negative reviews diminished it specifically through influencing the student's perception of his or her level of competence. [5,8,9,10,11]

In academic settings, extrinsic motivation can be used to promote positive learning outcomes among students with less intrinsic motivation [5], although some evidence exists that reliance on extrinsic rewards may actually lead to a reduction in intrinsic motivation. [8,12] One traditional form of extrinsic motivation is the use of letter grades as a

discriminating system. Concerns over the use of letter grades include flaws such as grade inflation, a phenomenon that has been previously documented at an American veterinary medical college [13], as well as, the subjectivity of providing scaled measures of a complex skill such as clinical performance. [14,15] The impact, if any, of the type of grade reporting system used on actual student outcomes is uncertain. Assignment of discriminating grades has been shown to impair student performance on a writing assignment when compared to descriptive or constructive feedback. [16] In contrast, some studies have shown that student performance increased when discriminating grades were expected, presumably due to a higher level of commitment to the learning task. [10,17] Students expecting letter grades demonstrated greater confidence in their answers, and greater accuracy of confidence judgments, than students in a pass/fail system. [18] This may suggest that students anticipating discriminating grades set higher performance goals for themselves while students anticipating pass/fail scoring realize that there is no added benefit to achievement that greatly exceeds the performance standard.

For many students future goals are a motivational factor. [4,19] Students with a greater perception of future direction are better able to determine the value of the present activities toward future goals, thus increasing the present motivation for learning and achieving tasks. [4] Understanding the functionality of the task has also been shown to increase motivation in academic situations. [20] While student motivation within the rigorous veterinary curriculum as a whole has been studied [1,21,22], to the authors' knowledge, no study has attempted to document how the manner of reporting performance evaluations impacts veterinary students' ability to sustain their motivation and their effort specifically during clinical rotations.

Among the North American colleges of veterinary medicine there is disparity in how clinical rotations are assessed and how grades are ultimately reported. Independent of the underpinning assessment techniques used, some schools utilize a traditional letter-grade reporting system, others only report performance assessments as "pass" or "fail," and others blend those two reporting systems depending on the nature of the clinical rotation (K.K. Cornell, personal communication, Feb 4 2016). At the authors' institution, clinical rotation grades are reported as "Satisfactory" or "Unsatisfactory" (S/U). Informal discussion among the faculty recently revealed differing beliefs about the value of this pass/fail (S/U) reporting system. Compatible with research in human medical training, some faculty felt that a pass/fail reporting system relieved the students both of the pressure to maintain high GPAs and of the distraction of discriminating letter grades during a period when stress levels are already expected to be high. [23,24,25] There is some evidence that within a college setting, instructors tend to view letter grades as measurements of student performance within a subject, while students tend to perceive grades as tools necessary to attain personal and professional goals. [26] Other faculty felt that since veterinary clinical students are accustomed to the letter grade as an extrinsic motivating factor and discriminating assessment tool, the use of a more familiar traditional

letter grade reporting system may enable students to better assess their own performance and help them maintain a high level of motivation to exceed a minimum performance standard. [27] Additionally, there is a concern that students whose clinical performance is superior to their classroom performance are penalized by pass/fail clinical grade reporting as within this system they are unable to improve their cumulative GPAs after conclusion of the third didactic year in which discriminating grade reporting is used. [27,28,29] While there are many dimensions to the consideration of whether to use discriminating or pass/fail grade reporting on clinical rotations, to the authors' knowledge, no study has attempted to document the specific motivational value to the students of the type of grade reporting system used.

The purpose of this study was to investigate factors influencing student motivation for learning and performance on a small animal internal medicine (SAIM) rotation, with particular emphasis on the impact of the performance evaluation reporting system utilized. Studies have shown that expectations of one's own motivation and study skills are highly accurate among professional students, including veterinary students. [21,30,31] For this reason, self-assessment surveys were used to identify student motivating factors and learning strategies. The use of letter grade reporting was investigated as a unique potential motivating factor, by assigning unofficial letter grades to a randomly selected portion of the students. We hypothesized that reporting standardized performance evaluations as proxy letter grades (A-F) would be associated with improved student performance compared with providing S/U grade reports alone. We also hypothesized that students who were provided with proxy letter grades would self-report a greater significance of grades as a motivating factor compared with the motivational effect of S/U reporting.

2. Methods

2.1. Grade Reporting

The internal medicine service at the authors' institution uses a rubric-based numeric performance evaluation formatted to facilitate the assessment of the American Veterinary Medical Association Council on Education's major clinical competencies. Students have unrestricted access to rotation instructional documents, including the assessment rubric, through an on-line institutional educational platform. Performance evaluations are completed collectively by all supervising faculty members and house officers working with students on each rotation. Each student receives a written evaluation at both an interim time point during the rotation and as a final evaluation of performance (Appendix A). The officially recorded S/U grade is derived from the numeric score on this final rubric, with an "S" assigned to students who receive at least 24 of 40 total available points and who also do not receive a "1 – Below expectations" in any category. Students with a numeric score of 23 or less, or who receive a score of "1 – Below expectations" in any category are assigned a "U" grade. Students receiving such "U" evaluations are expected to repeat the rotation or

appeal the grade through College defined procedures. Prior to the beginning of the study, each three-week rotation was randomly assigned to conventional grade reporting (CONV, S/U scale corresponding to rubric-based numeric score as described above) or proxy letter grade reporting (PROX, A-F scale corresponding to the percentage of the 40 total available points earned using the same standard rubric-based numeric score). This study was focused on evaluating how the grade reporting system, not assessment methodology, impacted student performance so the same rubric was used to derive both CONV and PROX scores. Therefore, in reporting PROX grades an "A" was assigned to students who earned 36 or more points (>90%), while an "F" was assigned to students who earned less than 24 points (<60%) or who received a "1 – Below expectations" in any evaluated category. Randomization was done at the rotation level, rather than the student level, to avoid competition or anxiety introduced by some students in a given rotation receiving letter grade reporting while others did not. To avoid students preferentially enrolling in rotations with or without letter grade reporting, the randomization assignment was kept confidential. One investigator (KEC) retained the randomization assignment of the rotations, and released it to the lead faculty member of the upcoming rotation during the week before the new rotation began. Each student received an interim and a final rubric-based assessment in writing as usual; for students in PROX groups an unofficial letter grade was additionally reported. At the end of each rotation for both CONV and PROX groups, the lead faculty member reported the interim and final rubric-based performance assessment scores to a departmental staff member for entry into a data spreadsheet.^a Scores were reported as lists of numbers only, not associated with names of the students who had earned each score.

2.2. Students

Veterinary students rotating through the SAIM service at the University of Georgia between March 4, 2013 and May 1, 2014 were eligible for inclusion. There were 6-10 students on each SAIM rotation. Students were aware that letter grades are not officially reported for clinical rotations at this institution. At orientation to the new rotation, all students were reminded of their unrestricted access to the numeric rubric (Appendix A) used to assess performance on the SAIM rotation. Students were then read an identical script asking them to participate in a study of student motivating factors by completing a questionnaire about their motivation and their learning experiences at the end of the rotation. It was emphasized participation was voluntary and anonymous, and that students could opt not to participate by simply not completing the questionnaire. Furthermore, this action could not be traced back to an individual rotation or student by investigators. In anticipation of this questionnaire, students were asked to consider factors that influenced their motivation over the course of the rotation. Students whose rotation had been randomized to the proxy letter grade reporting category (PROX group, see above) were additionally advised that unofficial letter grades corresponding to certain levels of performance would be

reported with their interim and final numeric rubric-based assessments. Although some students took the small animal medicine rotation more than once over the study period, each rotation attended by a student was considered a unique event, because performance and motivating factors may have varied over time. The scripts used to invite subject participation are available to interested investigators upon request. Approval from the University of Georgia Human Subjects Institutional Review Board was obtained (Project Number 2013-0922-0).

2.3. Questionnaire

All students were asked to complete the motivation self-assessment questionnaire during a defined time within regular business hours on the last day of the rotation (Appendix B). Questionnaires were anonymous, and were submitted to a departmental staff member with no knowledge of the study. That staff member entered data from questionnaires into a spreadsheet, and the original questionnaires were shredded. Questionnaire responses were not viewed by any investigators until the study was completed. Anonymity of questionnaires also meant that there was no means to exclude second responses from students who may have taken the small animal rotation twice.

Retrospectively, construct validity of the questionnaire was tested using a review panel of three experts in the educational field (including a College of Veterinary Medicine's Associate Dean of Professional Programs, a doctorate of Motivational Theory, and a doctorate with cognate of student learning outcomes assessment). While no omissions or additions to the questionnaire were recommended, it was suggested that responses to question 6 relating to motivational aspects of the rotation be grouped and presented by shared overarching constructs as opposed to individual responses. Responses to this question were therefore grouped under sub-categories relating to Achievement Goal theory (which corresponds to the more familiar concept of extrinsic motivation) or Expectancy Value theory (which corresponds to the more familiar concept of intrinsic motivation). The expert panel's conclusion was that the study questionnaire was appropriate for obtaining the subjective information needed to meet the objectives of the current study. Additionally, the questionnaire was re-administered to 30 fourth-year veterinary students to assess clarity of the questions. Question ambiguity was reported by two students only related to the questions regarding amount of time spent on various tasks (questions 2-4), and those questions were outside the scope of this report. Finally, a statistician was consulted regarding redundancy of the questionnaire items and redundancy was not demonstrated by Pearson correlation analysis (highest correlation coefficient for any pair of questions was $r = 0.51$).

By expert recommendation, responses from question 6 were categorized as follows:

Achievement Goals (corresponding to the more familiar concept of extrinsic motivation)

Performance approach goals: I wanted to write impressive SOAPs; I knew that I was being evaluated and wanted a high mark; and I am competitive and want to be seen as the best student.

Mastery goal (also an interest goal): I have an interest in small animal internal medicine.

Performance avoidance goals: I had a fear of failing the rotation; I did not want to look unprepared for rounds or case management; I did not want to look less intelligent than my classmates.

Expectancy Value (corresponding to the more familiar concept of intrinsic motivation)

Attainment value: Patient care is important to me; Client relations are important to me.

Utility value: I plan to pursue an internship/residency training; I desire a letter of recommendation from a medicine faculty member; I want to be successful in practice.

Interest value (also a mastery goal): I have an interest in small animal internal medicine.

Opportunity or other costs: "I had a fear of failing to rotation" while also considered a performance avoidance goal above, the potential for negative consequences on expectancy value associated with anxiety and the possibility for failure led to this additional classification.

The response "I was intimidated by one or more clinicians on the service" was classified as an anxiety item, outside the construct of Achievement Goal and Expectancy Value theories.

2.4. Data Analysis

Student motivating factors and experiences reported on the questionnaires were described cumulatively. Questionnaire responses were compared between CONV and PROX groups. Response frequencies were compared between

groups using the χ^2 test for independence. Rubric-based performance scores were compared between CONV and PROX groups using an unpaired t-test for unequal variances using publically available software.^b Alpha level was set at 0.05.

3. Results

3.1. Students and Questionnaires

Over the 14-month study period 157 students completed the SAIM rotation (83 CONV group, 74 PROX group). Of these, 107 students (60 CONV [72.2%], 47 PROX [63.5%]) completed a survey, for an overall response rate of 68%. There was no significant difference in response rate between groups ($p = 0.30$). In response to the question, "What resources did you utilize while on the Internal Medicine rotation?" students described that textbooks were their most common study resources (59 CONV [98.3%], 45 PROX [95.7%]), followed by class notes, scholarly journals, and internet resources (Figure 1). There was no difference between CONV and PROX groups in these responses ($p = 0.61$). In response to the question "Who did you feel played an important role in your learning and your growth as a future veterinarian during this block?" students reported that residents were most helpful to their learning (59 CONV [98.3%], 44 PROX [93.6%]), followed by faculty, interns and classmates (Figure 2). There was no difference between CONV and PROX groups in these responses ($p = 0.85$).

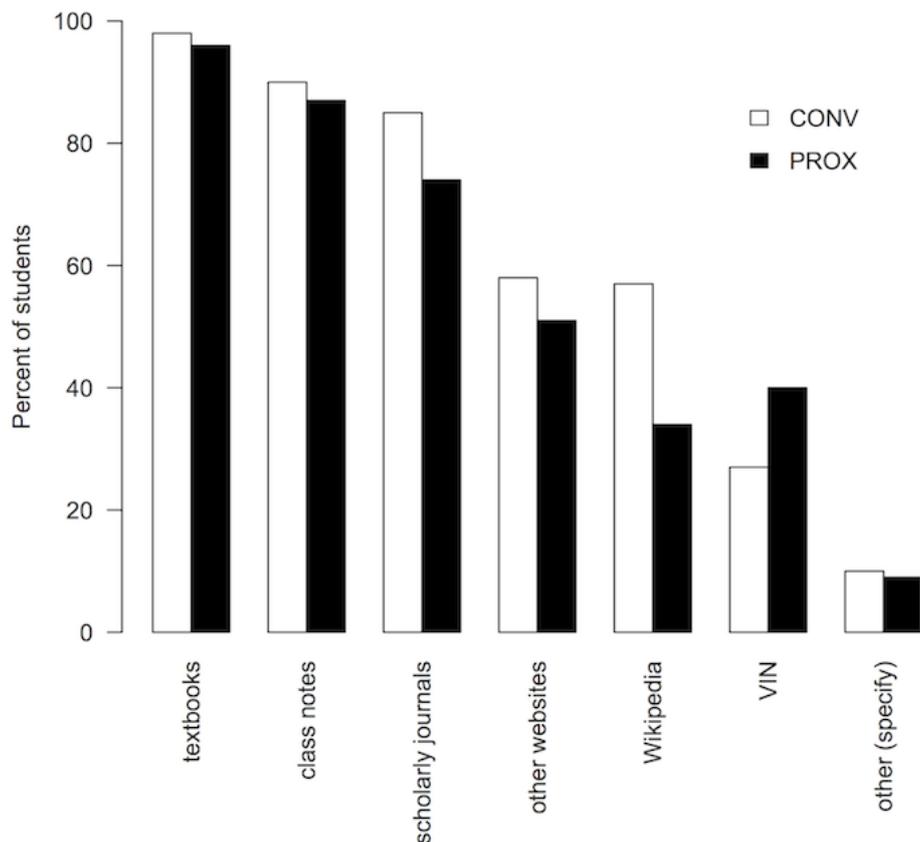


Figure 1. Resources used during a Small Animal Internal Medicine rotation as selected by students in the CONV and PROX groups. Abbreviations: CONV: conventional, meaning Satisfactory / Unsatisfactory scale corresponding to rubric-based numeric scores; PROX: proxy, meaning A-F scale corresponding to rubric-based numeric scores. There was no difference between CONV and PROX groups in these responses ($p = 0.61$)

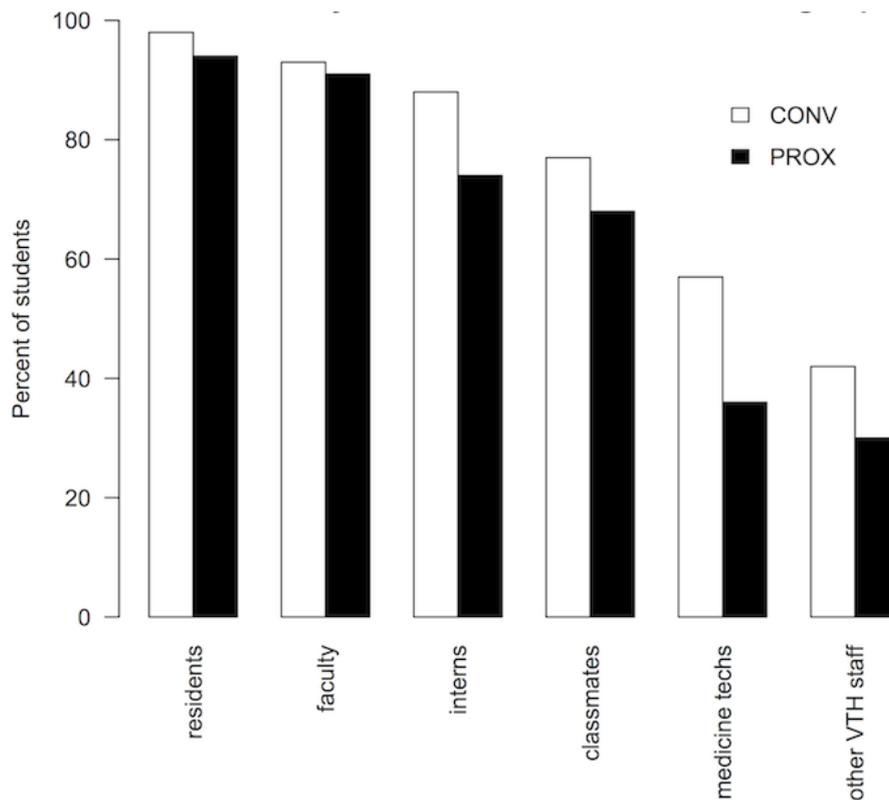


Figure 2. Personnel selected as important to learning during a Small Animal Internal Medicine rotation as selected by students in the CONV and PROX groups. Abbreviations: CONV: conventional, meaning Satisfactory / Unsatisfactory scale corresponding to rubric-based numeric scores; PROX: proxy, meaning A-F scale corresponding to rubric-based numeric scores. There was no difference between CONV and PROX groups in these responses ($p = 0.85$)

Of 14 available responses to the survey question "Which of the following, if any, were factors that motivated you to succeed on the Internal Medicine rotation?" the 3 most commonly selected answers were "Patient care is important to me," an attainment value goal (selected by 97 students, 55 CONV [91.7%], 42 PROX [89.4%]), "I want to be successful in practice," a utility value goal (selected by 91 students, 51 CONV [85.0%], 40 PROX [85.1%]) and "Client relations are important to me," an attainment value goal (selected by 83 students, 47 CONV [78.3%], 36 PROX 76.7%). Two items were purposefully included relating to grade reporting, one in a positive sense focused on a performance-approach Achievement Goal and the other in a negative sense that focused on both a performance-avoidance Achievement Goal as well as an Expectancy value cost. The specific items related to grade reporting, "I knew that I was being evaluated and wanted a high mark" was only selected by 16 students (12 CONV [20.0%], 4 PROX [8.5%]) while "I had a fear of failing the rotation" was selected by 24 students (10 CONV [17%], 14 PROX [30%]) (Table 1). There were no significant differences between PROX and CONV groups in the frequency of selection of these responses ($p = 0.90$). Of 12 available responses to the survey question "Which of the following aspects of the Internal Medicine rotation was the MOST beneficial to your learning and your growth as a future veterinarian?" the 2 most commonly selected answers were "One-on-one discussions with clinicians" (selected by 81 students, 46 CONV [76.7%], 35 PROX [74.5%]), and "Student topic rounds" (selected by 65 students, 40 CONV [66.7%], 25 PROX [53.1%]) (Table 2). There was no significant

difference between PROX and CONV groups in the frequency of selection of these responses ($p = 0.62$). Unsurprisingly, responses to the opposing question, "Which of the following aspects of the Internal Medicine rotation was the LEAST beneficial to your learning and your growth as a future veterinarian?" revealed reverse parallel selections, in that items uncommonly selected as MOST beneficial (Table 2) were commonly selected as LEAST beneficial (i.e. "journal club" and "none of the above").

Table 1. Motivational factors during the Small Animal Internal Medicine rotation as selected by students in the CONV and PROX groups.

	CONV	PROX
patient care is important to me	92%	89%
want to be successful in practice	85%	85%
client relations are important to me	78%	77%
interest in SAIM	47%	43%
didn't want to look unprepared for rounds/cases	43%	53%
plan to pursue internship/residency	27%	23%
wanted to write impressive SOAPs	25%	17%
wanted a high mark	20%	9%
didn't want to look less intelligent	18%	15%
fear of failing rotation	17%	30%
intimidated by clinicians	12%	11%
other (specify)	10%	15%
competitive/want to be seen as best	7%	4%
desire a letter of reference from faculty	7%	9%

Abbreviations: CONV: conventional, meaning Satisfactory/Unsatisfactory scale corresponding to rubric-based numeric scores; PROX: proxy, meaning A-F scale corresponding to rubric-based numeric scores.

Table 2. Beneficial factors for learning during the Small Animal Internal Medicine rotation as selected by students in the CONV and PROX groups

	CONV	PROX
one-on-one clinician discussions	77%	74%
topic rounds	67%	53%
researching/writing SOAPs	48%	38%
preparing for/reading cases	45%	45%
case-based rounds	37%	51%
writing d/c instructions	18%	28%
handling client communication	12%	26%
discussing RDVM consults	10%	9%
performance evaluation feedback	5%	2%
other (specify)	2%	2%
journal club	0%	0%
none of the above	0%	0%

Abbreviations: CONV: conventional, meaning Satisfactory/Unsatisfactory scale corresponding to rubric-based numeric scores; PROX: proxy, meaning A-F scale corresponding to rubric-based numeric scores; RDVM: Referring veterinarian

3.2. Student Performance

Over the 14-month study period, the mean rubric-based performance scores for all (n=157) students increased between the interim (3.76 ± 0.48) and final evaluations (4.14 ± 0.46). This difference was significant for students overall, and for CONV (n=83) and PROX (n=74) groups (all $p < 0.0001$). There was no difference in interim rubric-based performance scores between CONV and PROX groups ($p = 0.69$). There was also no difference in final rubric-based performance scores between CONV and PROX groups ($p = 0.90$).

4. Discussion

In this study, we investigated factors we believed might influence student motivation for learning and performance on a SAIM clinical rotation. Specifically, we considered the possibility that the reporting of letter grades could be a motivating factor. We were able to identify factors that a great majority of students considered motivating. Our data enabled us to reject both the hypothesis that reporting proxy letter grades (A-F) would be associated with improved student performance and the hypothesis that students to whom proxy letter grades were reported would self-report a greater significance of grades as a motivating factor.

Cultivating students into self-driven lifelong learners is a shared goal of many veterinary medical programs in the country; specifically, this goal appears in the Ideal Graduate description at the authors' college and is reflected in the American Veterinary Medical Association Council on Education's core competencies. [32] The process of learning has been described as comprising three components: what to learn (cognitive), why to learn (affective), and how to learn (metacognitive regulation). [33,34] The affective, or motivational, component centers around one's emotional responses to learning and the variables that can promote, hinder, or neutrally maintain one's progress. Motivation refers to the factors that direct goal-oriented behavior and explains the underlying

reasons why actions are activated, sustained, and stopped. [35,36] Both the quantity and quality of motivation experienced can drastically affect learning outcomes associated with cognition and metacognition, and ultimately, the success of the entire educational process. [6] Numerous theories of motivation and its influence over various educational behaviors have been proposed since 1913 with Dewey's "interest versus effort" approach to learning. [35,37] While no one theory has been universally accepted, components of many have contributed to the understanding, development, and evolution of both teaching and learning styles through modern times [35] and a recognized common theme of most theories is the intimate relationship between motivation and learning.

Of the potential motivational factors assessed in the current study, providing excellent patient care and client communication as well as the desire to achieve future success as a practicing clinician were more commonly reported as motivational than was the "fear of failing" or desire to "achieve a high mark." This suggests that factors primarily associated with intrinsic, as opposed to extrinsic, motivation had a greater influence on student performance during the clinical rotation under study in this report. Modern theories of intrinsic motivation refer to the underpinnings of this motivation as Expectancy Value, and sub-classify those into attainment value (importance to identity), utility value (importance to future goals), interest value (importance to learning in areas of native appeal) and opportunity or other costs (neglect of other tasks, anxiety, or possibility of failure). [38,39] The most commonly selected responses in our survey reflected attainment value ("Patient care is important to me" and "Client relations are important to me") and utility value ("I want to be successful in practice"). Conversely modern theories of extrinsic motivation use the terminology Achievement Goals, and sub-classify those into performance-approach goals (desire to demonstrate competence), performance-avoidance goals (desire to avoid demonstration of incompetence), and master goals (desire to learn). The responses associated with grade reporting in our survey included a performance-approach goal ("a high mark") and the performance-avoidance goal or expectancy value cost ("fear of failing the rotation") and these responses were selected by less than a quarter of respondents.

Development of intrinsic motivation is facilitated by students feeling a sense of educational autonomy and, while thought to require more time to develop, produces long-lasting and self-sustaining learning ability. [40,41] Clinical rotations may provide an opportunity for students to develop intrinsic motivation, because the variety in case exposure, client interactions, and small group discussions with instructors can enable students to tailor their approaches to learning, and to emphasize topics and circumstances of personal value. Students in our program are allowed some freedom in selection of cases to manage, which may allow them to choose disease conditions they find personally interesting, thereby promoting their engagement during case management. Similarly, diverse resources and tools to assist their learning are made available each day. In the current study, students reported varying opinions of the "most beneficial" learning tool, suggesting that they were indeed able to tailor their

learning experiences to differing preferences. Advantages of small group learning to aid in understanding and information retention have been reported in human medical training. [42] Not surprisingly and similar to human medical clerkships, resident instructors were found to play an instrumental role in student learning in our study, as they were the primary clinicians managing cases directly with the students. [43] Interestingly, a human medical student's pre-clinical GPA was found to be a more reliable predictor of clinical performance than instruction received or teaching behaviors of instructors during the rotation itself. [43] The caliber of resident instruction was not part of our study, and students completed surveys anonymously, thus the comparative impact of student factors or resident instructor factors could not be assessed.

Clinical rotations represent a unique learning environment for students as rotations are both an opportunity to apply pre-clinical knowledge toward actual patients, and a chance to demonstrate clinical competencies as healthcare providers. Rotation-based teaching can present a pedagogical challenge to instructors, as the pace of continued content delivery to students must be balanced against ongoing assessment of their performance. Faculty evaluation of medical student clinical performance using various methods has been reported to correlate inconsistently with more objective measures such as results from medical board examinations. [14,44,45] Clinical performance assessments are prone to evaluator subjectivity and multiple rater errors that contribute to inconsistencies and reduce the validity of assessments. [46] While competency-based assessment is a frequent topic of research in veterinary education, no single assessment tool has been validated as a gold standard in veterinary medical education. While the validity and reliability of various methods of evaluating outcome-based criteria of student performance have been described [47,48], the impact of how outcomes are reported to students, irrespective of the type of assessment system used, has not been investigated. [15,48] Ultimately the impact of any outcome report depends upon the value that the student places in the information received; that value may be influenced by the manner in which the assessment is conveyed, which is what led to the interest in proxy letter grade reporting in this study. [46,49] While a familiar, standardized criterion-based evaluation form was used in the current study to generate scores that were converted to both official S/U and proxy letter grades (Appendix A), specific content included in such student evaluation forms differs among all clinical services in the authors' hospital. Therefore, students in this hospital may not value the overall scores reported on these diverse forms as much as they value the individual feedback they are provided. Thus both CONV and PROX group students may have overlooked scores (S/U or unofficial proxy letter grades) in favor of specific, descriptive, individualized feedback which could explain why letter grade reporting was not identified as a highly motivating factor among the PROX group. Additionally, as student subjects were aware that only the S/U grades would be recorded on their transcripts, the perceived importance of an assigned proxy letter grade may have been minimal.

The best method of reporting performance evaluations on clinical rotations remains controversial in human medical training and has not been extensively investigated in veterinary medicine. Faculty must balance student academic stress with the obligation to ensure clinical competency prior to graduating veterinarians. [15] While discriminating grade assignment such as a letter-grade system has traditionally been used to communicate assessments of student knowledge or competency, it is typically regarded as favoring extrinsic motivation and its accuracy is limited by modern problems with grade inflation or rater error in clinical settings. [13,46] The adoption of pass/fail evaluations has not been associated with reductions in student achievement and is believed to better foster intrinsic motivation in human medical training. [50] However, some educators express concern that the use of pass/fail grade reporting, as opposed to discriminating grade reporting, impairs instructor ability to identify students in need of remediation because students who barely meet expectations are grouped with those who far exceed expectations. [51] While the current study found no influence of the type of grade reporting system used on either self-reported student motivation or student performance, no conclusions can be drawn regarding what evaluation tool best reflects actual student performance on veterinary clinical rotations as this was not an aim of the study.

This study was limited to the perceptions of students at a single college of veterinary medicine on a single clinical rotation, and so it is possible that the results may not be generalizable to other institutions or rotations. It is unlikely that rater variability influenced the results, because CONV and PROX groups were randomly assigned and all grades were derived using the same criterion-based numeric rubric. Finally, while students were repeatedly assured that questionnaire responses were anonymous, there may still have been an influence of social value bias, meaning that students reported answers that they thought instructors wanted to hear. However, students did demonstrate a willingness to select items that they considered least beneficial to their learning and growth, rather than simply skipping that question, or selecting exclusively "none of the above." This behavior suggests that social value bias was not a substantial influence upon student responses. Questionnaire anonymity did, however, limit the ability to compare differences in an individual student's responses between interim and final evaluations; future investigations into whether motivational factors change over the course of a single rotation period may be valuable.

5. Conclusion

Students on a fourth-year SAIM rotation did not report that proxy letter grade reporting influenced their motivation for clinical performance, and no difference in performance was detected between students to whom proxy letter grades were reported and those to whom only pass/fail grades were reported. Intrinsic and future-directed motivational factors including delivery of excellent patient care and client communication, as well as

perceived relevance of internal medicine to future success as a practicing clinician were most commonly reported as motivational for students.

Footnotes

a. Microsoft Excel® for Mac 2011, version 14.6.4, Microsoft Corporation, Redmond, WA.

b. R, R: A Language and Environment for Statistical Computing, R Development Core Team, 2010, R Foundation for Statistical Computing, Vienna, Austria.

Statement of Competing Interests

The authors have no conflicts of interest to disclose.

Abbreviations

SAIM: small animal internal medicine
 CONV: conventional pass/fail grade reporting
 PROX: proxy letter grade reporting
 S/U: pass/fail

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Appendix A

INTERNAL MEDICINE STUDENT EVALUATION FORM

Faculty: _____ Student: _____ Block: _____
 Report: Interim _____ Final _____ Grade: Satisfactory _____ Unsatisfactory _____ Check if comments on back: _____

Below expectations-1	Needs improvement-2	Acceptable-3	Expected-4	Exceeds expectations-5
Basic medical knowledge and skills				
1 Poor knowledge base and/or consistently fails to study about patients. Poor history and/or physical exam skills.	2 Occasional deficiency in knowledge base/ additional study. Inadequate history and/or physical exam skills.	3 Adequate knowledge base/ additional study. Satisfactory history and/or physical exam skills.	4 Good knowledge base/ studies additional material consistently. Well organized history and thorough PE.	5 Excellent knowledge base for all cases. Superior history, incl. material from patient's notes. Superior physical exam skills.
Clinical proficiency				
1 Consistently fails to identify problem, prepare a plan, or is unable to perform fundamental clinical tasks.	2 Occasional deficiency in problem solving skills. Often unable to perform fundamental clinical tasks.	3 Consistently identifies the major problem, envisions a basic plan, and performs fundamental clinical tasks.	4 Consistently identifies major/secondary problems, envisions a comprehensive plan. Easily performs clinical tasks.	5 Excellent. Interacts independently at advanced (nearly intern) level. Able to perform advanced clinical tasks.
Records (Does not include discharge instructions- see Client Communications)				
1 Consistently fails to properly use POMR format. Records are illogical, incomplete, disorganized or untidy.	2 Problems identified, assessments and plans are occasionally inaccurate. Records occasionally incomplete or disorganized.	3 Adequate. POMR format. No omissions/errors. Identifies patient problems, assesses data and formulates adequate plans.	4 Good. Records complete, prompt, accurate, in POMR format. Good diagnostic/therapeutic plans. Timely, thorough SOAP.	5 Excellent. Concise with minimal grammatical/ spelling errors. Clear/appropriate plans. Timely, thorough SOAP.
Rounds participation				
1 Usually unprepared and lacking a treatment plan. Cannot be engaged in discussions. Displays inadequate knowledge.	2 Occasionally unprepared to present cases. Sometimes lacks treatment plan. Inconsistent participation and knowledge.	3 Adequate ability to present cases and create treatment plans. Displays satisfactory participation and knowledge.	4 Good. Organized and well-researched cases. Adequate treatment planning. Active participation. Satisfactory knowledge.	5 Excellent. Organized/well-researched cases. Excellent planning. Superior participation and knowledge on all cases.

Below expectations–1	Needs improvement–2	Acceptable–3	Expected–4	Exceeds expectations–5
Patient care Ability to conscientiously provide treatments and care; to identify trends and recommend/ initiate improvements in patient care; to address critical care needs of patients.				
1 Through negligence, patients fail to receive treatments/ care. Poor attention to care/ needs. Fails to see new problems.	2 Needs improvement. Occasional oversights/poor organization cause neglect, inadequate care, or treatment administration.	3 Adequate. Provides directed care, but little creative initiative to recommend/ implement measures to maximize care.	4 Good. Consistently conscientious in providing treatments and care. Attentive to critical care needs of patients.	5 Excellent. Shows concern for other patients when colleagues are not available whilst displaying "expected" abilities.
Client communications				
1 Poor client communication skills or opportunities to communicate with clients are consistently missed.	2 Needs to improve on client communication skills or clients complain that they are unaware of progress.	3 Adequate client communication skills overall, considering both verbal and written format.	4 Good client communication skills in both verbal and written formats.	5 Excellent client communication skills in both verbal and written formats
Ethical conduct and Professionalism Attendance, initiative, responsibility, attitude, language, persistence, ability to work harmoniously with others, willingness to help, professional demeanor and dress.				
1 Poor ethical conduct and professionalism.	2 Needs to improve on ethical conduct and professionalism.	3 Demonstrates adequate ethical conduct and professionalism.	4 Demonstrates good ethical conduct and professionalism.	5 Demonstrates excellent ethical conduct and professionalism.
Appreciation for the role of research/Journal club Ability to access, interpret and apply evidence to clinical practice.				
1 Poor ability to utilize evidence or appreciate the role of research in medicine.	2 Needs to improve ability to utilize evidence and appreciate the role of research in medicine.	3 Adequately utilizes evidence for clinical practice. Appreciates the value of research in medicine.	4 Utilizes evidence for clinical practice/ cases. Values current research in veterinary medicine.	5 Excellent utilization of evidence for practice/cases. Seeks out novel data. Familiar with current areas of research.

Appendix B

SMALL ANIMAL INTERNAL MEDICINE: POST-ROTATION STUDENT QUESTIONNAIRE

1. What resources did you utilize while on the Internal Medicine rotation? *(please select ALL THAT APPLY)*
 - Textbooks
 - Scholarly journal articles (print or electronic, e.g. PubMed)
 - Veterinary Information Network (VIN)
 - Class notes
 - Wikipedia
 - Other websites
 - Other _____
 - _____
 - _____
2. On average, how many hours did you spend reading for/writing SOAP's per week?
 - 0-3 hours
 - 3-6 hours
 - 6-10 hours
 - 10+ hours
3. On average, how many hours did you spend researching/preparing for referral or recheck appointments per week?
 - 1-2 hours
 - 2-4 hours
 - 4-6 hours
 - 6+ hours
4. On average, how many hours did you spend researching/preparing for topic-based or case-based rounds per week?
 - 1-2 hours
 - 2-4 hours
 - 4-6 hours
 - 6+ hours
5. Who did you feel played an important role in your learning and your growth as a future veterinarian during this block? *(Please select ALL THAT APPLY)*
 - Faculty members
 - Resident(s)
 - Intern(s)
 - Medicine technician
 - Other hospital staff
 - Classmates

6. Which of the following, if any, were factors that motivated you to succeed on the Internal Medicine rotation? (please select UP TO FIVE)
- Patient care is important to me.
 - Client relations are important to me.
 - I wanted to write impressive SOAPs.
 - I knew that I was being evaluated and wanted a high mark.
 - I plan to pursue an internship/residency training.
 - I have an interest in small animal internal medicine.
 - I am competitive and want to be seen as the best student.
 - I had a fear of failing the rotation.
 - I desire a letter of recommendation from a medicine faculty member
 - I want to be successful in practice.
 - I did not want to look unprepared for rounds or case management.
 - I did not want to look less intelligent than my classmates.
 - I was intimidated by one or more clinicians on service.
 - Other _____

7. Which of the following aspects of the Internal Medicine rotation was the most beneficial to your learning and your growth as a future veterinarian? (Please select UP TO THREE)
- Topic student rounds (Mondays & Wednesdays)
 - Case-based student rounds (Tuesdays & Thursdays)
 - Preparing for and reading about cases
 - Researching and writing patient SOAPs
 - One-on-one discussions with clinicians
 - Feedback from evaluations
 - Discussion of referring veterinarian consultations
 - Journal Club
 - Handling client communications
 - Writing client discharge instructions
 - None of the above
 - Other _____

