



# Virtual Canine Anatomy Improves Student Outcomes in an Undergraduate Domestic Gross Anatomy Course

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## Background

Colorado State University (CSU) is a land grant institution committed to supporting the recruitment and retention of all students by recognizing the inherent value of diversity. There have been significant investments in programs to enhance retention of underrepresented minority and first generation students, including efforts by The Institute for Learning and Teaching (TILT) at CSU to improve courses with poor student success rates.

From 2013-2017 the undergraduate Domestic Animal Gross Anatomy (BMS305) course took part in the TILT Learning Ecologies Course Enhancement program and instituted several curricular and programmatic changes, resulting in improved student success rates.

To better understand the impact of these changes, TILT surveyed the BMS305 students regarding their self-efficacy and use of provided learning resources. Interestingly, higher performing (A/B grade) students self-reported less overall time studying anatomy, but more time in the open lab sessions, while also reporting greater use of CSU's Virtual Canine Anatomy (VCA) software (Figure 1), particularly before laboratory sessions.

## Hypotheses

The primary objective of the study reported herein was to corroborate the student self-reported data from the TILT surveys. To determine if VCA use positively correlates with student course performance, the VCA was embedded into the BMS305 course Learning Management System (Canvas) to track individual student VCA Canvas page views during the Spring 2018 session. The following hypotheses were tested:

- 1) Higher performing students (A/B grade) will have higher total VCA Canvas page views as compared to lower performing students (C/D grade).
- 2) Students who use VCA more frequently within the first three weeks of the course will perform better on the first laboratory practical examination.

## Methods

BMS305 SP18 Canvas VCA page view and course performance data were exported into Microsoft Excel and immediately scrubbed of all subject identifiers. The studies were considered "exempt" by the CSU Institutional Review Board for human subjects. Correlations between VCA page views and student performance were validated with t-tests in Excel, or ANOVA with Tukey's multiple comparisons test in Prism.

## Results

Total course VCA page views (n = students, mean ± SEM) were higher (P=0.04, t-test) among high performing (n = 79, 44.8 ± 3.4) vs. low performing (n = 22, 30.7 ± 3.4) students. Student performance on the first laboratory examination was correlated to VCA page views as early as week 1 (R=0.43, P<0.0001) and the sum of VCA page views by week 3 (R=0.46, P<0.0001).

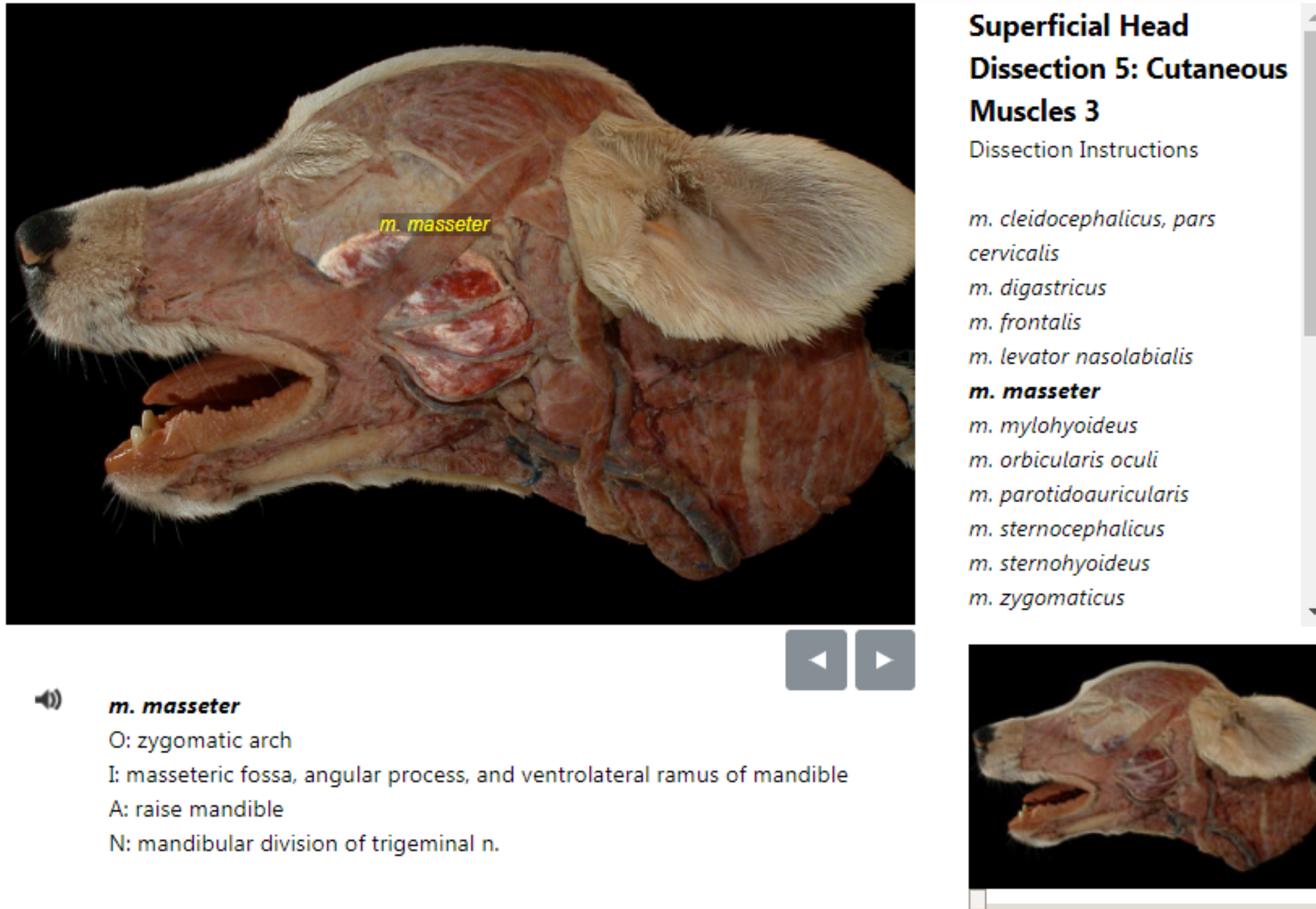
## Conclusion

In large courses, identifying students in need of assistance can be challenging. While VCA use continues to be associated with successful student outcomes, the predictive nature of VCA use early in BMS305 suggests that VCA page views may be used by instructors to identify students who are not effectively engaging in the course, early enough for an intervention to have a positive impact on their course performance.

VIRTUAL CANINE ANATOMY

**Figure 1**

Superficial Head Dissection 5: Cutaneous Muscles 3  
Dissection Instructions



*m. cleidocephalicus, pars cervicalis*  
*m. digastricus*  
*m. frontalis*  
*m. levator nasolabialis*  
***m. masseter***  
*m. mylohyoideus*  
*m. orbicularis oculi*  
*m. parotidoauricularis*  
*m. sternocephalicus*  
*m. sternohyoideus*  
*m. zygomaticus*

**m. masseter**  
O: zygomatic arch  
I: masseteric fossa, angular process, and ventrolateral ramus of mandible  
A: raise mandible  
N: mandibular division of trigeminal n.

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