Bridging the Gap:

Comparing Employer and Educator Expectations in Small Animal Dentistry

Brock Akerman, Hanan Ali, Taylor Cesarski

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1 Abstract

2 Introduction

Dr. Mariea Ross-Estrada, a faculty member at North Carolina State University's College of Veterinary Medicine, is exploring whether there are differences between the expectations of small animal primary care veterinary employers and veterinary educators regarding new graduates' competencies in dentistry. Through her own professional experience and conversations with colleagues, Dr. Ross-Estrada observed that many veterinarians must rely on on-the-job training to gain the skills necessary in small animal dentistry. These shared experiences prompted her to investigate whether there is a misalignment in what is taught in veterinary programs and what is expected in clinical practice.

To explore this question, Dr. Ross-Estrada distributed two surveys: one to medical directors and private practice owners and the other to primary care veterinary educators. Both surveys included similar questions regarding what early-career veterinarians are expected to have learned during their education and the skills they are expected to perform in practice.

2.1 Research Question

How do small animal primary care employers (medical directors and practice owners) and primary care veterinary educators differ in regards to their expectations of early career veterinary graduates' competencies in small animal dentistry?

2.2 Statistical Questions

1. Are there significant differences between educators and practice owners in their belief that new graduates are competent in key dental skills on their first day of practice?

2. Is there a difference between educators and practice owners in their reports (educators' actual teaching vs. owners' perceptions) of which dental skills were taught in the pre-clinical DVM curriculum for recent graduates?

3. Is there a difference between educators and practice owners in their level of agreement about whether specific dental skills should be taught pre-clinically?

4. Do employers and educators differ in their expectations about how many dental procedures new graduates should complete during clinical training?

5. Is there difference between the instructional formats in dentistry reported by DVM programs and the formats perceived by employers to have been completed by early career veterinarians?

6. Do educators and employers differ in their views on which formats of clinical instruction in dentistry should be required for DVM students as part of their clinical training?

7. Is there a difference between the clinical dentistry skills that educators report DVM students are learning during their clinical training and the skills that employers believe recent graduates have completed as part of their DVM program?

8. Do educators and employers differ in their opinions about which clinical dentistry skills DVM students should be required to practice or learn during their clinical training?

3 Data

3.1 Data Description

Two separate surveys were administered to mutually exclusive groups: veterinary employers who have worked with students, and educators who have taught students. There was no overlap between these groups and they can be assumed to be independent.

The employer data set consists of responses from 29 participants answering 40 questions, while the educator data set includes 43 participants answering 34 questions. Each group was asked a single qualifying question to determine eligibility for participation, along with nine questions covering demographics and institutional context. Educators were then presented with 24 competency and sentiment-based questions, while employers answered 30 such items focused on professional expectations and training in veterinary medicine.

Survey questions took several forms. Some were binary (Yes/No), particularly those related to demographics and institutional affiliation. Others used a "select all that apply" format, commonly seen in questions asking respondents to identify procedures performed at their practice. Many of these questions were followed by Likert-scale items. The Likert scales were even-numbered and omitted a neutral option, which may have contributed to at least two instances where respondents selected both "agree" and "disagree" for the same item.

Several questions offered an "Other" response with a text box for elaboration. A few required numeric input, such as estimates of hours worked or the number of practicing veterinarians. These integer fields were not restricted by any upper bound, regardless of contextual reasonableness.

Survey completion time differed by group. Educators, on average, spent more time completing the survey than employers. While no follow-up question asked participants to explain their response time, this discrepancy may reflect greater engagement or a tendency for more elaborated responses among educators. It may also suggest a greater willingness among educators to participate more thoughtfully. The box plot below illustrates the distribution of survey duration (in minutes) by group.

Survey Completion Time by Group
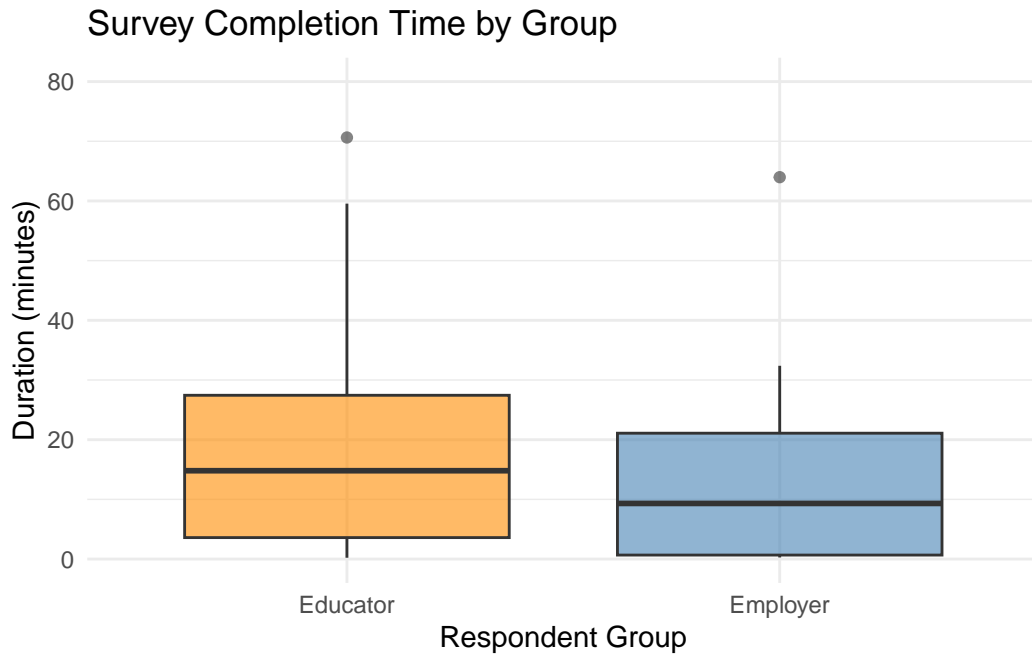
Regarding the proportion of the survey completed, employer responses were more variable—spanning the full range from partial to full completion. In contrast, educators tended to complete more of the survey, with a concentration near full completion and a less pronounced left tail. The density plot below visualizes these differences in survey progress across groups.

Survey Progress Density by Group
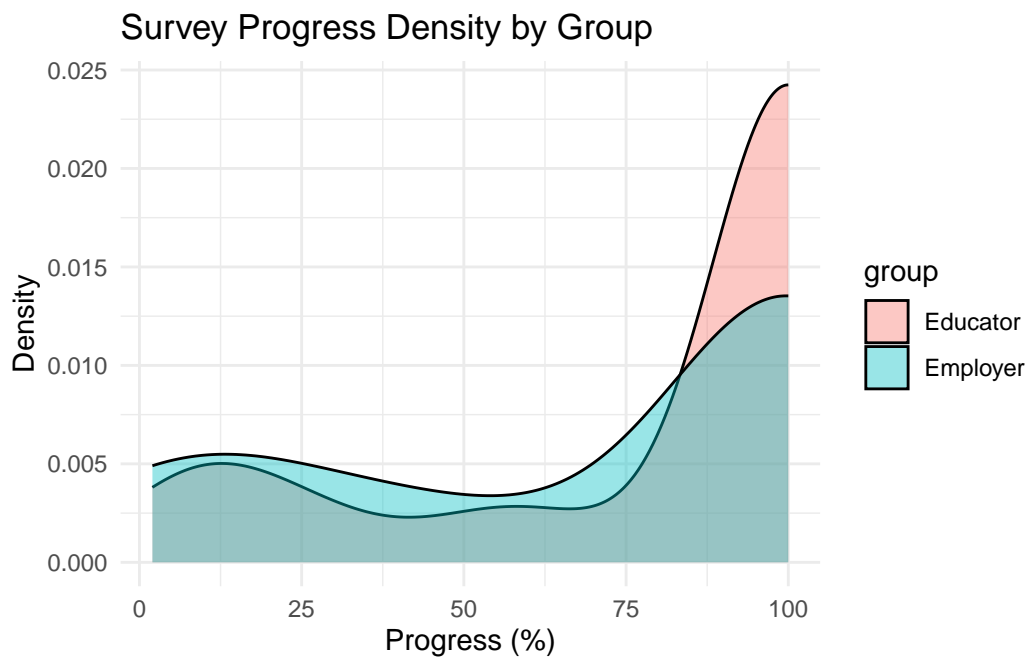
```
#SPACER FOR MORE ANALYTICS
From the educators dataset we could talk about:
* Q27; How long have you been teaching DVM students in the clinical training portion of a DV
* Q28; Does your institution have a teaching hospital?
* Q29; On average, how many dental procedures does your primary care service perform each we


#SPACER FOR MORE ANALYTICS

From the employers dataset we could talk about:
* Q33; Which of the following best describes your job setting or organization?
* Q36; On average, how many dental procedures does your practice/oganization/institution per
* Q37; Which of the following best describes the person who completed this survey?
```

3.2 Data Source

Survey data were collected using Qualtrics, a cloud-based experience management platform commonly used for gathering feedback and sentiment across workforce domains. Participants from the educator survey were recruited via email invitation sent by the researcher, using pre-existing contact lists. Dr. Ross-Estrada distributed the employer survey to her personal and professional networks online. Participation was voluntary and anonymous. There was no incentive offered for completing the survey.

3.3 Preprocessing Description

Although the employer and educator data sets shared a similar structure, they were not identical. Most pre-processing steps were applied uniformly across both data sets, with minor deviations where needed.

The data sets were imported into the RStudio environment (version 2024.04.1 Build 748). A new variable was created to label the data source ("Educator" or "Employer") for later grouping and visualization. The existing respondent_id column served as a unique identifier and was treated as the primary key.

Initial cleaning involved removing extraneous metadata included by Qualtrics—such as survey start and end times, IP addresses, geolocation data, and question display logic—all of which were irrelevant to the analysis. These columns were trimmed to streamline the dataset for subsequent transformation and statistical work.

Column names in the original Qualtrics export were alphanumeric but often ambiguous and misleading. Many variable names did not match the corresponding survey question numbers. Our team manually mapped the exported column names to their corresponding survey questions and responses by referencing adjacent metadata fields and using deductive reasoning. This process allowed us to build an index-based column naming structure, which greatly improved the manageability and interpretability of the dataset.

Before diving into question-specific analysis, we first identified the subset of survey questions relevant to our research objectives. All unrelated or out-of-scope items were removed. This step reduced the employer dataset from 176 columns to 100, and the educator dataset from 171 columns to 102.

Several formatting inconsistencies also needed to be resolved. Some multi-select questions appeared in the form of comma-separated text responses within a single column, while others were exported into multiple

binary columns. Additionally, for certain questions, a response option that received zero selections was dropped entirely by Qualtrics. To standardize these issues, we implemented a script to "explode" comma-separated responses into individual binary columns. For dropped columns, we manually reintroduced them as zero-filled dummy variables to preserve the full response structure.

Finally, we filtered out participants who answered less than half of the survey. We also excluded:

- Employers who responded "No" to the question: "Do you work with early career veterinarians (someone who has graduated from a DVM program after May 2021)?"

- Educators who responded "No" to: "Do you teach in any capacity of the dental curriculum at your institution?"

After all preprocessing steps, the final cleaned datasets consisted of 13 employer participants and 30 educator participants.

4 Statistical Methods

4.1 Method Description

Likert scale questions (statistical questions #1,3, 6, and 8): These questions utilize a likert scale to answer Strongly Agree, Agree, Disagree, or Strongly Disagree on a variety of skills and procedures. To analyze this data, we will use diverging stacked bar charts and tables for exploratory data analysis and the Mann-Whitney U Test for the formal hypothesis procedure. The Mann-Whitney U Test is a non-parametric test that does not rely on an assumption of normality. It does require independence between datasets and it is reasonable to assume that the educators and employers were independent from each other when taking the survey. The Mann-Whitney test particularly works well with these questions due to the ordinal (and therefore ranked) nature of the data.

Select all that apply questions (statistical questions #2, 5, and 7): These questions asked the participants to "select all that apply" as it relates to skills in pre-clinical curriculum, format of dental instruction, and skills for clinical training respectively. We will utilize frequency tables and bar plots to explore the data for these questions and use Fisher's Exact Test as a formal inference procedure for the comparison of the two groups. Fisher's Exact Test works with categorical data with independent samples, in this case educators and employers. In this context, it is preferred over Chi-Squared Tests due to the small sample size and therefore not meeting the expected count threshold that is required to proceed with Chi-Squared Tests. Given the small sample sizes, we acknowledge the limited power of these analyses and may consider post hoc power analyses for these tests.

Numerical entry questions: (statistical question #4): This question asks participants to enter a number related to the number of dental procedures that should be completed during training in different areas. We plan to produce box plots and/or histograms to visually examine the data. Depending on the normality or lack thereof of the distributions, we will then conduct either a two-sample t-test or a Mann-Whitney U Test. As mentioned above, the Mann Whitney U test is a non-parametric test that does not depend on the assumption of normality. If the assumption on normality is met, we can consider a two-sample t test for this analysis.

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5 Results

5.0.1 S1 Are there significant differences between educators and practice owners in their belief that new graduates are competent in key dental skills on their first day of practice?

5.0.2 S2 Is there a difference between educators and practice owners in their reports (educators' actual teaching vs. owners' perceptions) of which dental skills were taught in the pre-clinical DVM curriculum for recent graduates?

5.0.3 S3 Is there a difference between educators and practice owners in their level of agreement about whether specific dental skills should be taught pre-clinically?

5.0.4 S4 Do employers and educators differ in their expectations about how many dental procedures new graduates should complete during clinical training?

5.0.5 S5 Is there difference between the instructional formats in dentistry reported by DVM programs and the formats perceived by employers to have been completed by early career veterinarians?

Both educators and employers were asked a question relating to the format of instruction during the clinical year.

Employers were asked: "What format of clinical instruction in dentistry do you believe that the early career veterinarians (individuals who have graduated from a DVM program after May 2021) hired into your practice/organization/institution completed as part of their DVM training? Select all that apply."

Educators were asked: "What format of instruction in dentistry does your DVM program provide during the clinical year? Select all that apply."

Since the question was of the format "select all that apply," participants were able to select more than one response and percentages will not add to 100%. Results reported below are the percentages of their respective group (educators or employers) that selected the given format of instruction. Percentages were utilized due to the difference in sample size.

Educators and employers differed in their perceptions of clinical dental instruction formats completed by early career veterinarians. While a majority in both groups acknowledged didactic instruction, educators reported higher rates of wet lab (73.3% vs. 46.2%) and live patient training (93.3% vs. 38.5%) compared to employers. Conversely, employers more frequently identified simulation training (30.8% vs. 16.7%) than educators. These differences suggest varying expectations or awareness between the two groups regarding dental training experiences of recent graduates.

Perceived Clinical Instruction Formats in Dentistry
Completed by Early Career Veterinarians
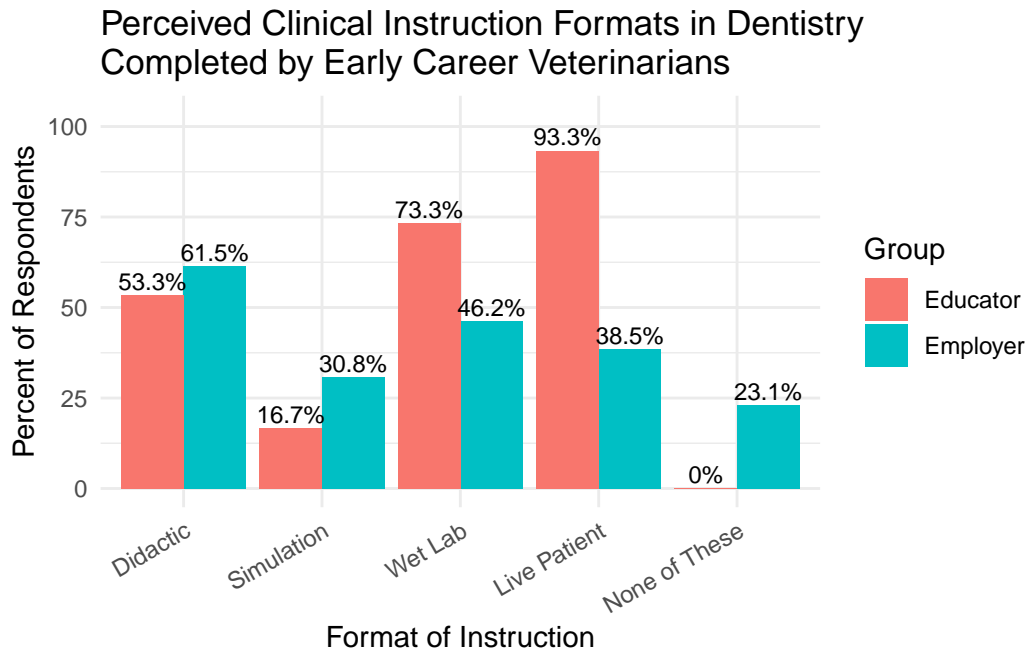
5.0.6 S6 Do educators and employers differ in their views on which formats of clinical instruction in dentistry should be required for DVM students as part of their clinical training?

In question #21 of the employers version of the survey, participants were asked, "Which of the following types of *clinical instruction in dentistry* do you think that DVM students should be required to complete as part of a *DVM program*? Select one response for each of the instructional types listed below." The analogue of this question for educators was survey question #17. We want to make a note that the educators survey question had a slight variation in phraseology. It asked, "Which of the following types of *instruction* do you think DVM students should be required to complete as part of their *clinical training*? Select one response for each type of instruction listed below.".

This question is targeting how participants feel about what dental veterinarian medical programs are teaching and what topics should be required in their curriculum. The research question asked if there was a difference in opinions on this matter. To infer from the data, we will use the Mann-Whitney U-Test, a non-parametric test also known as Wilcoxin Rank Sign Test. This test assumes mutual exclusivity between groups.

```
       question     W     p_value significance
Q17_01   Q17_01 138.5 0.414724985           ns
Q17_02   Q17_02 108.0 0.362883946           ns
Q17_03   Q17_03 162.0 0.712880664           ns
Q17_04   Q17_04 263.5 0.002740855           **
Q17_05   Q17_05    NA          NA         <NA>
Q17_06   Q17_06    NA          NA         <NA>
Q17_07   Q17_07    NA          NA         <NA>
```

5.0.7 S7 Is there a difference between the clinical dentistry skills that educators report DVM students are learning during their clinical training and the skills that employers believe recent graduates have completed as part of their DVM program?

5.0.8 S8 Do educators and employers differ in their opinions about which clinical dentistry skills DVM students should be required to practice or learn during their clinical training?

In question #26 of the employers version of the survey, participants were asked, "Which of the following skills do you think that DVM students should be required to practice/learn as part of the clinical training portion of a DVM program? Select one response for each of the skills listed below." The analogue of this question for educators was survey question #21

This question hits at the sentiment on what both groups think should be required practice/learnings for students. The research question asked if there was a difference in opinions on this matter. To infer from the data, we will use the Mann-Whitney U-Test, a non-parametric test also known as Wilcoxin Rank Sign Test. This test assumes mutual exclusivity between groups.

```
        question     W    p_value significance
Q21_01    Q21_01 139.0 0.62171592           ns
Q21_02    Q21_02 157.0 0.71723375           ns
Q21_03    Q21_03 126.5 0.19379896           ns
Q21_04    Q21_04 156.0 0.76158684           ns
Q21_05    Q21_05 148.5 1.00000000           ns
Q21_06    Q21_06 127.5 0.32836731           ns
Q21_07    Q21_07 104.5 0.04863265            *
Q21_08    Q21_08 104.5 0.04892603            *
Q21_09    Q21_09 115.5 0.07564530            .
Q21_10    Q21_10 115.5 0.07587786            .
Q21_11    Q21_11  54.0 0.20728866           ns
Q21_12    Q21_12    NA         NA         <NA>
Q21_13    Q21_13    NA         NA         <NA>
Q21_14    Q21_14    NA         NA         <NA>
```

```
  view(Educator_Data_Clean %>% select(starts_with("Q17")))
  view(Employer_Data_Clean %>% select(starts_with("Q21")))
```

5.1 Findings

5.2 Statistical Analysis

6 Discussion/Conclusion

6.1 Interpretation of Results

6.2 Implications of the Study

6.3 Limitations

6.4 Recommendations

6.5 Summary of Key Findings

6.6 Final Thoughts

7 Appendix