

# Bridging the Gap:

## Comparing Employer and Educator Expectations in Small Animal Dentistry

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# **1 Abstract**

## **2 Introduction**

### **2.1 Purpose of project**

### **2.2 Study details**

## **3 Data**

### **3.1 Data Description**

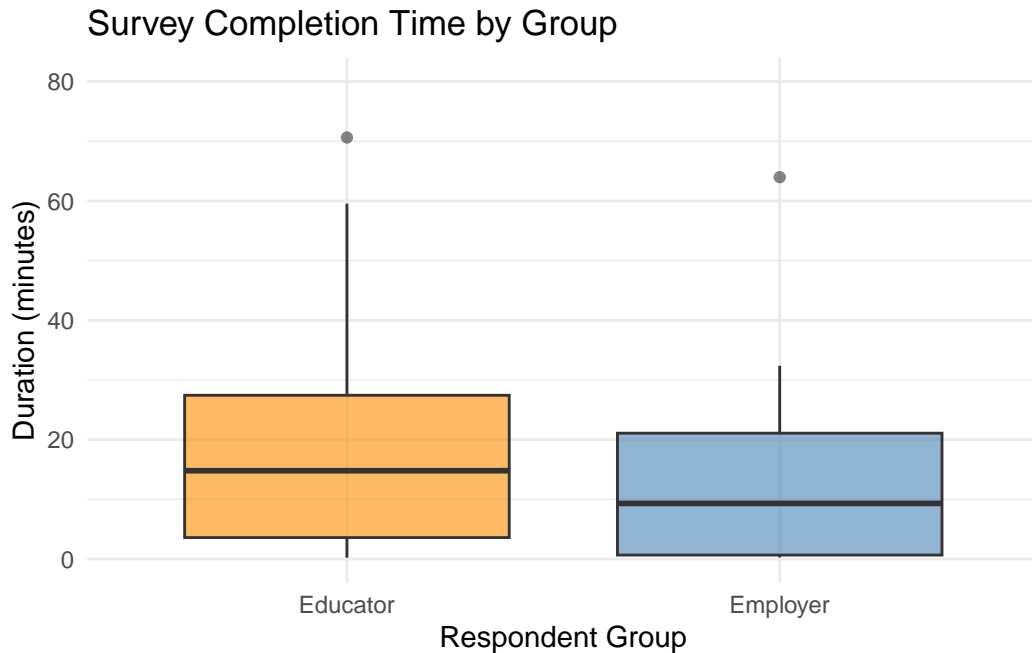
Two separate surveys were administered to mutually exclusive groups: veterinary employers who have worked with students, and educators who have taught those students. There was no overlap between these groups—no evidence suggests that any surveyed student was both taught by an educator and later employed by a participating employer.

The employer dataset consists of responses from 29 participants answering 40 questions, while the educator dataset 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.

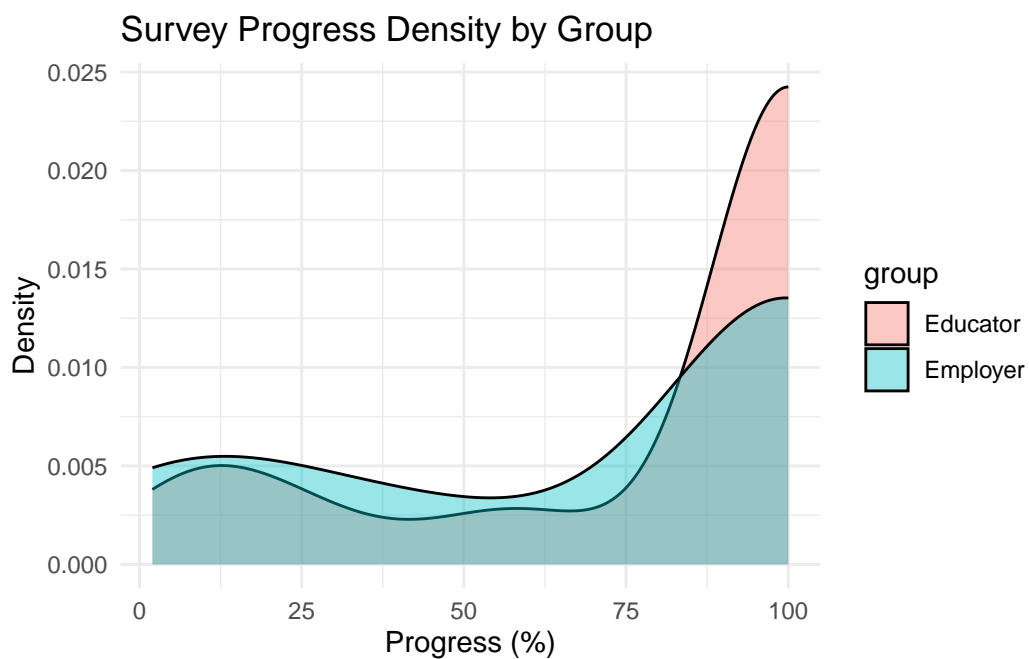
Survey questions took several forms. Some were binary (Yes/No), particularly those related to demographics and institutional affiliation. Others used a “select all that apply” format, commonly seen in questions asking respondents to identify procedures performed at their practice. Many of these questions 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.



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.



#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 DVM p
* Q28; Does your institution have a teaching hospital?
* Q29; On average, how many dental procedures does your primary care service perform each week
```

```
#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/organization/institution perfor
* 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 were recruited via email invitation sent by the researcher, using pre-existing contact lists. Participation was voluntary and anonymized.

## 3.3 Preprocessing Description

Although the employer and educator datasets shared a similar structure, they were not identical. Most preprocessing steps were applied uniformly across both datasets, with minor deviations where needed.

The datasets 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 Research Question Answered

**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?**

#### Statistical Questions

**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?

**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?

**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?

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

**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?

**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?

**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?

**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?

## 4.2 Method Description

Statistical questions #1,3, 6, and 8 all deal with participants utilizing 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.

Statistical questions #2, 5, and 7 were all questions that 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.

Statistical question #4 asks participants to enter numerical entries related to the number of dental procedures that should be completed during training in different areas. We plan to produce boxplots 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.

## 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?**
- 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. 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>

Warning in FUN(X[[i]], ...): NAs introduced by coercion

```
Q17_05 Q17_06 Q17_07
      3      1      0
```

Warning in FUN(X[[i]], ...): NAs introduced by coercion

```
Q21_05 Q21_06 Q21_07
      1      1      0
```

# A tibble: 13 x 7

	Q21_01	Q21_02	Q21_03	Q21_04	Q21_05	Q21_06	Q21_07
	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>
1	3	3	4	4	<NA>	<NA>	<NA>
2	4	3	4	4	<NA>	<NA>	<NA>
3	4	4	4	4	<NA>	<NA>	<NA>
4	3	3	4	4	<NA>	<NA>	<NA>
5	4	<NA>	3	3	<NA>	<NA>	<NA>
6	3	4	4	3	<NA>	<NA>	<NA>
7	4	4	4	4	<NA>	<NA>	<NA>
8	4	4	4	4	<NA>	<NA>	Repeated labs and exposure through~
9	4	2	4	3	1	<NA>	<NA>
10	4	4	4	3	<NA>	4	Live patient only if they are adop~
11	4	4	4	4	<NA>	<NA>	<NA>
12	3	2	4	3	<NA>	<NA>	<NA>
13	3	3	4	4	<NA>	<NA>	<NA>

Warning in FUN(X[[i]], ...): NAs introduced by coercion

```
Q17_05 Q17_06 Q17_07
      3      1      0
```

Warning in FUN(X[[i]], ...): NAs introduced by coercion

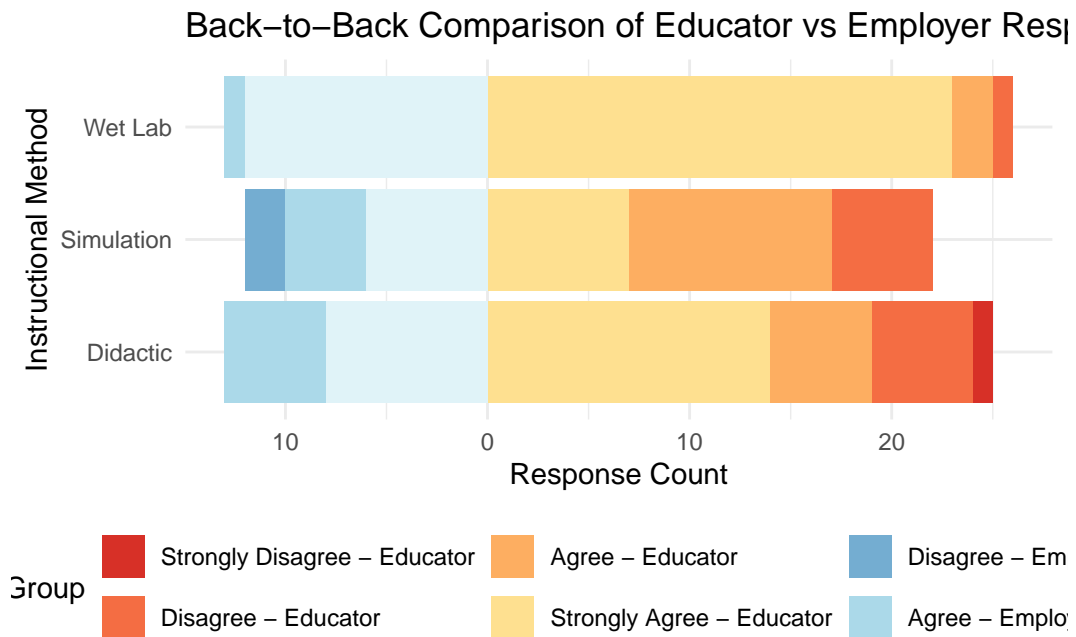
```
Q21_05 Q21_06 Q21_07
      1      1      0
```

# A tibble: 13 x 7

	Q21_01	Q21_02	Q21_03	Q21_04	Q21_05	Q21_06	Q21_07
	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>
1	3	3	4	4	<NA>	<NA>	<NA>
2	4	3	4	4	<NA>	<NA>	<NA>
3	4	4	4	4	<NA>	<NA>	<NA>
4	3	3	4	4	<NA>	<NA>	<NA>
5	4	<NA>	3	3	<NA>	<NA>	<NA>
6	3	4	4	3	<NA>	<NA>	<NA>
7	4	4	4	4	<NA>	<NA>	<NA>



8	4	4	4	4	<NA>	<NA>	Repeated labs and exposure through~
9	4	2	4	3	1	<NA>	<NA>
10	4	4	4	3	<NA>	4	Live patient only if they are adop~
11	4	4	4	4	<NA>	<NA>	<NA>
12	3	2	4	3	<NA>	<NA>	<NA>
13	3	3	4	4	<NA>	<NA>	<NA>



Warning in .f(.x[[i]], .y[[i]], ...): NAs introduced by coercion

Warning in .f(.x[[i]], .y[[i]], ...): NAs introduced by coercion

```
# A tibble: 7 x 4
  question      W p_value significance
  <chr>      <dbl>   <dbl>   <fct>
1 Q17_01    138.  0.415    ns
2 Q17_02    108.  0.363    ns
3 Q17_03    162.  0.713    ns
4 Q17_04    264.  0.00274 **
5 Q17_05     NA   NA      <NA>
6 Q17_06     NA   NA      <NA>
7 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**