



# Which Came First, the Chicken or the “Superbug”?

## Change in Student Perceptions of Antibiotic Resistance

Ella Lee<sup>1</sup>, Hannah Creasey<sup>2</sup>, Lisa Wiltbank<sup>3</sup>, Kimberly Booth<sup>3</sup>

<sup>1</sup>South Dakota State University, <sup>2</sup>Lewis & Clark College, <sup>3</sup>North Dakota State University



### Do students relate biological concepts to real-life decisions?

- Every year 2 million Americans fall ill to antibiotic-resistant infections (CDC). Because the majority of people in society are not scientists, teaching non-major biology students about antibiotic resistance is critical.
- An introductory biology class for non-major students was used to examine student understanding of the mechanisms of antibiotic resistance and how it relates to real life scenarios.
- This project evaluates the effect of instruction on student understanding of antibiotic resistance, as well as the rationale behind the choices they were asked to make.

### How were real-life decisions assessed?

- A survey was collected before instruction, after instruction, and at the end of the semester (10 weeks later.)
- Instruction covered mechanisms of antibiotics and antibiotic resistance through videos, small group discussions, and case studies.
- Focus question:
 

**“You are contemplating buying one of two chicken breasts: one from a chicken that was given food containing antibiotics and one not. Will you choose the chicken that was not fed antibiotics rather than the chicken that was fed antibiotics? Why or why not?”**
- Responses were analyzed by which chicken breast was chosen as well as by student rationale. Rationale was categorized into themes shown in *Table 1* by two coders with an inter-rater kappa averaging 0.79. Any discrepancies were discussed until 100% agreement was reached.

### Students were unsure of the effects of antibiotic use in livestock.

Table 1.

Theme:	Student references:
Antibiotic Resistance	Antibiotic resistance, its mechanisms, or the overuse of antibiotics.
Meat Quality Harmed by Abx	That they don't want a chicken that has been sick, or that meat raised without antibiotics is healthier or better quality.
Meat Quality Improved by Abx	The assumption that chickens raised with antibiotics were healthier, or that the meat was safer for consumption.
Availability	Cost, routine, or ease of access to antibiotic free chicken as a reason for their choice.
Prefers "natural", "organic", etc.	Preference for "natural", or "organic" chicken or claimed they did not like the idea of using antibiotics in chicken.
No Preference	There is no difference between chicken raised with or without antibiotics.
Vague	Student did not make a choice or left no reasoning for their choice.

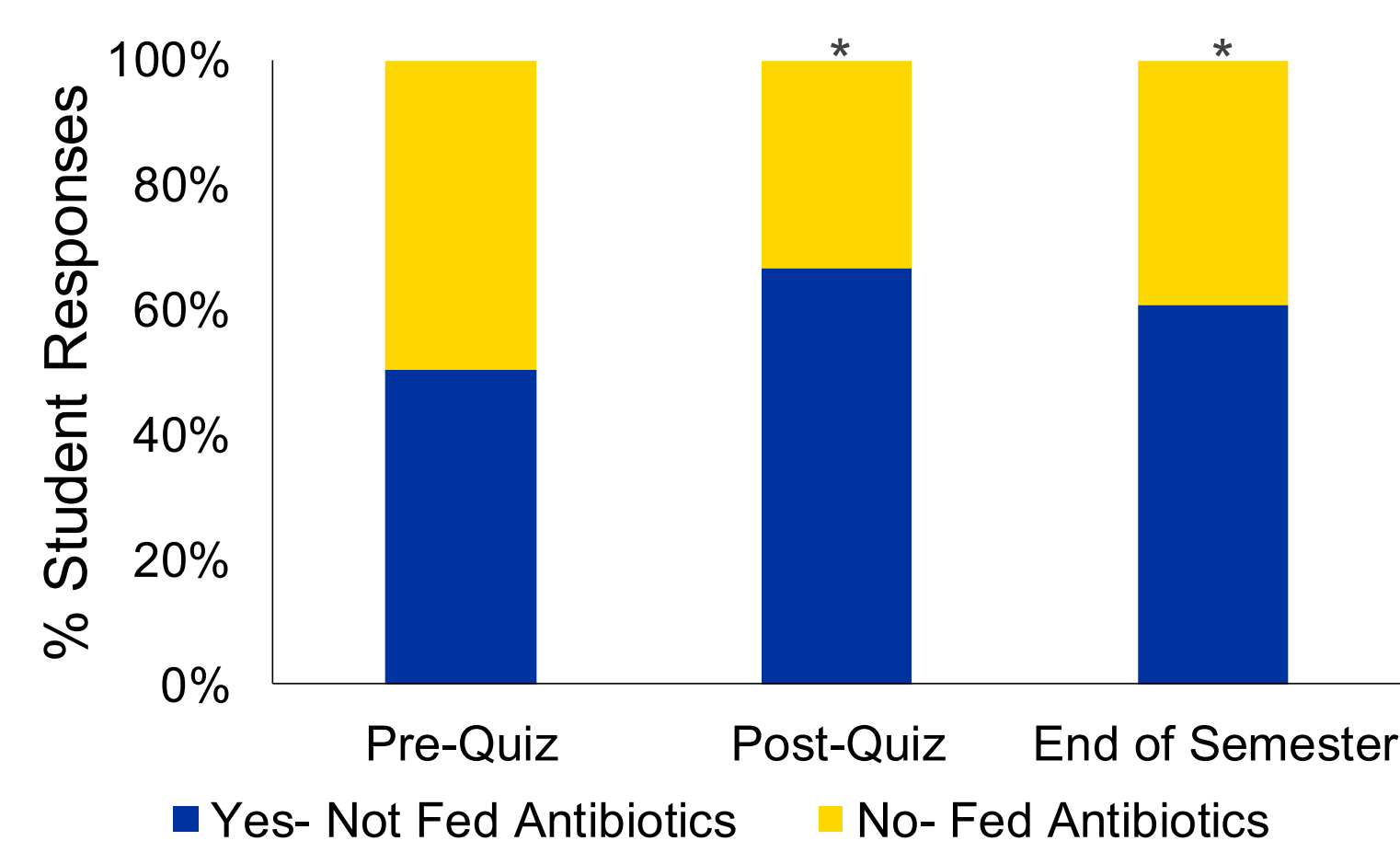
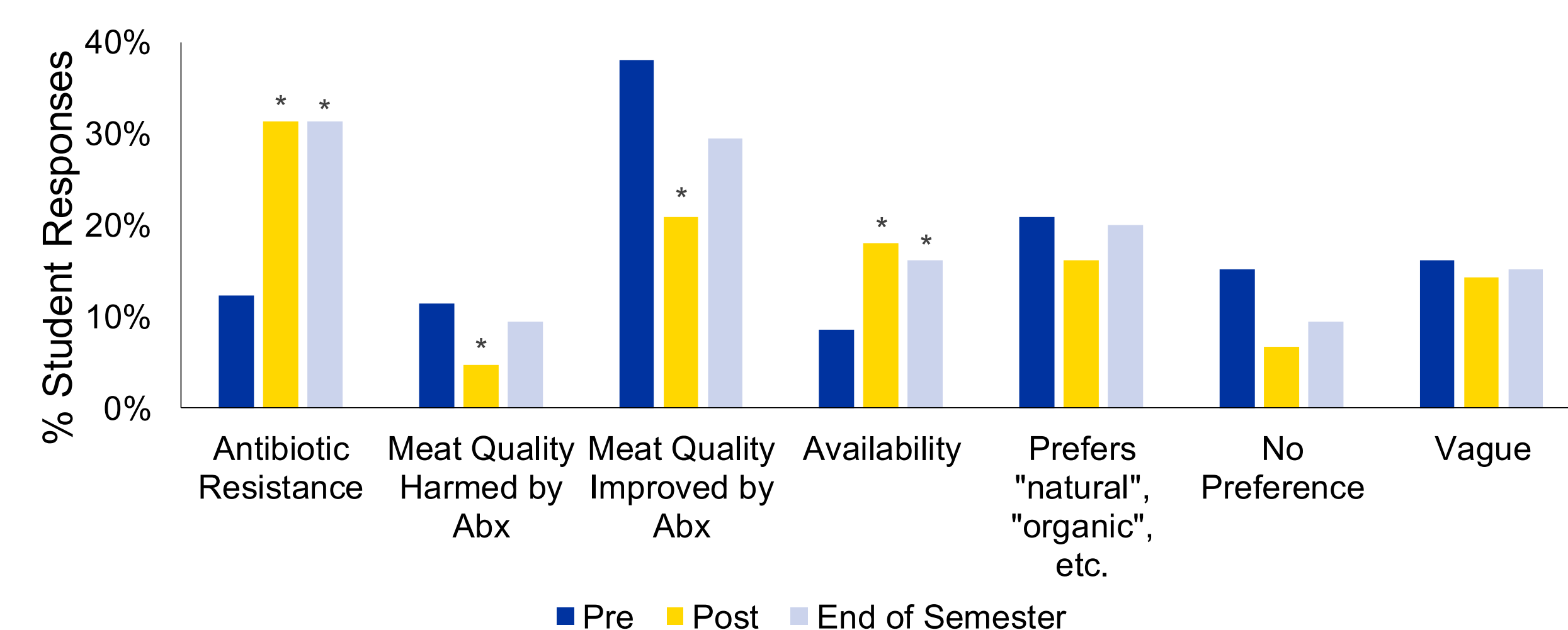


Figure 1. (left) Yes/ No responses through all surveys. n=105

Figure 2. (below) Frequency of themes through all surveys. n=105

\* denotes statistically significant change from the pre-survey



- Instruction decreased the frequency of students who would choose antibiotic fed chicken. (*Figure 1*)
- Choosing the chicken raised without antibiotics would limit the overuse of antibiotics in livestock and subsequent antibiotic resistance.
- Student mentions of antibiotic resistance doubled after instruction, and the effect lasted through the end of the semester. (*Figure 2*)

### What were students thinking?

#### How often do students use buzzwords to describe the chicken?

- Students mentioned buzzwords more in the pre-survey. (*Table 2*)
- Students used buzzwords to explain their rationale when they don't have formal instruction about the science of raising chicken with antibiotics.
- “Natural” was the most prevalent word in all surveys, but its use decreased after instruction. (*Figure 3*)

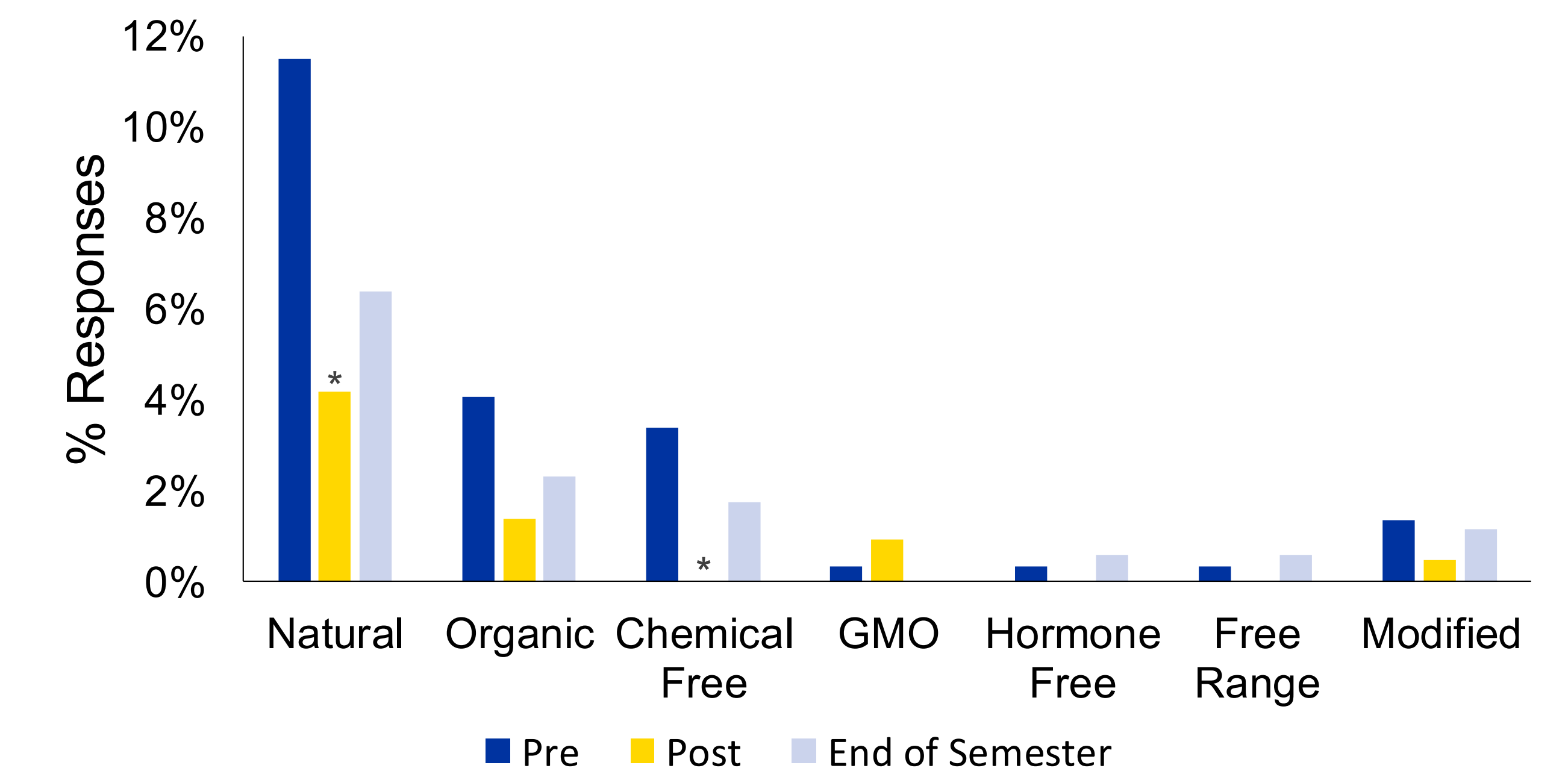


Figure 3. Student mentions of specific buzzwords by survey. \* denotes statistically significant change from the pre-survey.

Table 2. Overall use of buzzwords in student responses. Pre-survey to Post-survey change and Pre-survey to End of Semester changes were statistically significant.

Survey	Sample Size	Buzzword Mentions	% of Sample
Pre	n=295	63	21%
Post	n=215	15	6.97%
End of Semester	n=172	22	12.79%

#### Are student references of antibiotic resistance scientifically accurate?

- In the pre-survey, more students correctly mentioned antibiotic resistance than incorrectly mentioned antibiotic resistance. (*Figure 4*)
- Mentions of antibiotic resistance, whether correct or incorrect, increased after instruction. (*Figure 4*)
- The instruction had little effect on student fears that chicken antibiotics could transfer to them and possibly have a negative effect. (*Figure 4*)

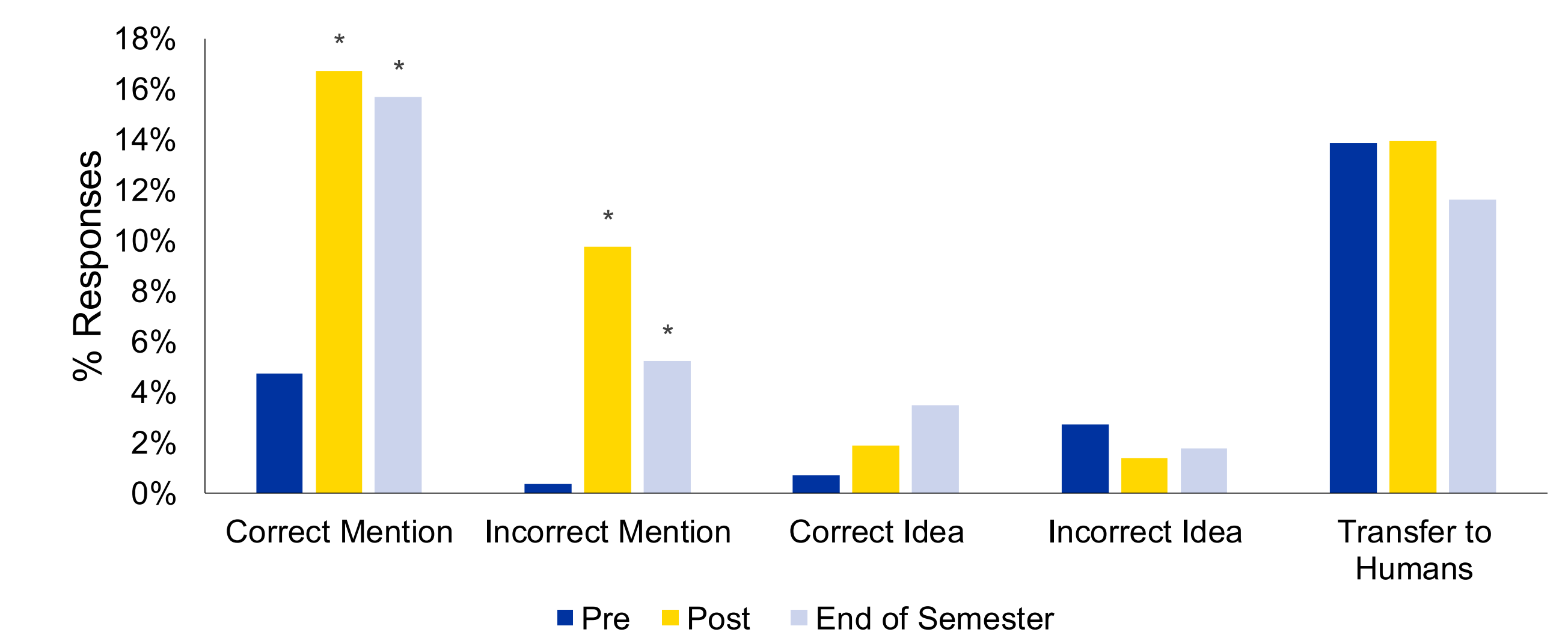


Figure 4. Accuracy of student mentions of antibiotic resistance & frequency of student mentions of antibiotics transferring from chickens to humans. \* denotes statistically significant change from the pre-survey.

### Students made the “right” choice, but their reasoning was often inaccurate.

- The instructor's goal of increasing awareness of antibiotic resistance was achieved, more students chose to buy chicken raised without antibiotics after instruction. (*Figure 1*)
- Many students used buzzwords incorrectly throughout all surveys, possibly because they are common marketing words used on food products, and most have strong connotations. (*Figure 3*)
- Students used antibiotic resistance in their reasoning more after instruction, although they were not always scientifically accurate. (*Figure 4*)
- Recommendations for instruction:
  - Utilize original survey responses for class discussions of common student misunderstandings of antibiotic resistance.
  - Address the probability of antibiotics transferring to humans.
  - Discuss commonly used buzzwords and their scientific meaning to create more informed consumers.

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