

Vaxx Facts: The Need for Evidence-Based Decision Making

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Intro Not all individuals, such as those who are immunosuppressed, are equally susceptible to common illnesses. These individuals must rely on something called "**herd immunity**". High vaccination rates make it harder for microbes to spread between individuals and stop outbreaks¹. For example, a vaccination rate of 80-90% is needed to reach herd immunity for the influenza virus. However, each virus treated by the MMR vaccine has its own herd immunity vaccination rate.²

We need our citizens to make decisions confidently on a foundation built around evidence when presented with socio-scientific issues. Vaccination is one example of these types of issues. The class surveyed for this study consisted of all non-Biology majors. The majority of the world population are also non-Biology majors, which makes this sample very reflective of the larger population.

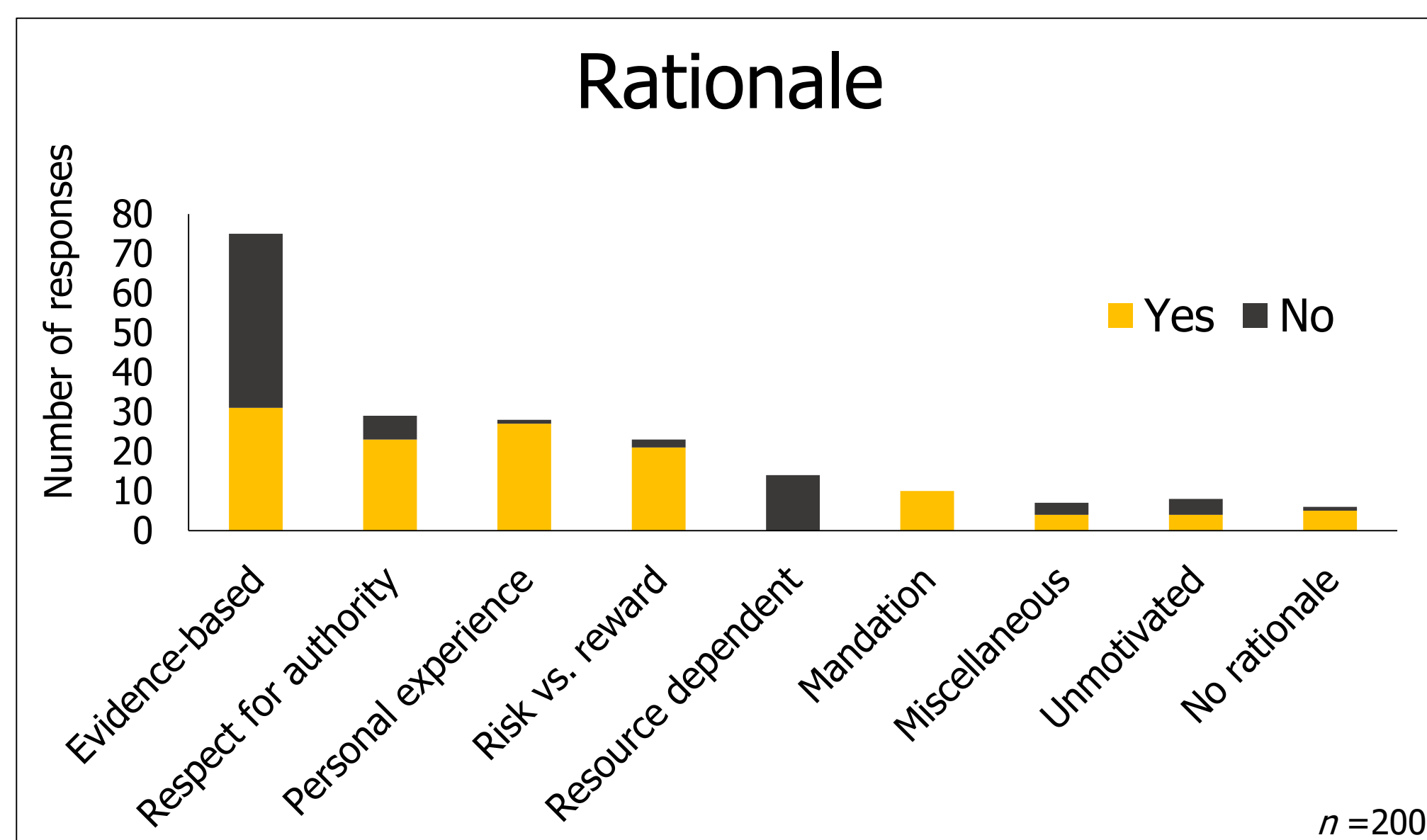
Research Questions

What influences how students make decisions about socio-scientific issues?
Are they consistent with how they make decisions across concepts?

Methods

This study used a survey given to an introductory, non-majors Biology course with a total enrollment of 203 in Fall 2018. Only students who completed the survey were included in study. (n=200, 98.5%) Surveys were analyzed for answer choice and rationale provided. Two researchers coded each question in 20% increments and calculated an IRR for each. Question A having a final IRR of 83% and B 87%. Rationales were determined to be scientific or non-scientific when comparing answer consistency across questions.

Question A: Do you plan to receive, or have you already received the influenza vaccine?



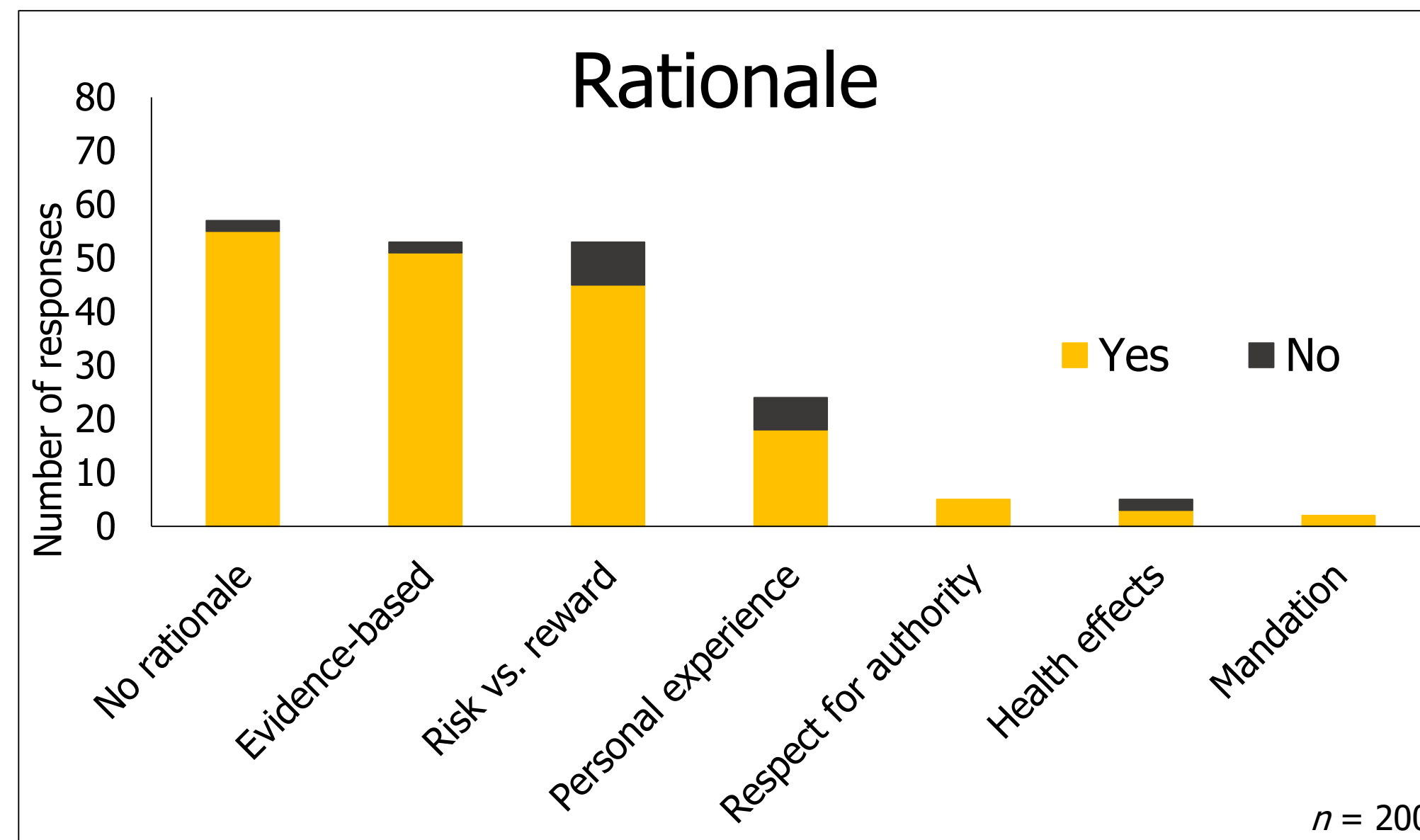
- 63% of students said "Yes" to receiving the flu vaccine compared to 37% who said "No"
- Most students whose answers were "Evidence-based" chose "No" to receiving the influenza vaccine (59%)

Rationale	Description
Evidence-based	Used evidence (scientific, medical, etc.) to back up their decision
Respect for authority	Stated that their decision relied on the input of an authority such as a doctor, parent, etc.
Personal experience	Relied on personal/past experiences with the topic
Risk vs. reward	Clearly outlined the risks versus the rewards of the scenario when making their decision
Resource dependent	Pertaining to the utilization of available time and/or money
Mandation	Stated that their child would be required to receive the vaccination
Miscellaneous	A variety of responses that did not fit into any other code
Unmotivated	Stating that the student was "too lazy" or did not care enough
No rationale	Chose not answer the question or provided rationale that did not explain their answer

- The most commonly observed student rationale was "Evidence Based"(38%)

Results

Question B: Would you allow your child to receive the MMR vaccine?



- 90% of students said "Yes" to letting their child receive the MMR shot, compared to 10% that said "No"
- Most students whose answers were "Evidence-based" chose "Yes" to letting their child receive the MMR vaccine (96%)

Rationale	Description
No rationale	Chose not to answer the question or provided rationale that did not explain their answer
Evidence-based	Used evidence (scientific, medical, etc.) to back up their decision
Risk vs. reward	Clearly outlined the risks versus the rewards of the scenario when making their decision
Personal experience	Relied on personal/past experiences with the topic
Respect for authority	Stated that their decision relied on the input of an authority such as a doctor, parent, etc.
Health effects	These students showed concern with the potential positive/negative health effects the vaccine would have
Mandation	Stated that their child would be required to receive the vaccination

- The most commonly observed student rationale was "Evidence-based" (27%)

Consistency across questions

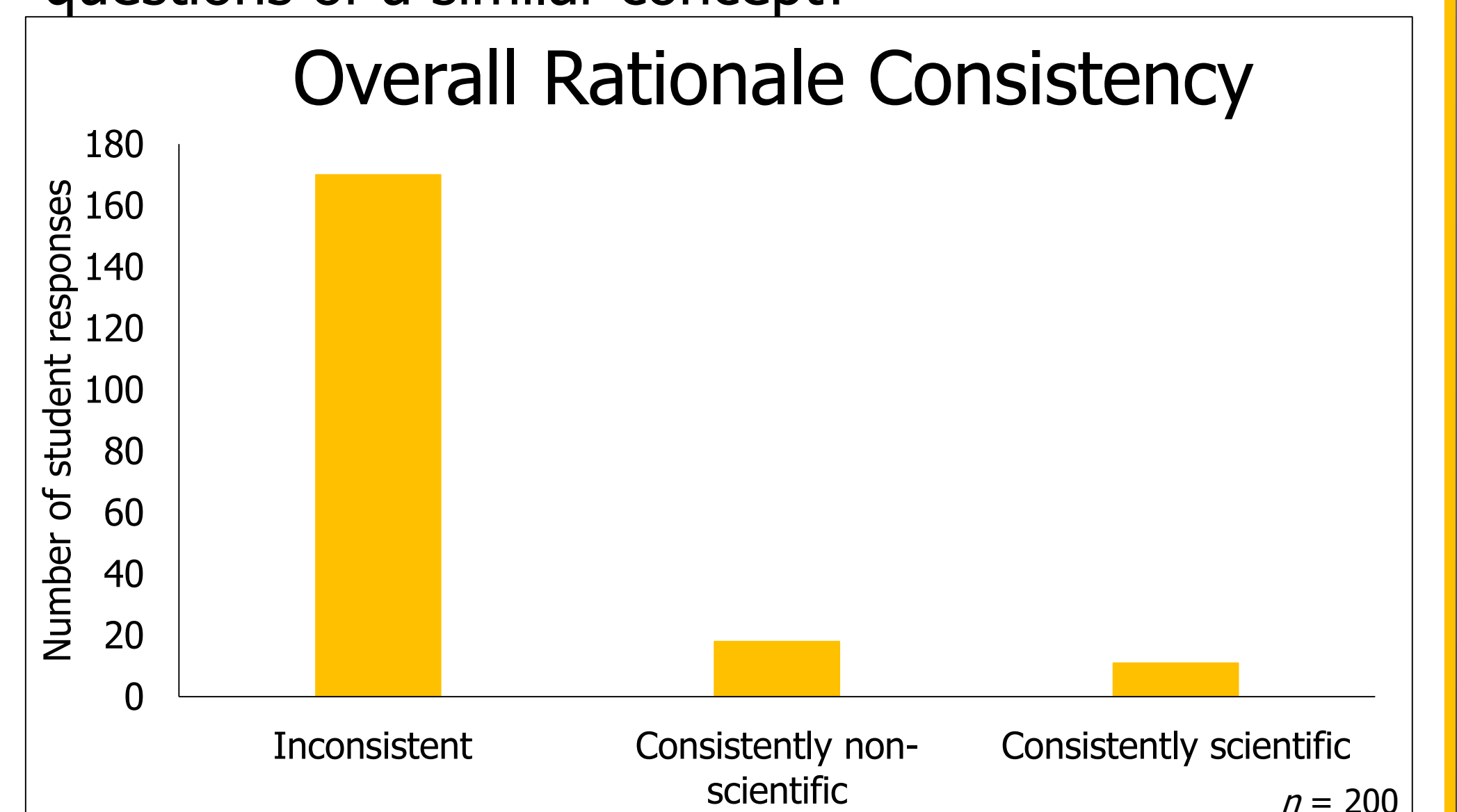
Are students consistent with their answer choice across questions of a similar concept?

		Flu		Total
		No	Yes	
MMR	No	13 (6.5%)	7 (3.5%)	20 (10%)
	Yes	61 (31%)	118 (59%)	179 (90%)
Total		74 (37%)	125 (63%)	199 (100%)

* $\chi^2(1, n=200)=7.36, p=0.007$ n = 199

- The expected MMR vaccination rate was higher than the flu (90% to 63%)
- Some students that responded "Yes" to receiving the flu vaccine but went on to say "No" to letting their child receive the MMR vaccine (3.5%)
- A $p < 0.05$ validates that students who chose "Yes" to the flu vaccine were more likely to choose "Yes" to the MMR vaccine for their child

Are students consistent in their rationale across questions of a similar concept?



- Most students were inconsistent in their answer rationale across concepts (84%)
- A small number of students were consistent with their rationale, scientific and non-scientific (15%)

Student vaccination rates are so low it is jeopardizing herd immunity!

Conclusions Even after a semester of instruction highlighting the importance of scientific reasoning, students are not making evidence-based decisions consistently. This population of students is not reaching a high enough vaccination rate to ensure herd immunity from the influenza virus or any of the viruses treated by the MMR vaccine. This confirms a need to promote evidence-based decision making in the classroom.

Further work A survey to determine if student performance in the class affects evidence-based decision making. A cross-comparison of teaching strategies in major versus non-major classrooms could be used to determine if decision making strategies are affected by differential instruction

Literature Cited: 1. Department of Health and Human Services (2017). *Vaccines Protect Your Community*. <https://www.vaccines.gov/basics/work/protection#> 2. Plans-Rubio, (2012). *The vaccination coverage required to establish herd immunity against influenza viruses*. Preventive Medicine. 55:1, 72-77.

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