

# Learning Statistics from Videos: Students' Qualitative and Quantitative Responses



Binghui Zheng and Jennifer L. Cooper  
Wesleyan University

## Introduction

With videos used in association with face-to-face class sessions, it is important to consider how students' learning and their reactions.

### Instructional Design Principles

- **Multimedia:** Words and visuals are better than words alone (Mayer & Anderson, 1992)
- **Coherence:** Remove extraneous features of text and visuals (Harp & Mayer, 1997; Mayer et al., 2001; Rey, 2012)

While the effectiveness of visuals depends on their relevance, emotionally appealing designs can increase learning through effects on motivation and affect (e.g., Mayer & Moreno, 2007; Clark & Mayer, 2016)

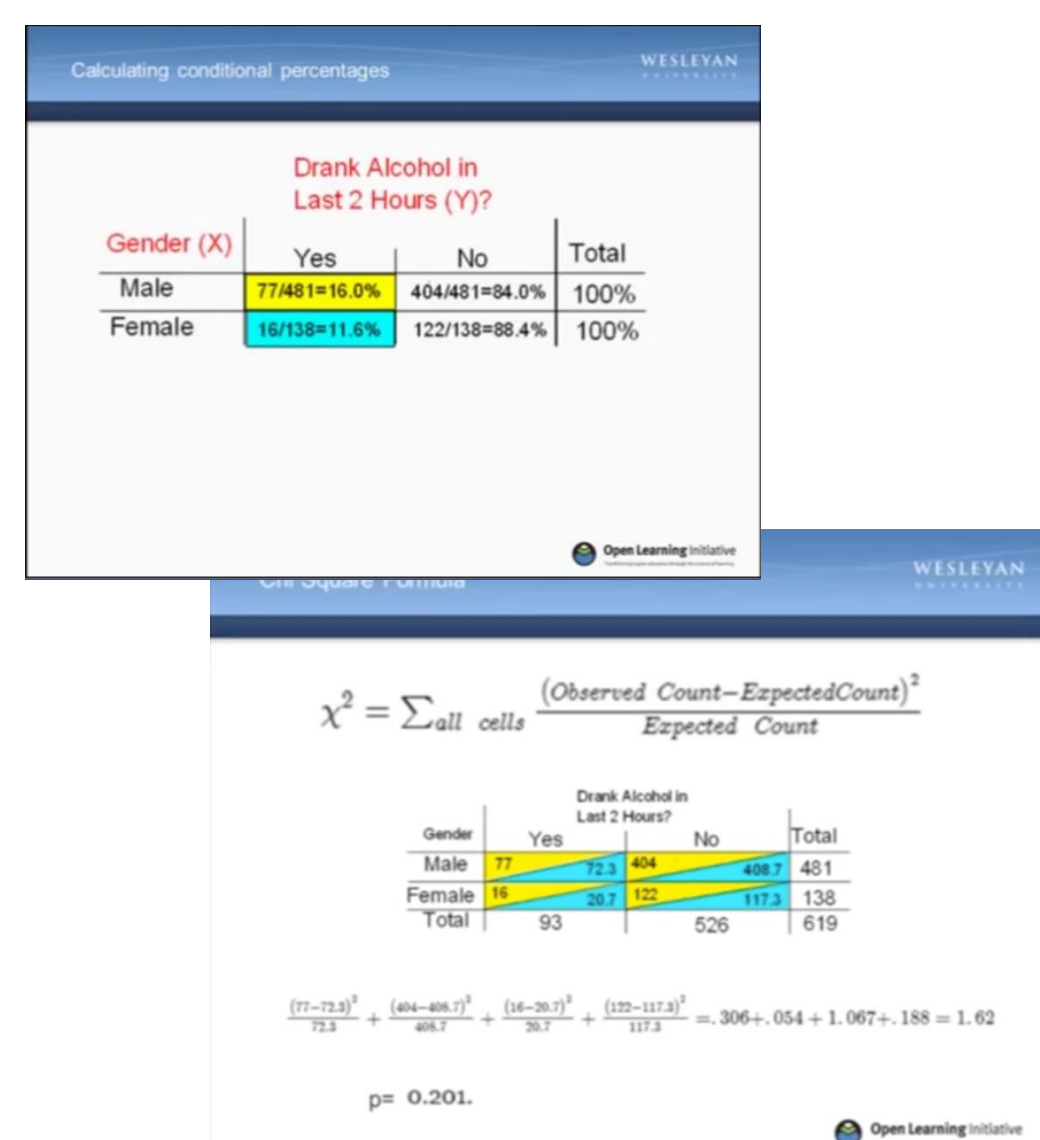
### Research Question:

How do videos' visual formats affect learning and reactions to statistical lessons?

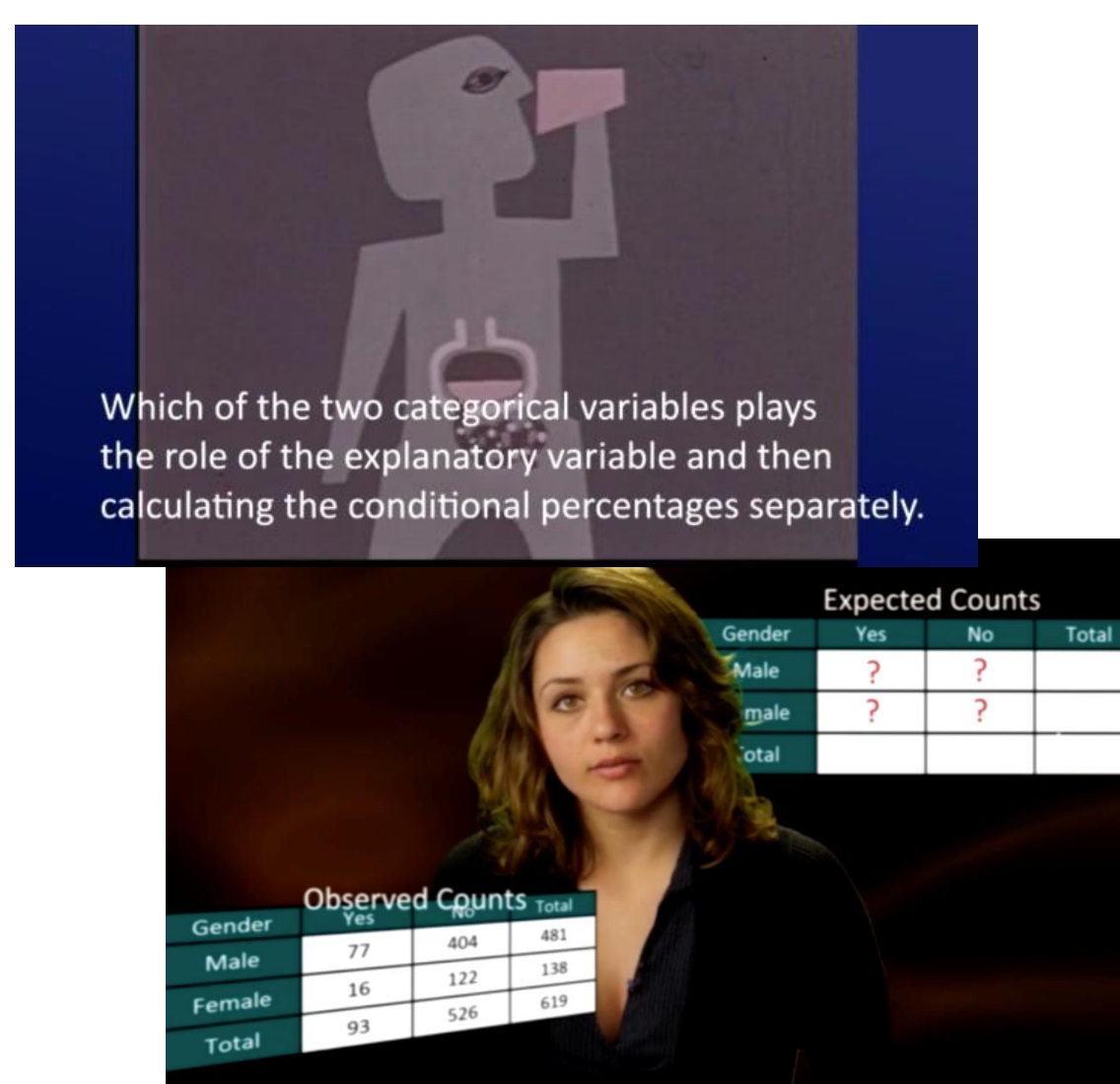
## Experiment Design

74 introductory psychology students (65% with previous statistics)

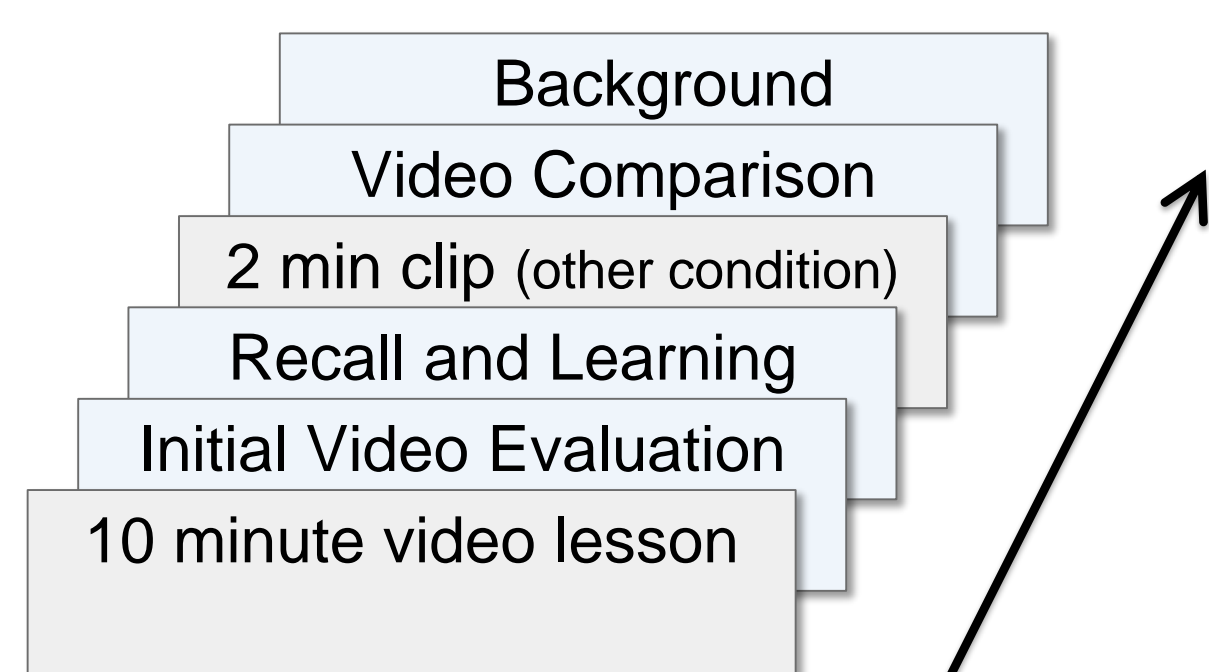
### Lecture-Style Video



### Documentary-Style Video

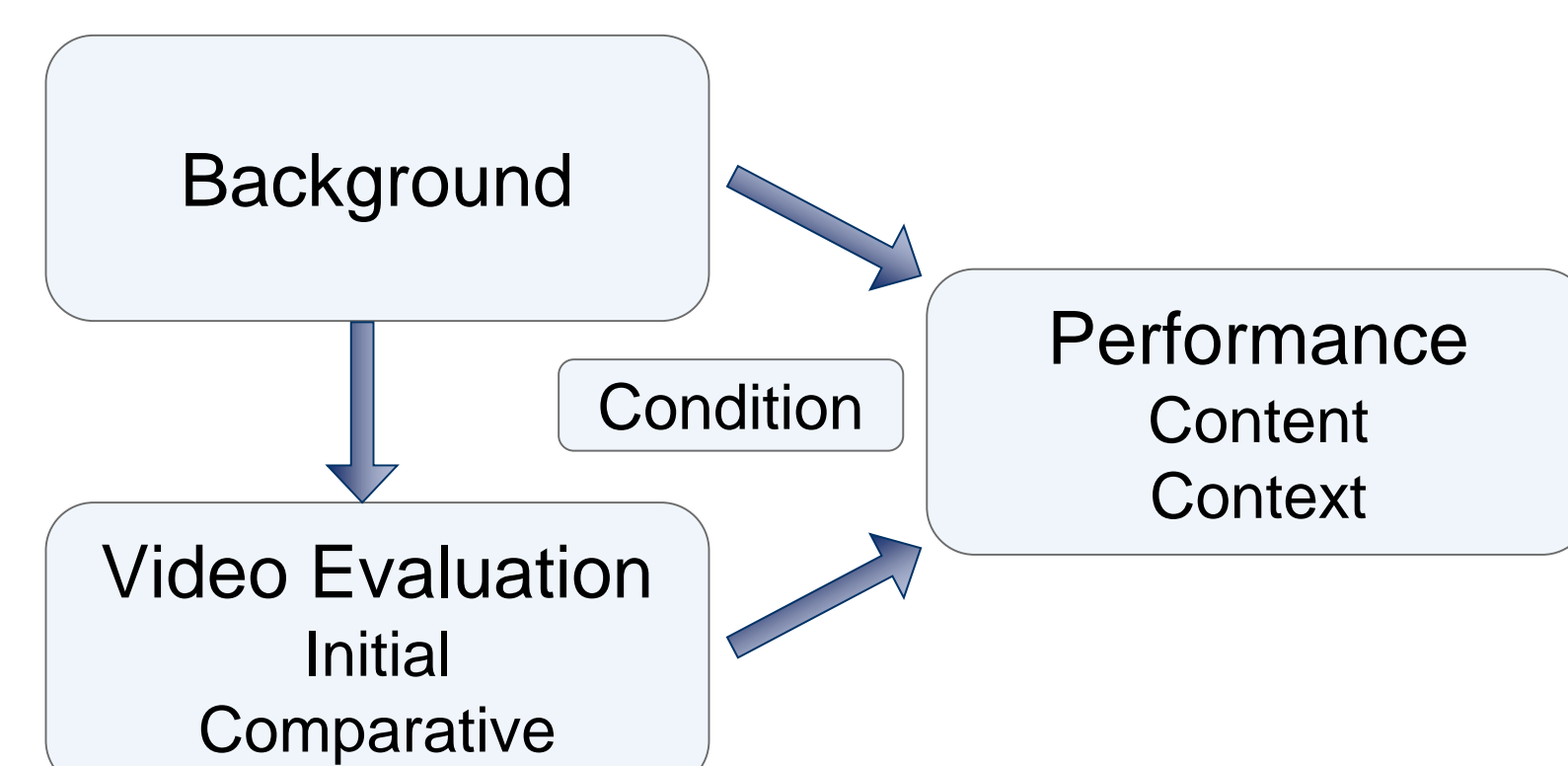


### Procedure



## Research Questions

How are students' backgrounds, opinions of the video, and performance related?

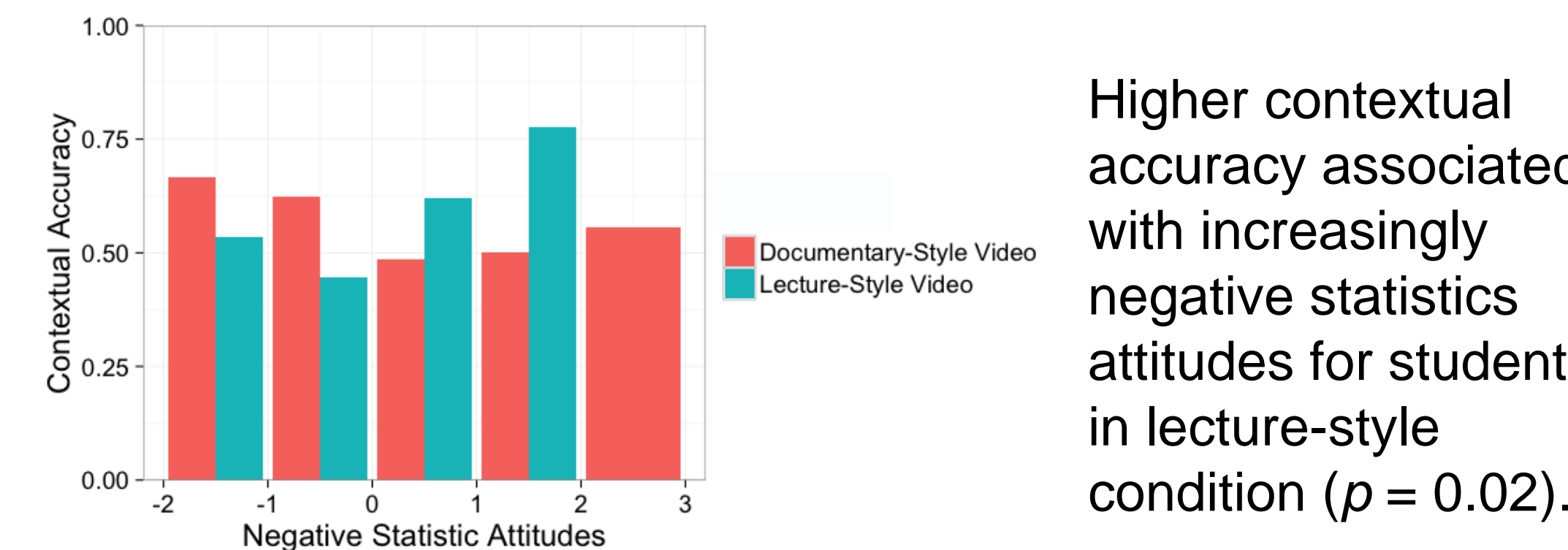
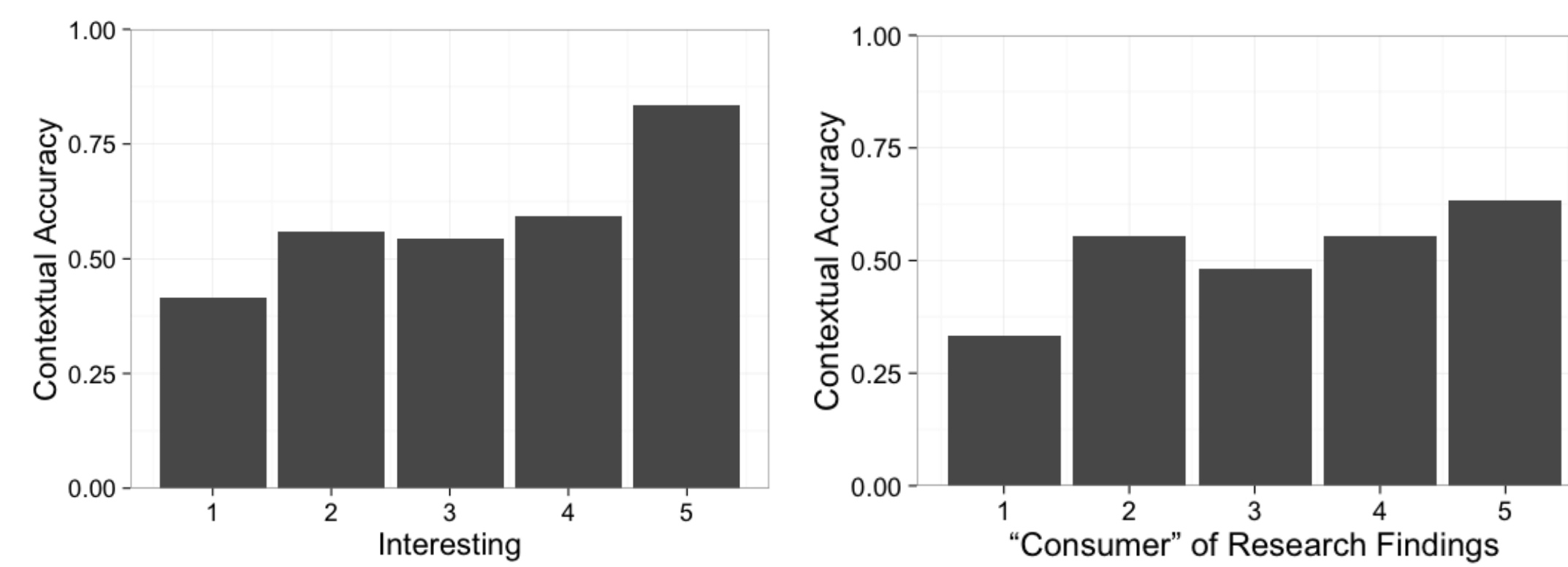


## Results

### Contextual Accuracy:

Higher contextual accuracy associated with

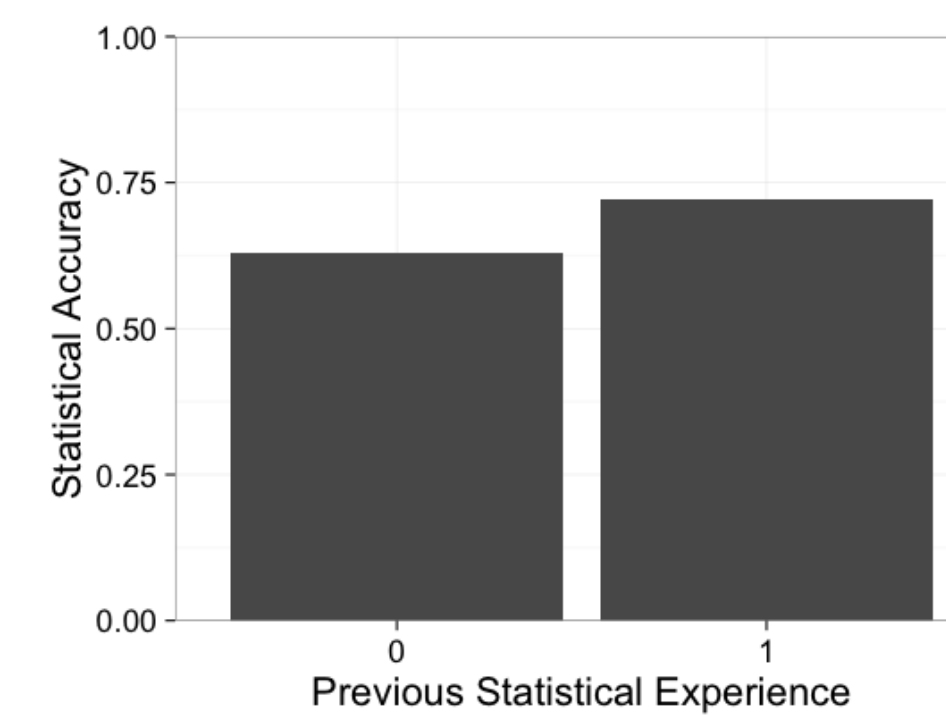
- Higher ratings of interest in video ( $p = 0.03$ )
- Stronger belief in research "consumers" needing training ( $p = 0.02$ )



Higher contextual accuracy associated with increasingly negative statistics attitudes for students in lecture-style condition ( $p = 0.02$ ).

### Statistical Content Accuracy:

- No effect of condition:  $M = 68.8\%$ ,  $SE = .03$
- Improved performance with statistics experience ( $M = 72\%$  versus  $M = 63\%$ ,  $p = .01$ )
- Not related to attitudes towards statistics ( $p = .32$ )
- Unrelated to contextual accuracy ( $r = .02$ )



### Opinions Related to the Videos:

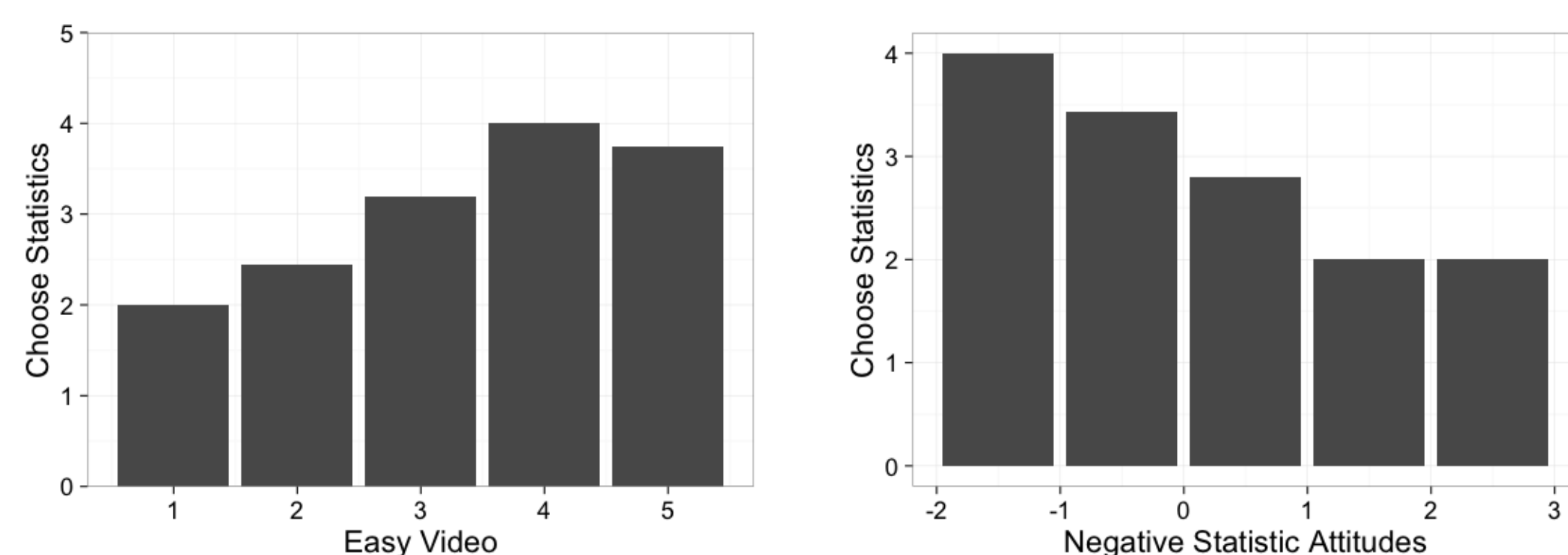
Were opinions related to accuracy? Generally No.

Was a part of the video distracting?

- Similar reports by condition (documentary: 51%, lecture: 38%)
- Similar impacts for each condition: mid-way between "negatively" and "neither negatively or positively"
- No effect on performance

How likely are you to take a non-required statistics course?

- Higher for students rating the video as easier ( $p < .001$ )
- Higher for students with less negative attitudes ( $p < .001$ )



### What were students' comments on the videos?

	Documentary Video More Distracting (% per cell)		Documentary Video More Engaging (% per cell)	
	Original Video Style	Lecture	Original Video Style	Lecture
no stats	17%	36%	17%	36%
stats	8%	26%	8%	26%

- These opinions were unrelated to statistical accuracy
- The same features (pictures, music, pace, etc.) were reported under both categories
- Marginally more likely to report either characteristic in lecture-style condition
  - 4 individuals reported the new video as both distracting and engaging

"The old video was incredibly boring with little to no interaction ... The new video was horrible at keeping my attention on the thing I was supposed to be concentrating on ..., but it kept me more engaged."

"the new one was more captivating but also more distracting"

### Students' Interpretation of a Test Result

Running the Chi Square Test of Independence showed that the Chi Square value was 166.67 and the p-value was very small, with  $p < .0001$ . A researcher wanted to know how someone's marital status was or was not related to their employment status. How would you answer the researcher's question? In your answer, please include the variable(s) and/or other information about the data. [A data table 2 x 2 table with marginal sums was shown.]

Style of Video	Is there a relationship?			Did you reject the null hypothesis?		
	Accurate Response of Yes	Response and Reason Consistent	Accurate Reason for Decision	Accurate Response of Yes	Response and Reason Consistent	Accurate Reason for Decision
Documentary	46%	49%	65%	22%	22%	30%
Lecture	41%	41%	51%	16%	14%	16%

Accuracy and consistency were non-significantly higher in the documentary video.

## Discussion

- Video style, video ratings, and most background questions did not predict statistical accuracy, although various measures predicted student recall for the context.
- Students comments on the videos varied widely, with potentially stronger reactions in students not having previous stats experience and in students who viewed the lecture-style video first.
- Instructional design recommendations are still an open question.

### Limitations

- Misunderstanding of the shortened video clip reduced sample size for comparative evaluations
- High proportion of students had statistics experience

### Future Directions

- Are different difficulty levels of questions more likely to be influenced by condition?
- How do other statistical abilities relate to performance and opinions?

## References and Acknowledgements

- Mayer, R. E., & Anderson, R. B. (1992). The instructive animation: Helping students build connections between words and pictures in multimedia learning. *Journal of Educational Psychology, 84*(4), 444.
- Harp, S. F., & Mayer, R. E. (1997). The role of interest in learning from scientific text and illustrations: On the distinction between emotional interest and cognitive interest. *Journal of Educational Psychology, 89*(1), 92.
- Mayer, R. E., Heiser, J., & Lonn, S. (2001). Cognitive constraints on multimedia learning: When presenting more material results in less understanding. *Journal of Educational Psychology, 93*(1), 187.
- Rey, G. D. (2012). A review of research and a meta-analysis of the seductive detail effect. *Educational Research Review, 7*(3), 216-237.

Tiffany Gordon and Alison Lam contributed to the development, running, and analyses of this experiment. Production of the videos used was supported by grants 0942246 and 1323084 to Lisa Dierker from the National Science Foundation, Transforming Undergraduate Education in Science, Technology, Engineering and Mathematics (TUES) and the Lauren B. Dachs Grant in Support of Interdisciplinary Research in the Social Impacts of Science.