

The Use of a Data and Statistics Integrity Module in Introductory Courses

Lisa W. Kay

Department of Mathematics and Statistics, Eastern Kentucky University

Introduction

Out of concern for students' ability to evaluate information, a team of statistics faculty has been working to create a module on statistics and data integrity. Students need to be able to recognize well done, legitimate research or journalism; recognize fake news; recognize satirical websites; and evaluate everything in between. There are methods available online, such as the CRAAP test provided by the Meriam Library at California State University, Chico (2019). CRAAP stands for Currency, Relevance, Authority, Accuracy, and Purpose. A handout, Evaluating Information—Applying the CRAAP Test, is available in pdf format at

<https://library.csuchico.edu/sites/default/files/craap-test.pdf>.

A faculty team at Eastern Kentucky University (EKU) came up with SCAM: Sources, Conditions, Accuracy, and Motive. One faculty member created a PowerPoint presentation based on faculty discussions, and some instructors have been using the presentation in some sections of introductory statistics and in a couple of interdisciplinary honors courses. In one of the honors courses, the author teamed up with two librarians to present a comprehensive lesson, which included an activity, on evaluating information. Faculty members are also in the process of developing a question bank in Blackboard, EKU's learning management system.

Courses

Introduction to Statistical Reasoning

- 3-credit-hour introductory statistics course
- Text: *Statistics: The Art and Science of Learning from Data*, 4th Ed., Alan Agresti & Christine A. Franklin

Applied Statistics

- 4-credit-hour introductory statistics course with college algebra prerequisite
- Text: *Introductory Statistics*, 10th Ed., Neil A. Weiss

Kentucky Narratives and Numbers

- 3-credit-hour interdisciplinary honors course team taught by professors of English and statistics
- Texts/readings: *Workshop Statistics: Discovery with Data*, 4th Ed., Allan J. Rossman & Beth L. Chance; and works by Wendell Berry, Robert Gipe, George Ella Lyon, Maurice Manning, Bobbie Ann Mason, Ed McClanahan, Gurney Norman, Chris Offut, James Still, and Frank X Walker

Visualization: Statistics, Art, & History

- 3-credit-hour interdisciplinary honors course team taught by professors of statistics and history with guest lectures by art historian
- Texts/readings: *Data Points: Visualization That Means Something*, Nathan Yau; *Beautiful Evidence*, Edward Tufte; Excerpts from *The Visual Display of Quantitative Information*, 2nd Ed., Edward Tufte

PowerPoint Presentation: SCAM

The PowerPoint presentation currently consists of 28 slides that describe the elements of SCAM, address confirmation bias, and provide examples of ways in which statisticians attempt to maintain data integrity in academic studies.

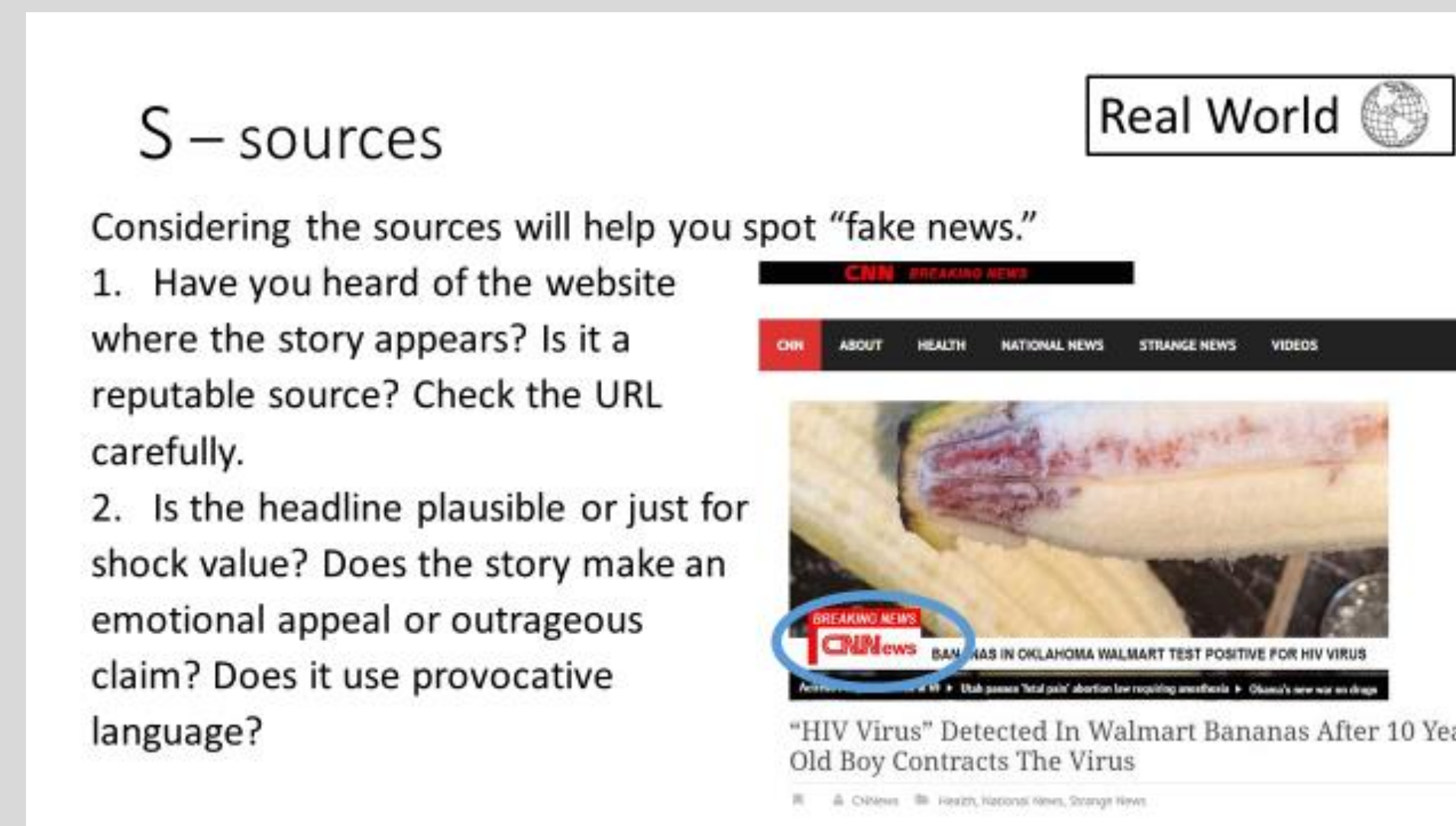


Figure 1: Example of Sources Slide from PowerPoint Presentation

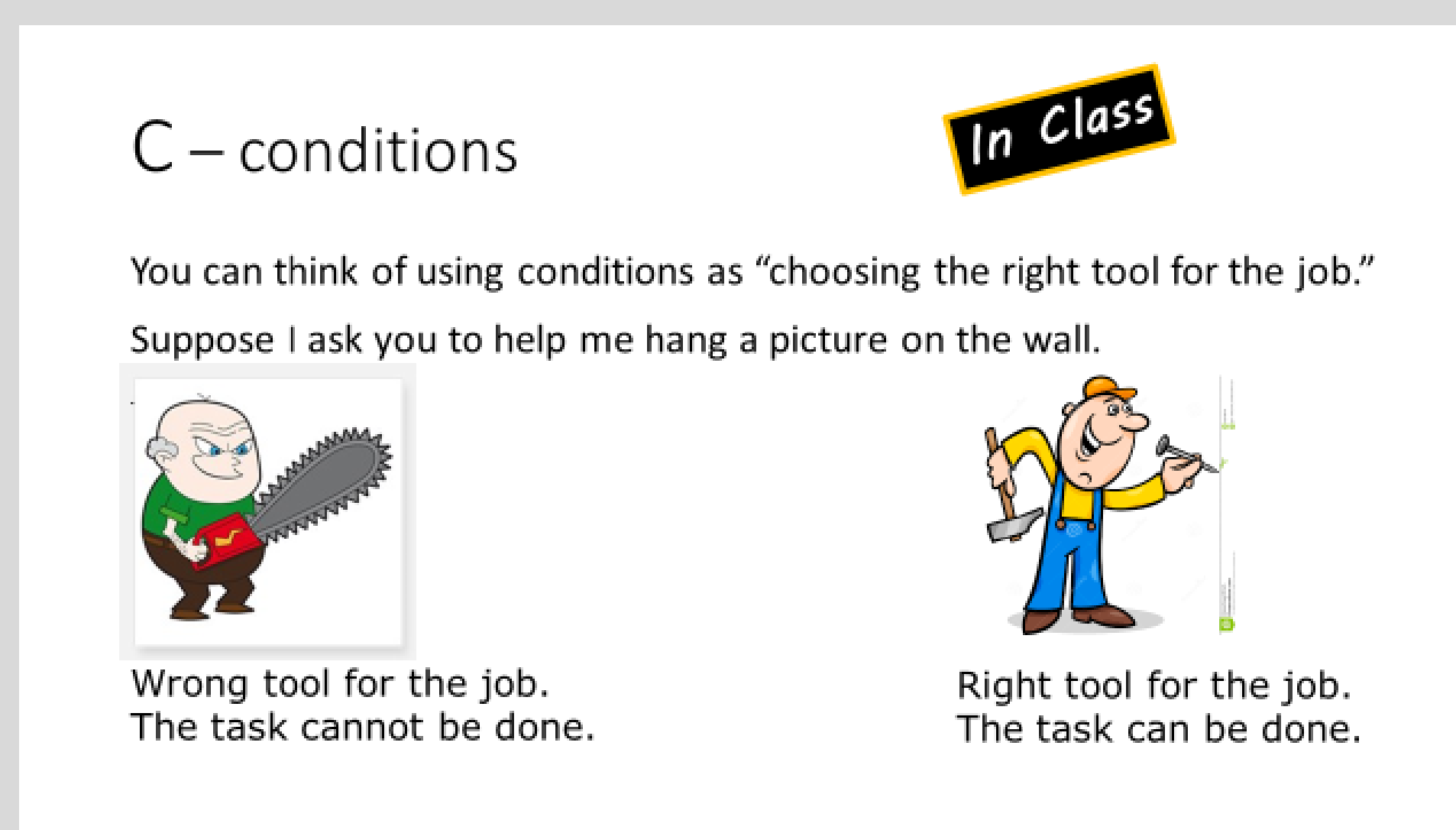


Figure 2: Example of Conditions Slide from PowerPoint Presentation

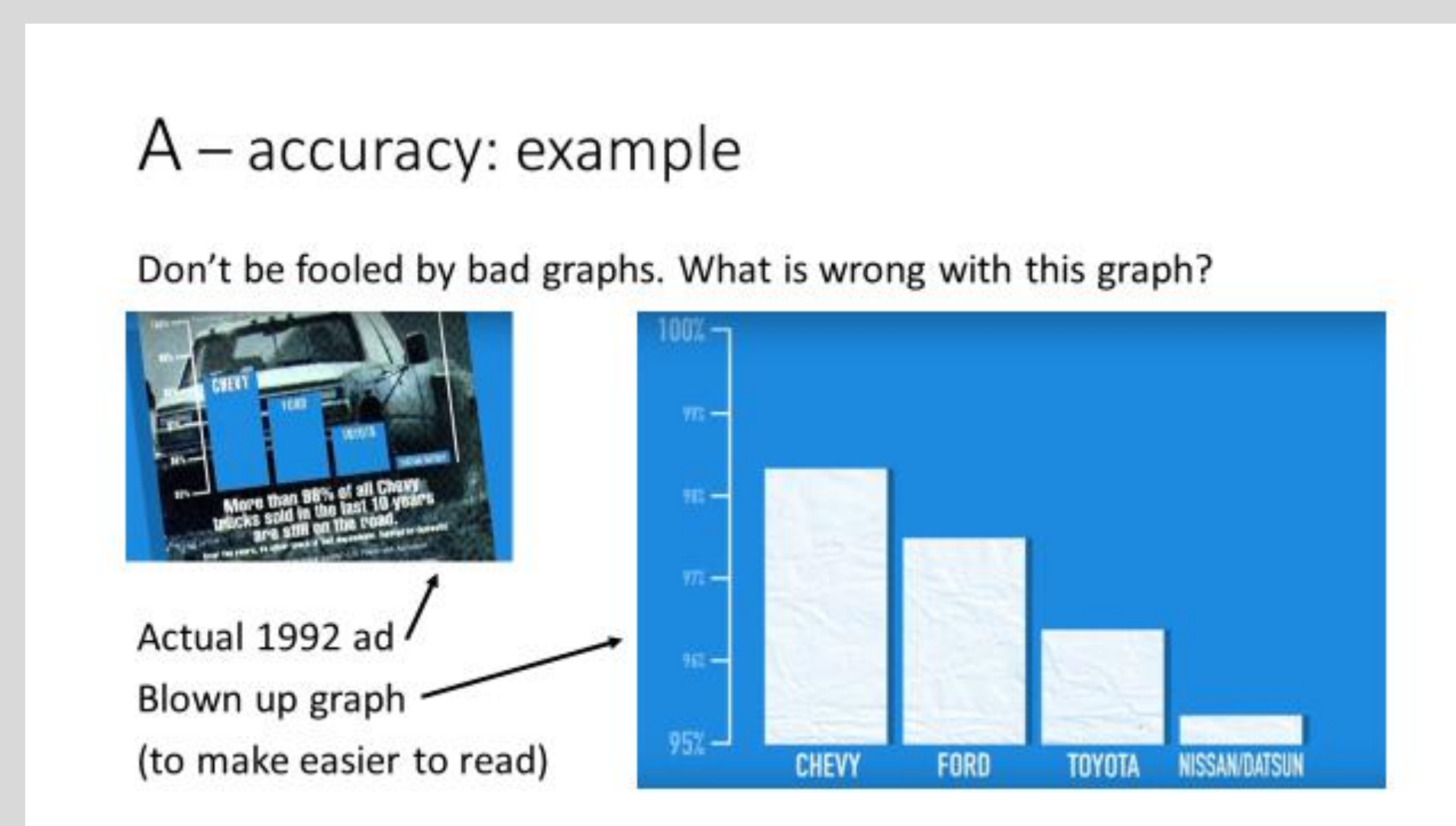


Figure 3: Example of Accuracy Slide from PowerPoint Presentation

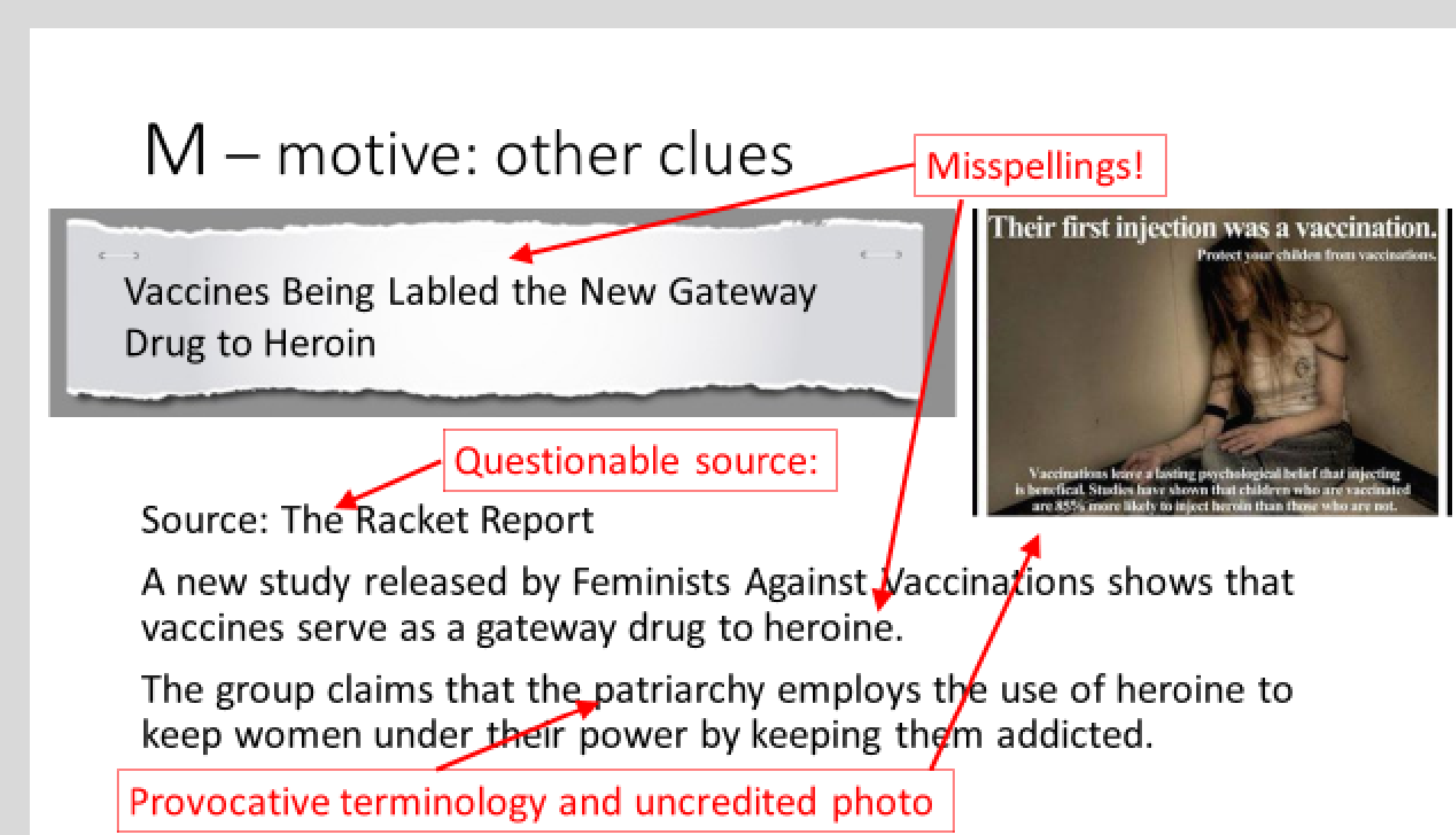


Figure 4: Example of Motive Slide from PowerPoint Presentation

PowerPoint Presentation: Other

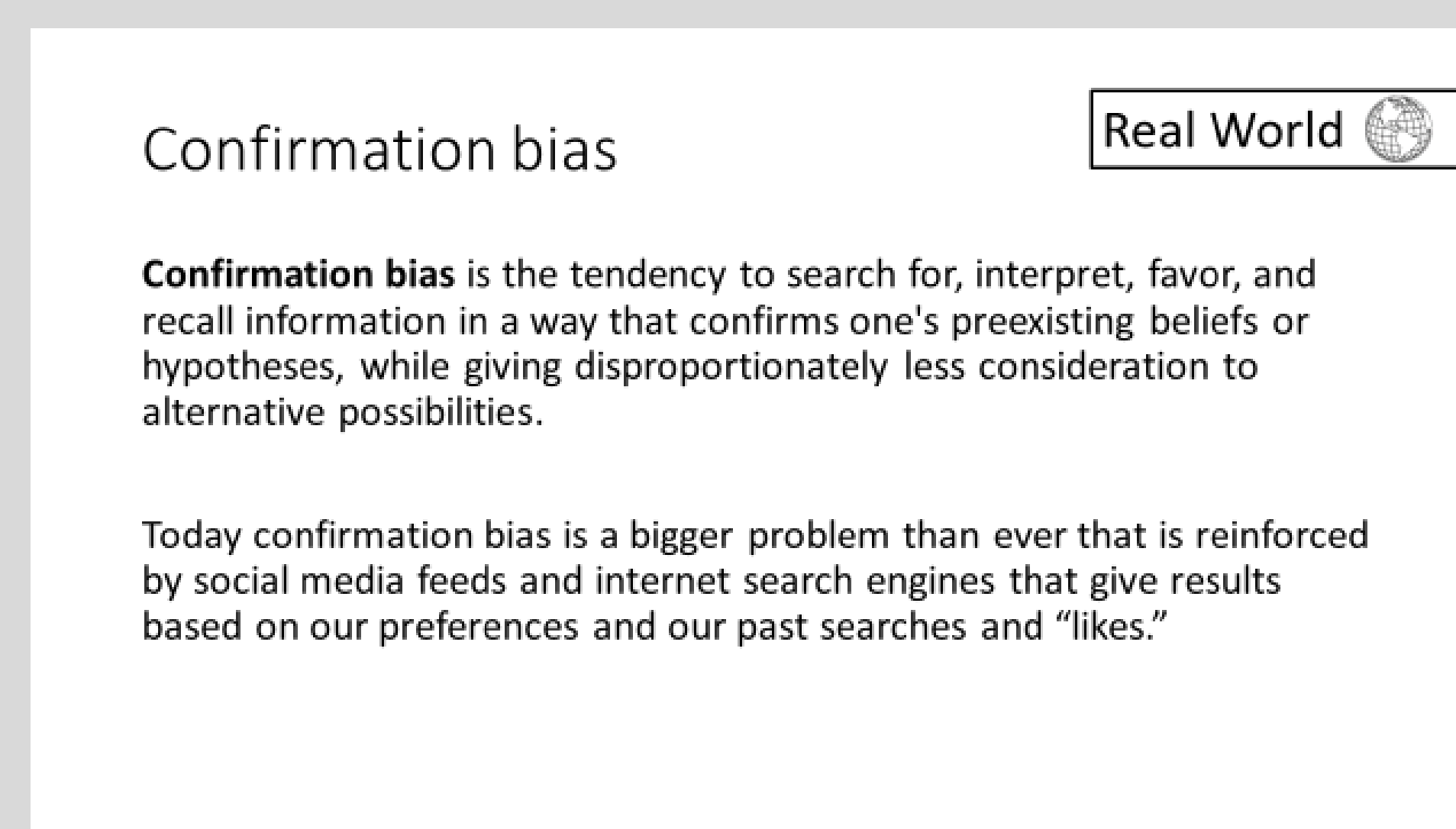


Figure 5: Confirmation Bias Slide from PowerPoint Presentation

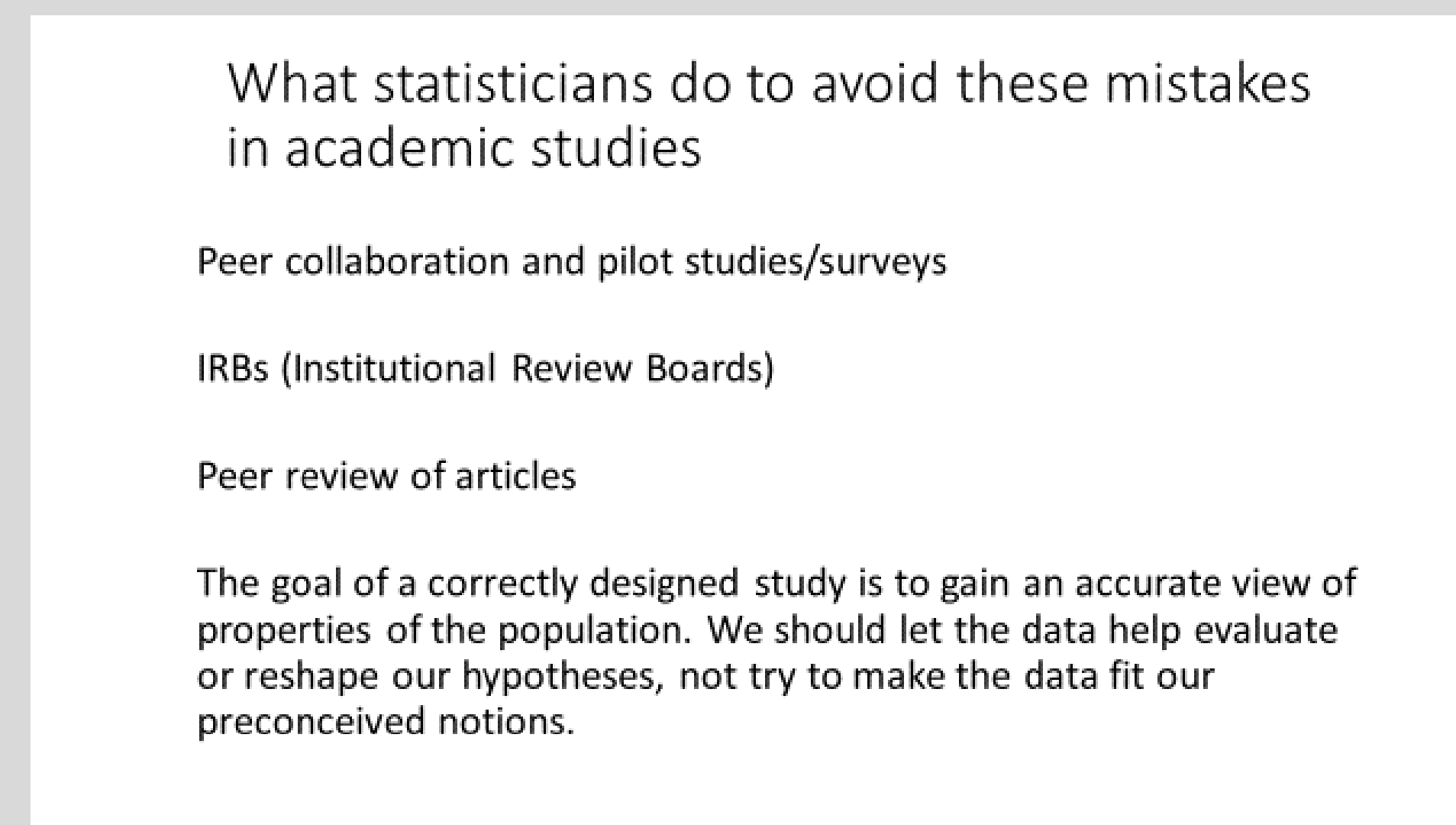


Figure 6: Academic Studies Slide from PowerPoint Presentation

Assessment Results

Variations of two problems (graph critique, evaluation of source) from the Spring 2018 Kentucky Narratives and Numbers final exam, the Spring 2019 Visualization midterm exam, the Spring 2019 Visualization final exam, and the Spring 2019 online section of Introduction to Statistical Reasoning final exam were assessed using one of the criteria from EKU's General Education Element 2 rubric (revised and integrated, found at https://gened.eku.edu/sites/gened.eku.edu/files/files/GE_QEP_Rubric_2.pdf). Results are summarized in Table 1. The honors results are generally better than the introductory statistics results.

Table 1: Assessment Results, Spring 2018 Honors Final ($n = 14$), Spring 2019 Honors Midterm & Final ($n = 15$), Spring 2019 Intro Stat Final ($n = 46$)

Criterion: Interpretation/Evaluation	4 Accomplished Exceeds course expectations	3 Competent Meets course expectations	2 Developing Incomplete in meeting course expectations	1 Beginning Inadequate in meeting course expectations
Graph Critique Source Evaluation				
Spring 2018 KY Narratives & Numbers Final	0 (0.0%)	5 (35.7%)	9 (64.3%)	0 (0.0%)
Spring 2019 Visualization Midterm	1 (6.7%)	12 (80.0%)	2 (13.3%)	0 (0.0%)
Spring 2019 Visualization Final	0 (0.0%)	7 (46.7%)	6 (40.0%)	0 (0.0%)
Spring 2019 Intro to Statistical Reasoning Final	0 (0.0%)	8 (17.4%)	32 (69.6%)	6 (13.0%)
	0 (0.0%)	1 (2.2%)	43 (93.5%)	2 (4.3%)

Question Bank Examples

The following questions are examples from the question bank that is under development:

- Investigate *The Burrard Street Journal* at <http://www.burrardstreetjournal.com/> (*The Burrard Street Journal Burrard Street Journal 12_31_17.htm*). Is this a legitimate news site? Justify your answer. [Multiple-choice options]
- What should make you question the legitimacy of the article found at <http://now8news.com/several-injured-zombie-like-attack-walmart/> (*Now8News Walmart Article 12_31_17.htm*) before you even read it? [Multiple-choice options]
- Which of the following potential signs of illegitimate news can be found in the article at <https://70news.wordpress.com/2016/11/12/final-election-2016-numbers-trump-won-both-popular-62-9-m-62-7-m-and-electoral-college-vote-306-232-hey-change-org-scrap-your-loony-petition-now/> (*70News Election Article 12_31_17.htm*)?
 - The article contains grammatical errors.
 - The author admits to using Twitter as a source.
 - The numbers listed are not consistent.
 - All of the above
- Read the article at <http://politicono.com/palin-calls-boycott-mall-america-santa-always-white-bible/> and comment on its legitimacy. [Multiple-choice options]

Future Development of Module

Current plans for the ongoing development of the data and statistics integrity module include the following:

- Continue to update and refine the PowerPoint presentation
- Continue to add items to the question bank
- Consider developing pre-test and post-test for assessment purposes
- Consider finding or creating rubric specific to data integrity and the evaluation of information

References

Meriam Library, California State University, Chico. (2019). Is this source or information good? Retrieved from <https://library.csuchico.edu/help/source-or-information-good>
 Meriam Library, California State University, Chico. (2010). Evaluating information—Applying the CRAAP Test. Retrieved from <https://library.csuchico.edu/sites/default/files/craap-test.pdf>

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