

Teaching Introductory Statistical Concepts in an Interdisciplinary Honors Course

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Introduction

The author, a statistics professor, has team taught the following interdisciplinary honors courses: Governed by Chance, with a government professor; and Kentucky Narratives and Numbers, with an English professor. Governed by Chance examines statistical concepts in a political context. In Kentucky Narratives and Numbers, literary works serve as a basis for generating discussions about topics of interest in the commonwealth such as family, poverty, health, education, coal, the economy, basketball, and guns. Both courses include coverage of graphs, descriptive statistics, data collection, randomness, probability, confidence intervals, hypothesis testing, correlation, and linear regression. Real data sets and summaries are used to engage students in both courses. In particular, data sets and statistics related to Kentucky are used in Kentucky Narratives and Numbers; the instructors generally find pertinent data via internet searches.

Course Details

Governed by Chance

- Texts/references: *Statistics: Concepts and Controversies*, 8th Ed., Moore/Notz; *More Damned Lies and Statistics: How Numbers Confuse Public Issues*, Best; *A Simple Guide to SPSS® for Political Science*, 1st Ed., Kirkpatrick/Kidd; *Visual Display of Quantitative Information*, 2nd Ed., Tuft
- Course requirements: activities/participation, homework, projects, quizzes, exams, final exam, papers, and group project presentation
- Examples of data/graphs/statistics used: Gallup polls on various topics, NPR piece on government use of a happiness index, FiveThirtyEight piece on fundraising and margin of victory, CNN article on gun control survey, Bureau of Labor Statistics wage statistics, and political data/statistics from Pew Research Center

Kentucky Narratives and Numbers

- Texts/readings: *Workshop Statistics: Discovery with Data*, 4th Ed., Rossman/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
- Course requirements: daily assignments, online homework, computer projects, discussion leader responsibilities, midterm exam, final exam, term paper, and paper presentation
- Examples of data/graphs/statistics used: Kentucky Derby times, data from the Administration on Aging, “School Pay” amounts for the 2016 NCAA Men’s Basketball Tournament coaches from *USA Today*, University of Kentucky basketball data, Kentucky Lottery information, probability plots based on data from the Kentucky Geological Survey and Kentucky Division of Water, Eastern Kentucky University enrollment data, survey of Kentuckians on gun rights, 2010 Census data from the Kentucky State Data Center, Keeneland horse sales, Kentucky State Police data on counterfeiting/forgeries, and Kentucky Parent Survey statistics

Honors Courses at EKU

- Courses fulfill general education requirements at regional four-year institution
- Students sign up for interdisciplinary course so that it fills one of two major areas included in the course within general education structure
- Only prerequisite is honors rhetoric course
- Quantitative backgrounds of students vary widely
- Classes capped at 20 students

Team Teaching

Team Teaching Structure for These Courses

- Both instructors attend all or most classes
- Instructors work together to create class plans
- Both instructors contribute to class discussions (although often one is in charge of leading a particular discussion)
- Both instructors participate in assessment of student work (some work is graded jointly, while some may be scored by one instructor)

Challenges

- Addressing field-specific terminology and approaches
- Integrating information from different areas in a way that is seamless and interesting
- Finding ways to include all of the topics that both instructors see as relevant
- Convincing students that it is acceptable for instructors to cross disciplinary boundaries during discussions and to have different perspectives

Opportunities

- Being creative in course construction
- Learning more about another specialty
- Working with high-achieving students (if teaching course for honors program/college)
- Developing examples or approaches that may be used in other courses

Finding a Teaching Partner

- Network with faculty in other areas through honors program/college workshops or other events
- Consider other areas that might mesh well with statistics and contact a faculty member from a relevant department
- Work with a colleague from another department who teaches quantitative courses

Strategies for Interdisciplinary Collaboration When There is No Support for Team Teaching

- Teach an interdisciplinary course solo by getting resources, data, and ideas from colleagues in another department
- Collaborate on a joint project with a faculty member in another discipline so that both a statistics class and a class from the other field can work on the project
- Find a colleague in another discipline who has a class that meets at the same time as a statistics class and put the classes together for a one-time interdisciplinary activity

Assessment Data

Table 1: Assessment Problem 1, Kentucky Narratives and Numbers, Spring 2016 (n = 11), Spring 2017 (n = 13)

Criterion		4	3	2	1
		Accomplished Exceeds course expectations	Competent Meets course expectations	Developing Incomplete in meeting course expectations	Beginning Inadequate in meeting course expectations
Comprehension	S '16	0 (0.0%)	6 (54.5%)	4 (36.4%)	1 (9.1%)
	S '17	0 (0.0%)	10 (76.9%)	2 (15.4%)	1 (7.7%)
Terminology and notation	S '16	5 (45.5%)	3 (27.3%)	2 (18.2%)	1 (9.1%)
	S '17	2 (15.4%)	5 (38.5%)	4 (30.8%)	2 (15.4%)
Execution of appropriate strategies for solving problems	S '16	0 (0.0%)	7 (63.6%)	3 (27.3%)	1 (9.1%)
	S '17	0 (0.0%)	9 (69.2%)	3 (23.1%)	1 (7.7%)
Mathematical/logical operations	S '16	8 (72.7%)	1 (9.1%)	1 (9.1%)	1 (9.1%)
	S '17	9 (69.2%)	1 (7.7%)	2 (15.4%)	1 (7.7%)
Interpretation of solutions in context	S '16	8 (72.7%)	2 (18.2%)	0 (0.0%)	1 (9.1%)
	S '17	10 (76.9%)	1 (7.7%)	0 (0.0%)	2 (15.4%)
Integration across course	S '16	6 (54.5%)	4 (36.4%)	0 (0.0%)	1 (9.1%)
	S '17	4 (30.8%)	7 (53.8%)	1 (7.7%)	1 (7.7%)

Table 2: Assessment Problem 2, Kentucky Narratives and Numbers, Spring 2016 (n = 11), Spring 2017 (n = 13)

Criterion		4	3	2	1
		Accomplished Exceeds course expectations	Competent Meets course expectations	Developing Incomplete in meeting course expectations	Beginning Inadequate in meeting course expectations
Comprehension	S '16	0 (0.0%)	2 (18.2%)	8 (72.7%)	1 (9.1%)
	S '17	0 (0.0%)	8 (61.5%)	4 (30.8%)	1 (7.7%)
Terminology and notation	S '16	1 (9.1%)	5 (45.5%)	4 (36.4%)	1 (9.1%)
	S '17	3 (23.1%)	2 (15.4%)	7 (53.8%)	1 (7.7%)
Execution of appropriate strategies for solving problems	S '16	0 (0.0%)	3 (27.3%)	7 (63.6%)	1 (9.1%)
	S '17	0 (0.0%)	5 (38.5%)	7 (53.8%)	1 (7.7%)
Mathematical/logical operations	S '16	2 (18.2%)	8 (72.7%)	0 (0.0%)	1 (9.1%)
	S '17	4 (30.8%)	7 (53.8%)	1 (7.7%)	1 (7.7%)
Interpretation of solutions in context	S '16	2 (18.2%)	2 (18.2%)	6 (54.5%)	1 (9.1%)
	S '17	4 (30.8%)	3 (23.1%)	5 (38.5%)	1 (7.7%)
Integration across course	S '16	1 (9.1%)	5 (45.5%)	4 (36.4%)	1 (9.1%)
	S '17	2 (15.4%)	5 (38.5%)	5 (38.5%)	1 (7.7%)

Table 3: Assessment Data, Introduction to Statistical Reasoning, Spring 2013 (n = 30)

Criterion		4	3	2	1
		Accomplished Exceeds course expectations	Competent Meets course expectations	Developing Incomplete in meeting course expectations	Beginning Inadequate in meeting course expectations
Comprehension		0 (0.0%)	3 (10.0%)	18 (60.0%)	9 (30.0%)
Terminology and notation		1 (3.3%)	15 (50.0%)	9 (30.0%)	5 (16.7%)
Execution of appropriate strategies for solving problems		0 (0.0%)	2 (6.7%)	19 (63.3%)	9 (30.0%)
Mathematical/logical operations		1 (3.3%)	15 (50.0%)	9 (30.0%)	5 (16.7%)
Interpretation of solutions in context		0 (0.0%)	10 (33.3%)	15 (50.0%)	5 (16.7%)
Integration across course		1 (3.3%)	11 (36.7%)	9 (30.0%)	9 (30.0%)

Assessment Summary

Two problems (confidence interval for a proportion, hypothesis test about a proportion) from the Spring 2016 and Spring 2017 Kentucky Narratives and Numbers classes were assessed using EKU’s General Education Element 2 rubric, found at <http://gened.eku.edu/course-assessment-information>. Results are summarized in Tables 1 and 2. For the sake of comparison, General Education data for an introductory statistics course are provided in Table 3. The honors results are generally better than the introductory statistics results. The honors students had difficulty interpreting the results of the hypothesis test.

Student Evaluations

Governed by Chance students provided input via the honors program’s on-paper, in-class evaluations and online IDEA evaluations:

- Some students wanted more political science content
- Evaluations generally not as positive as those for Kentucky Narratives and Numbers

Students in Spring 2016 Kentucky Narratives and Numbers provided midterm feedback given to the professors:

- Students felt rushed, wanted more time for activities
- Some wanted to separate literature and statistics by class period

Students in Spring 2016 Kentucky Narratives and Numbers class provided end-of-term feedback via the honors program’s on-paper, in-class course evaluations and online IDEA evaluations:

- Feedback was generally positive
 - Some still felt rushed; some wanted more public policy content
- Students in Spring 2017 Kentucky Narratives and Numbers provided midterm feedback given to the professors:
- Some students thought certain topics were overemphasized
 - A couple of students suggested not copying articles

Student evaluations and pre-test/post-test data will be available later.

Recommendations

Recommendations for Kentucky Narratives and Numbers in 2018:

- Remove discussion leader assignment in order to move through discussions more efficiently and effectively
- Modify schedule in order to allow for more time for in-class statistics activities
- Find ways to make stronger connections between the literature and the statistics, making any mid-class discussion transitions as seamless as possible
- Possibly cut back some on statistics examples related to basketball and coal; insert examples related to other topics

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