

> Search (Statistical Literacy)**Innovative Ideas for an Introductory Statistics Course**

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Analyzing Real Biomedical Data Using Scientific Writing and TI Calculators

This presentation will address innovative teaching methods used in a specialized introductory Statistics course for students enrolled in pharmacy and health sciences programs. In our degree programs, statistical literacy is absolutely essential for students' understanding of how to responsibly treat patients, in the development and approval of any drug, and in everyday life. I will elaborate on the use of real biomedical data, use of statistical applications on TI calculators, use of misleading statistics in the mass-media, and use of scientific writing in my statistics course. Using TI calculators for complex statistics carried out on biomedical data allows for more lecture time being spent on independent problem solving, analyzing and interpreting real world data, and validating statistics in medical journal articles. Scientific writing is used by students during all lectures, tests, and assignments. These activities are successfully utilized to promote a deeper, conceptual understanding of statistics, improve complex cognitive skills and engage students in the learning process.

Karen Sue Briggs North Georgia College & State University (kbriggs@northgeorgia.edu)

Popular Media and Introductory Statistics

If Mark Twain correctly equated "damn lies" and statistics, the reason is the lack of society's statistical literacy. In an effort to improve our students' statistical literacy, we have implemented a Statistical Literacy Project in our Elementary Statistics course in which each student is asked to find a current popular media article of personal interest which cites statistics-based research. After obtaining a copy of the cited article, each student then provides a written analysis that contrasts the conclusions reported in both the research and media articles. Students are assessed upon how they use the concepts they have learned in class to evaluate the validity of the statistical argument reported in the media article. In this session, examples of students' projects will be demonstrated and discussed together with points of learning from the instructor's perspective. Many students in the pilot study embraced the projects and produced reports demonstrating increased maturity for statistical thinking.

> Search (Quantitative Literacy)**Current Events Friday** by Kira Hamman Penn State Mont Alto (kira@psu.edu)

"Why do we need to know this?" is possibly the second most-asked question in introductory mathematics courses, right after, "will this be on the test?" Answering the former with the latter ("You need to know it because it will be on the test") is unsatisfactory to most of us and, in any case, simply begs the question of why it is important enough to be on the test. Current Events Friday is both an attempt to deal with this question in a Finite Mathematics course and a subversive way to infuse quantitative literacy and civic engagement into an otherwise traditional curriculum. Think of it as infiltration, if you want. Think of it as a low-risk way to try out such an approach, if you prefer. Either way, it gets meaningful applications of lower-level mathematics into the classroom without a trip to the curriculum committee. What's not to love?

MINICOURSE #5 David Housman, Goshen College; Rick Gillman, Valparaiso University

A Game Theory Path to Quantitative Literacy

Game Theory, defined in the broadest sense, can be used to model many real-world scenarios of decision making in situations involving conflict and cooperation. Further, mastering the basic concepts and tools of game theory require only an understanding of basic algebra, probability, and formal reasoning. These two features of game theory make it an ideal path to developing habits of quantitative literacy among our students. This audience-participation 9 mini-course develops some of the material used by the presenters in their general education courses on game theory and encourages participants to develop their own, similar, courses.

> Search (Quantitative Reasoning)**First Year Seminar / First Year Experience Mathematics Courses****First Year Seminar Voting Theory Course at TCNJ**, Karen Clark College of New Jersey (kclark@tcnj.edu)

I offered a First Year Seminar course on Voting Theory, Apportionment, and Fair Division in the Fall 2008 semester and will offer the course again in the Fall 2010 semester. The class is designated as "writing intensive" by the college, and thus must include a significant amount of student writing, including revisions of written work. The course also satisfies a liberal arts Quantitative Reasoning requirement, so it must include a nontrivial amount of mathematical content. I will discuss the challenges of balancing these requirements for an extremely diverse group of students - my class included students who were taking calculus, and included students who had difficulty with simple arithmetic.

General Contributed Paper Sessions

Kevin Charles Moore Arizona State University - RIMSE (kevin.c.math@gmail.com)

The Role of Quantitative and Covariational Reasoning in Trigonometry Curriculum

Recent research studies report that students and teachers have weak understandings of central ideas of trigonometry, including angle, measure and trigonometric functions. In light of these research findings, multiple studies have suggested rethinking trigonometry instruction. Thompson and Bressoud suggest that trigonometry instruction should begin by developing students' understanding of angle measure and the process by which an angle is measured. They also advocate that students learn to use the radius of a circle as a unit for measuring an angle. This presentation will describe a sequence of instructional activities designed to support the construction of meanings and connections that have resulted in students understanding the sine and cosine functions. Both the creation and implementation of the instructional activities were set within an investigation focused on the understandings students develop as they interact with research designed curricular materials. In addition to various research findings in trigonometry, research on covariational and quantitative reasoning informed the design and implementation of the materials. The activities were intended to engage students in making meaning of applied problems such that they identified quantities, the relationships between quantities, and how the values of the quantities changed together. These applied contexts were conjectured to provide a context in which students could reflect upon and construct mathematical understandings consistent with the instructional goals. The presentation of the sequence of instructional activities will highlight the role of quantitative and covariational reasoning in learning trigonometry by discussing the meanings and understanding that students developed when these instructional materials were used.

Quantitative Reasoning by Darcel Ford Strayer University (dford64@comcast.net)

For students to compete successfully in a global environment, it is imperative that the level of technological competency be elevated and for the development of a technologically capable workforce. Within these constructs, Strayer University is geared towards sustaining active learning in Algebra classrooms in order to complete baccalaureate requirements. The more troubling aspect of the adult learner's foray into higher education is the lack of quantitative reasoning skills. The introductory Algebra curriculum at Strayer University is designed to smooth the transition into other courses that require a post secondary level of quantitative reasoning. The course is a coherently coordinated quantitative reasoning course that interrelates cross discipline quantitative concepts to prepare learners for the rigors of the quantitative courses. This presentation will discuss the attributes of the curriculum and how these attributes assist adult learners. The following topics are addressed in this presentation:

- 1) Fundamentals of Reasoning and Logic,
- 2) Functions and graphs,
- 3) Probability and "odds," and
- 4) Recent developments and discoveries in mathematics.

Selected Other Abstracts:

Deborah J. Gougeon, University of Scranton (gougeond1@scranton.edu)

An Examination of Student Attitudes in a Business Statistics Course

Over a period of five years, this study surveyed a total of 386 undergraduate students on the first day of a required Introductory Business Statistics course. Students were asked to respond to eleven questions that measured their attitudes and expectations regarding this course. For example, students were asked whether they felt the course would be relevant or not to their overall business education, how much time they anticipated spending on homework assignments as well as on general study for the course, and what they anticipated their final grade would be, in addition to other specific questions. Overall, the findings of this survey reveal, among other things, a generally negative attitude towards the course, an inclination to dedicate minimal study time, and an anomalous expectation of achieving a high final grade.

Kenneth A. Ross MAA (rossmath@pacinfo.com)

Benford's Law, a Growth Industry

Benford's Law is based on the observation that in many sets of data, the first digit is 1 about 30% of the time, the first digit is 9 about 5% of the time, and the frequencies of the other possible first digits lie between 5% and 30%. In general, this is a statistical phenomenon that isn't easy to understand, but it also occurs in a deterministic setting which is easily understood. This will lead into an aspect of the phenomenon involving data that grow exponentially, such as populations of cities or counties, which can be explained to anyone who understands logarithms. By resorting to pictures, one can even avoid logarithms.

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Zipf's Distribution in "Gadsby"

An interesting fact about English is that it follows a statistical law discovered by George K. Zipf: the frequency of occurrence of a word is inversely proportional to its rank order in the frequency table. Other languages also exhibit similar behaviors except that Zipf's distribution would be modified by a parameter. In 1939, Ernest Wright published an unusual novel "Gadsby: Champion of Youth", which is a lipogram – it purposefully avoided the use of any word containing the letter "e", but is still grammatically correct, for a total of 50,110 words! In this work, we investigate how Zipf's law is affected in "Gadsby" due to the absence of the most frequently used letter and hence many frequently used words. We present our findings for both word frequency and letter frequency distributions.