DOCUMENT RESUME

ED 401 288 TM 025 780

AUTHOR	Stallings, William M.; And Others
TITLE	Tips, Tropes, and Trivia: Ideas for Teaching Educational Research.
PUB DATE	Apr 96
NOTE	12p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, April 8-12, 1996).
PUB TYPE	Viewpoints (Opinion/Position Papers, Essays, etc.) (120) -- Speeches/Conference Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Comprehension; Creativity; *Educational Research; *Figurative Language; Higher Education; Instructional Effectiveness; *Research Methodology; *Statistics; Teaching Experience; Teaching Methods

ABSTRACT

The collective experience of more than 50 years has led to the development of approaches that have enhanced student comprehension in the teaching of educational research methods, statistics, and measurement. Tips for teachers include using illustrative problems with one-digit numbers, using common situations and everyday objects to illustrate statistical concepts and techniques, and using such "low-tech" aids as transparencies to project complex illustrations. Verbal images or figures of speech (tropes) are useful in expressing statistical concepts. Sometimes a historical note will make a point more vividly than a current allusion, as a discussion of an early controlled experiment illustrates. Teachers should use their creative imaginations to find ways to help students understand statistical concepts. (Contains 16 references.) (SLD)

Tips, Tropes, and Trivia: Ideas for Teaching Educational Research

William M. Stallings and John H. Neel

Georgia State University

Charles K. West

University of Illinois at Urbana-Champaign

Running Head: TIPS, TROPES, AND TRIVIA

Abstract

Collectively, we have over 50 years experience teaching educational research methods, statistics, and measurement. During this time we have borrowed, adapted, and even developed some approaches that seem to have enhanced student comprehension. Our approaches include telling stories from the history of statistics and psychology, computing with simple data sets, employing tropes (especially metaphors) that vividly convey technical concepts, working through thought experiments, finding statistical examples in advertisements, and illustrating operational definitions in homey ways (e.g., determining if the Thanksgiving turkey is done). Our goal in writing this paper is not so much that of having the readers try our ideas as it is to help them free up their own creative imaginations.

Tips, Tropes, and Trivia: Ideas for Teaching Educational Research

Each of us can look back over 25 years of teaching behavioral statistics, measurement, and research methods. And during that time we have hit upon, borrowed, and adapted some ideas that seemed to have worked -- at least for us. With rare exception, we claim no originality. And yet most of these ideas do not seem in to be in the teaching repertoire of our colleagues. What follows is a sample.

Tips

When teaching computational statistics, use illustrative problems with one digit numbers (ideally, with integer means and standard deviations). Such data sets are compatible with definitional formulas and facilitate hand computation. For example, in demonstrating the equivalence of testing the difference between two sample means by ANOVA and by dummy variable regression, a convenient set is: for X; 1, 3, 2, 2 and for Y; 6, 5, 5, 4. Sources of "easy" numbers include Hope (1967), Dudek (1981), and Huck (1972) for ANCOVA. We agree with Read & Riley (1983) who argue "Lengthy calculations should be avoided . . . [statistics problems with simple numbers] lack nothing in illustrative value. Calculations will be quicker, easier, more reliable, and more readily checked. These advantages should reinforce students' confidence and permit more emphasis on statistical concepts". (p. 229) Incidentally, Read & Riley (1983) also contains useful references for generating simple numbers.

Some students seem to have forgotten what they learned about doing science in high school biology. Even the concept of operational definitions can give trouble. So, when introducing operational definitions we ask, "How do you know when the Thanksgiving Turkey is done?" Student answers have included: when the pop-up thermometer pops up; when the legs move easily; when the meat thermometer reads 190°F and so on. Obviously, they understand the concept.

Newspapers, magazines, and everyday objects may yield illustrations. For example, on a cardboard light bulb package you will find words such as "average life 750 hours." And then you have a springboard for distinguishing statistics as descriptors, statistics as estimators, and parameters. As another illustration, on a recent trip to his dentist one of us saw a two-page advertisement for Slazenger golf balls contained in an out-of-date magazine found in the waiting room. The first page of the ad pictured a collection of golf balls, each with a different brand name. The caption read: "Tired of the confusion? Which is best for distance, accuracy, optimum spin?" And then followed the usual textbook formula for this standard deviation, in deviation score format and with degrees of freedom in the denominator. Surely, this is a real world application. As a third example, we have found useful illustrations of rival hypotheses in Ray and Tom Magliozzi's newspaper column, "Car talk." Recently, a reader wrote to extoll the seemingly magical virtues of a Franz Filter (every 4000 miles you put in a fresh roll of toilet paper and remove the old roll; you <u>never</u> need to change the oil). The Magliozzis (1994) responded that "there are other factors that could contribute to your luck." And they go on to list them: more highway than city driving; the writer obviously cared for his car in other ways; and so forth.

Once, at a cocktail party, we got into a conversation with a psychiatrist about teaching. The psychiatrist remarked that it was easier to remember ideas associated with motion as opposed to ideas that seem static. We use this approach in teaching the concepts embedded in the 2 X 2 table customarily used to summarize the consequences of rejecting or failing to reject the null hypothesis, depending on whether or not Ho is true. Now we draw a tree diagram starting at the top with Ho, then branching to true or false with each of these branching into reject or fail to reject; we then summarize the consequences. It works! The psychiatrist was right.

Although they are "low tech," overhead transparencies allow the instructor to project complex illustrations -- and cartoons. The American Statistical Association (Faulkner, et al., 1993) has published a collection of transparency masters for use in teaching statistics. Sources for making your own transparencies are as varied as your imagination permits. Years ago, at a used book sale we picked up a copy of Treloar's (1951) Biometric Analysis: An Introduction. It contains a series of tables and illustrations based upon Pearson and Lee's (1903) data on heights of husbands and their wives. Students immediately see (and understand) how empirical regression lines are drawn with column and row means, that scatterplots with percentile contour lines are like topographic maps, and that scatterplots of grouped data can be depicted in three dimensions in a view that resembles a large city's skyline as seen from an airplane. We have collected dozens of comic strip cartoons which touch on measurement or statistics. A recent favorite is a "Sally Forth" in which the wife says to her husband, "Have you ever noticed how there's a direct relationship between the number of stoplights you miss and how bad you have to go to the bathroom?"

Tropes

We are continually searching for verbal images or figures of speech (tropes) to express statistical concepts. Of those we have found, the most vivid is one used by McCall (1939) as quoted in Cureton (1971): "Every pupil, teacher and patron needs to learn . . . that every measurement in the world is not a point but a probable-error <u>blur</u> [emphasis ours] -- narrow with micrometer measurements and wide with mental measurements." (pp. 6-7)

On a related topic we begin our units on interval estimation by taking about the age of antique furniture: "Now here we have a hunt board, <u>circa</u> 1820, from the Georgia Piedmont." Most students know that 1820 is the estimated date when the piece was handcrafted and that the circa gives a band of dates within which the true date probably lies. And of course, circa is antique dealer argot for "blur."

We are still polishing the analogy of computing descriptive statistics and making soup stock. In both cases the goal is to extract the "essence" from the "ingredients." And in both cases the "ingredients" lose their individual identities.

Trivia

We have tried to explain simple regression by having students imagine that they place bar magnets over scatterplot's data points with the graph itself flat on the floor. If there are two ordered pairs with the same values, two magnets would be placed over that point. Students are then told to imagine that they have a straight, rigid steel rod. They further imagine that the bar magnets are aligned vertically and that their task is to find a position for the rod such that it is in equilibrium with all the magnets. This position should approximate the regression of Y on X line. By rotating the magnets to a horizontal position and repeating the process of putting the rod into equilibrium with the magnets, the regression of X on Y should be approximated. We have used data sets in Hope (1967) for this exercise.

Sometimes, a historical note will make a point more vividly then a current allusion. Consider the topic of controlled experiments. According to Morrison (1989), perhaps the first controlled clinical experiment was conducted in 1747 by Dr. James Lind, surgeon on board the man-of-war, H.M.S. Salisbury. From those crew members suffering from scurvy Lind selected 12, as alike as possible. All were berthed in the same quarters and fed the same rations for a period of 14 days. Six treatments were offered (each with some medical precedent); two patients were assigned to each treatment. One treatment consisted of having the patients eat two oranges and one lemon daily; those two sailors improved. Good sources for statistical history include Cowles (1989), Porter (1986), Stigler (1986), and Walker (1929).

And did you ever wonder about the origin of reliability in its psychometric meaning? The much maligned Cyril Burt told us in prefactory note to his belatedly published paper on using ANOVA in estimating test reliability (Burt, 1955). In brief, Gauss (and Fechner after him) used the German cognate of precision in referring to the consistency of measurements. Around the turn of the century, another term Zuverlässigkeit, was adopted by German psychologists; Spearman translated this as reliability.

Our Hope

By now we trust that we have piqued your interest with our "Tips, Tropes, and Trivia." Our hope is not so much that you will try our ideas (though we would be gratified), but that you have sensed the variety of resources available to you as a teacher of educational statistics, measurement, and research methods.

References

Burt, C. (1955). Test reliability estimated by analysis of variance. British Journal of Statistical Psychology, 8 (Part II), 103-118.

Cowles, M. (1989). Statistics in psychology: An historical perspective. Hillsdale, NJ: Erlbaum.

Cureton, L. W. (1971). The history of grading practices. Measurement in Education, 2, 1-8.

Dudek, F. J. (1981). Data sets having integer means and standard deviations. Teaching of Psychology, 8, 51.

Faulkner, E., Carlson, R., Poste, H., & Sherr, L. (1993). Transparency master book for statistics. St. Louis, MO: Mosby Year Book.

Hope, K. (1967). Elementary statistics: A workbook. New York: Pergamon Press.

Huck, S. W. (1972). The analysis of covariance: Increased power through reduced variability. Journal of Experimental Education, 41, 42-46.

McCall, W. A. (1939). Measurement. New York: Macmillan.

Magliozzi, R., & Magliozzi, T. (1994, July 30). Car talk. Atlanta Constitution, E 37.

Morrison, P. (1989). Review of the book The history of Scurvy and Vitamin C. Scientific American, 260, 118-119.

Pearson, K., & Lee, A. (1903). On the laws of inheritance in man. I. Inheritance of physical characters. Biometrika, 2, 357-462.

Porter, T. (1986). The rise of statistical thinking, 1820-1900. Princeton, NJ: Princeton University Press.

Read, K. L. Q., & Riley, I. S. (1983). Statistics problems with simple numbers. American Statistician, 37, 229-231.

Stigler, S. (1986). The history of statistics: The measurement of uncertainty before 1900. Cambridge, MA: Harvard University Press.

Treloar, A. E. (1951). Biometric analysis: An introduction. Minneapolis, MN: Burgess Publishing.

Walker, H. M. (1929). Studies in the history of statistical methods with special reference to certain educational problems. Baltimore: Williams and Wilkins

Author Note

William M. Stallings and John H. Neel, Department of Educational Policy Studies.

Correspondence concerning this article should be sent to William M. Stallings, Department of Educational Policy Studies, Georgia State University, University Plaza, Atlanta, Georgia 30303.

TM 025780

AERA April 8-12, 1996

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)

ERIC®

REPRODUCTION RELEASE

(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: Tips, Tropes, and Trivia: Ideas for Teaching Educational Research

Author(s): William H. Stallings, John H. Neel, and Charles K. West

Corporate Source: Georgia State University, University of Illinois Urbana-Champaign

Publication Date: 12 April 1996

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce the identified document, please CHECK ONE of the following options and sign the release below.

[X] Sample sticker to be affixed to document

Check here
Permitting microfiche (4"x 6" film), paper copy, electronic, and optical media reproduction

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Level 1

Sample sticker to be affixed to document [ ]

or here
Permitting reproduction in other than paper copy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY

Sample

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Level 2

Sign Here, Please

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Signature: William M. Stallings	Position: Professor of Educational Policy Studies
Printed Name: William H. Stallings	Organization: Georgia State University
Address: Department of Educational Policy Studies, Georgia State University, University Plaza, Atlanta GA 30303	Telephone Number: (404) 651-2582
	Date: 17 April 1996

CUA

THE CATHOLIC UNIVERSITY OF AMERICA
Department of Education, O'Boyle Hall
Washington, DC 20064
202 319-5120

February 27, 1996

Dear AERA Presenter,

Congratulations on being a presenter at AERA[1]. The ERIC Clearinghouse on Assessment and Evaluation invites you to contribute to the ERIC database by providing us with a written copy of your presentation.

Abstracts of papers accepted by ERIC appear in *Resources in Education (RIE)* and are announced to over 5,000 organizations. The inclusion of your work makes it readily available to other researchers, provides a permanent archive, and enhances the quality of *RIE*. Abstracts of your contribution will be accessible through the printed and electronic versions of *RIE*. The paper will be available through the microfiche collections that are housed at libraries around the world and through the ERIC Document Reproduction Service.

We are gathering all the papers from the AERA Conference. We will route your paper to the appropriate clearinghouse. You will be notified if your paper meets ERIC's criteria for inclusion in *RIE*: contribution to education, timeliness, relevance, methodology, effectiveness of presentation, and reproduction quality.

Please sign the Reproduction Release Form on the back of this letter and include it with **two** copies of your paper. The Release Form gives ERIC permission to make and distribute copies of your paper. It does not preclude you from publishing your work. You can drop off the copies of your paper and Reproduction Release Form at the **ERIC booth (23)** or mail to our attention at the address below. Please feel free to copy the form for future or additional submissions.

Mail to: AERA 1996/ERIC Acquisitions
The Catholic University of America
O'Boyle Hall, Room 210
Washington, DC 20064

This year ERIC/AE is making a **Searchable Conference Program** available on the AERA web page (http://tikkun.ed.asu.edu/aera/). Check it out!

Sincerely,

Lawrence M. Rudner, Ph.D.
Director, ERIC/AE

---

[1]If you are an AERA chair or discussant, please save this form for future use.