Statistics in the Classroom

Disaster Week—An Interdisciplinary Approach

The eighth grade classes at Brown Middle School in Ravenna, Ohio, did an interdisciplinary unit on natural disasters entitled “Disaster Week.” (How appropriate for a middle school!) Our school is teamed and each team tries to have one or two interdisciplinary units each year.

Our goals were to have the students understand four natural disasters that affect our area: fires, floods, earthquakes, and tornadoes. We wanted them to correctly use data analysis techniques to solve the questions posed to them. We also wanted them to understand that these disasters could happen to them and to have thought about what they would do if they were ever faced with one of these disasters.

In science class they learned how these forces come to be. In language arts they read about the flood in Shady Side, Ohio, and made a videotape to send to the students there. In social studies, they dealt with the social implications of these disasters. A speaker from the Red Cross, a weatherman from a local TV station, a fireman, and our state representative all came to talk about various aspects of safety in natural disasters.

It is always difficult to find a way to make mathematics “fit” into interdisciplinary units. Data analysis was the answer. It not only was germane to the issues at hand, it also brought all the strands of the unit into a coherent whole.

The students were divided into groups of three or four. Each group could select which disaster they wished to work on. They were given a list of questions, such as “Which continent is safest to live on if you wish to escape an earthquake?” “Is it better to live east or west of the Mississippi River if you wish to be safe from tornadoes?” Each group had five to seven questions that they could answer. They were given data from the World Almanac. The only alteration made to the data was that we listed the continent names next to the countries.

We perceived that three of our nine classes would have difficulty organizing the data so we had parent volunteers and students from a nearby university come in to help.

The assignment was to make a poster that had at least three graphs that answered the questions. They had to make a written report and make a presentation to the class of their findings. We also made a slideshow of the whole unit and presented it along with our...
Disaster Week—continued from page 1

posters to our school's Parent Advisory Council and to the local Rotary Club.

Assessment of the data projects was done by using a checklist. Points were allotted for each graph, for the overall appearance of the poster, for the written summary, and for the in-class presentation. When asked to evaluate the whole unit, the items getting the highest ranking from the students were the data projects and the videotaping. The kids loved them! As teachers, we found the time on task was much increased.

We believe that we accomplished our goal of having the students use data analysis techniques to solve problems posed to them. Every student participated in some productive way.

The data analysis part of this unit certainly fits the NCTM Standards. It required that the students organize and analyze data to solve a problem and then communicate their findings both verbally and in writing.

Our unit this year is on the crisis of world population. We plan to use a similar format. Wish us luck!

—Maria Mastomatteo
Brown Middle School
Ravenna, Ohio

Video Review

Statistics: Decisions Through Data

Text by David S. Moore, Purdue University, 1992.

COMAP, 57 Bedford Street Lexington, MA 02173; telephone: 800-772-6627

Statistics: Decisions Through Data is adapted from Against All Odds (the excellent videotape series on statistics developed for colleges and universities), and is designed for use at the high school level. The original 26 hours of videotape have been edited into five hours. An accompanying text has been written by David Moore to be used with the videotapes.

The course has been organized into 21 units. For each unit, the videotape is 12-20 minutes long, allowing for viewing and supplemental discussion within a class period. The text provides, for each unit: a summary of the video;
prerequisites (both mathematical and statistical); student learning objectives; an overview of the content; questions to guide taking notes; key facts: exercises; a quiz; solutions to the exercises and quiz. (Unit 1, being a general introduction to the series, has no quiz; neither Unit 1 nor Unit 2 include a set of key facts.)

The organization of each videotape is similar. A real-world situation or two are used as a "hook": the three or four main ideas of the videotape are listed and described; the statistical techniques are developed for, and used with, real-world examples; the main ideas are summarized.

The reviewer previously had the opportunity to review several of the videotapes in the Against All Odds series (STN March 1989). "Decisions Through Data" contains the reviewer's favorite examples from AAO as well as a number of others. All examples are explained well, are interesting and motivating and show the usefulness of statistics; the visual work is excellent.

This material should be most effective in bringing statistics into the world of high school students. It could form the heart of a statistics course for the general college-intending high school population. (Some teachers might want to add a treatment of probability, including simulation, to such a course.)

"Statistics: Decisions Through Data" is really high quality material. The best praise comes from an elementary student who heard the first ten minutes of Unit 7 on Normal Curves. He slipped up to me as I was leaving the room and said "Cool video!"

Reviewed by
Albert Shulite
Oakland Schools
Waterford, Michigan

(Editor's Note: Dr. Shulite has also discussed each of the 21 units briefly, giving the main ideas developed and the real-world examples used. Due to space limitations, they cannot be presented here. However, to indicate the extent of his comments, those regarding the first hour of the five hours follow. For a copy of the complete review, send a business size SSAB to the STN Editor. Please be sure that your return envelope has a 29 cent stamp affixed. Thank you.)
Book Review

Contemporary Precalculus Through Applications

North Carolina School of Science and Mathematics, Janson Publications, Inc. 1991

There is an unflattering tale that suggests the camel must have been designed by a committee because no individual mind could have created a thing of such haphazard incongruity. So it is with some trepidation that a reviewer approaches a book written by a team of 10 writers. But the result here is an outstanding success. Perhaps this was to be expected because parts of the book had previously been published in the series “New Topics for Secondary School Mathematics” with accompanying software by the National Council of Teachers of Mathematics.

The book is intended as a foundation for future course work in mathematics (calculus, finite mathematics, discrete mathematics, and statistics), and also engineering, the physical and life sciences, business, finance, and computer science. The goals of the textbook parallel those of the NCTM Curriculum and Evaluation Standards and the applications dealt with are genuine “real world” ones that do “…motivate and apply theory.”

The eight chapters cover data analysis, functions, modeling, trigonometry, and matrices. The data analyzed are only in two variables, but there is an interesting blend of contemporary “exploratory data analysis” techniques with the more traditional ones. But it is in the “area modeling” that the book excels. Not only is there a first-rate chapter on the topic itself, with some fascinating and unusual examples (e.g., determining the “best” speed limit, 10-speed bicycle gears, optimizing elevator usage), but mathematics is used to model a range of phenomena throughout the book.

The book is written in a direct conversational and personal style. There are extended worked examples with detailed descriptive analyses. The photographs imply that much of the material is intended for group work or cooperative learning. Computers and calculators are expected to be available as necessary tools for much of the computation in the exercises. The Index has a rather curious form and seems to have been computer-derived. This does not conform to the high standards of the rest of the book. However this is a minor criticism about an otherwise splendid piece of work. Let the concluding sentence of the team’s preface speak for itself: “The course has been constructed with the philosophy that the quality of learning is more important than completing a syllabus.” Amen to that.

—Reviewed by Michael Cooke
Notre Dame Regional Secondary School
Vancouver, British Columbia

Statistics in the Classroom

On a Baseball Playoff

We read with interest the September 1991 issue of Statistics Teacher Network. In particular, the article about the playoff scenario in the National League was certainly interesting and highlighted how different decision rules can lead to some crazy outcomes or scenarios. We would like to point out what actually happened in that famous year when there was a strike in the middle of the baseball season.
The following tables give the records for each major league team (taken from Information Please: Book of Sports Facts and Records 1983, A. & W. Publishers, Inc., New York, 1983, pp. 103-104). The tables give the results for each half of the season and then the overall results. Several interesting outcomes can be seen in these tables.

No team won both halves of the entire season. Therefore, the team that won the first half of the season (highest winning percentage in the first half) played the team that won the second half of the season (highest winning percentage in the second half) in a playoff. The teams are identified in the table. In three of the four Divisions, the team that had the highest overall winning percentage in that Division failed to make the playoffs! They were St. Louis, Cincinnati, and Texas. Furthermore, Cincinnati had the highest overall winning percentage in the Major Leagues and did not qualify for the playoffs!

This is somewhat like your second example in the STN article about the batting averages. A team that finishes in second place in both halves of the season can still end up with the best overall record or have the best overall winning percentage. However, in two cases (St. Louis and Cincinnati) these teams finished second in each half-season behind two different teams in their respective Divisions. An exact analogy to the batting average example comes from the American League Western Division. Texas had a lower winning percentage than Oakland in both half-seasons, but had a better overall winning percentage.

Finally, there is also a tremendous inequity in the number of games played, which leads to an unfair decision rule as to what teams are eligible for the playoffs. For example, in the first half-season, Cincinnati played one game less than Los Angeles and finished with one win less. Had Cincinnati been given the opportunity to play one more game, they might have tied Los Angeles. The same is true for St. Louis and Montreal in the second half-season. Thus, the number of games played should have been part of the decision rule.

We hope your readers find this useful as an example of what actually happened, rather than what could have happened. Furthermore, it illustrates how a proper understanding of some simple statistical principles may have a profound impact on defining logical decision rules.

—Stephen J. Ruberg, Ph.D.
and Kurtis Doyle
Marlon Merrell Dow Inc.
Kansas City, Missouri

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| **Western Division** |     |     |    |     |     |     |     |     |
| Oakland*         | 27 | 23 | .517 | 27 | 22 | .551 | 64 | 55 | .534 |
| Texas            | 33 | 22 | .600 | 24 | 26 | .460 | 57 | 48 | .539 |
| Chicago          | 31 | 22 | .585 | 33 | 30 | .534 | 54 | 52 | .509 |
| California       | 31 | 29 | .517 | 30 | 30 | .490 | 51 | 50 | .500 |
| Kansas City*     | 20 | 33 | .380 | 20 | 23 | .466 | 40 | 33 | .510 |
| Seattle          | 21 | 36 | .381 | 25 | 25 | .442 | 46 | 51 | .465 |
| Minnesota        | 17 | 39 | .308 | 24 | 36 | .423 | 41 | 48 | .500 |

*Qualified for playoff.

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| **Western Division** |     |     |    |     |     |     |     |     |
| Los Angeles*      | 36 | 21 | .632 | 27 | 26 | .500 | 63 | 47 | .573 |
| Cincinnati        | 35 | 21 | .625 | 31 | 21 | .596 | 66 | 43 | .541 |
| Houston*          | 28 | 29 | .491 | 32 | 20 | .623 | 60 | 49 | .555 |
| Atlanta           | 25 | 29 | .465 | 25 | 27 | .451 | 50 | 56 | .537 |
| San Francisco     | 27 | 32 | .458 | 29 | 23 | .550 | 56 | 58 | .505 |
| San Diego         | 23 | 33 | .412 | 18 | 36 | .333 | 41 | 49 | .500 |

*Qualified for playoff.
Source Code Available...

Turbo-Pascal source code that demonstrates the Central Limit Theorem may be obtained by sending a request to gjohnson@carleton.edu. The sampling distributions of sums/averages are simulated with the results displayed in histogram form. I currently use this program for classroom demonstration to accompany the text *Statistics* by Freedman, Pisani, Purves, Adhikari. If e-mail is not available, send a 5 1/4 inch disk and a mailer with sufficient postage.

—Roger W. Johnson Department of Mathematics and Computer Science Carleton College Northfield, MN 55057-4025

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Book Review

**Data Visualization**


*Data Visualization* is a short text (99 pages) designed to give students a unique introduction to descriptive statistics. This is done by submerging students in different examples based on real data sets. Students are instructed to interpret and then construct different graphical representations, to calculate a few descriptive statistics, and to choose which graphical representation is most appropriate for a particular data set. In addition to learning these basic tools and techniques, an important aim of the authors is to help students develop a critical attitude towards statistics presented in the media.

There are 10 chapters in the book, some of which bear traditional titles (e.g., "Box-Plots") and some of which have more unusual titles (e.g., "You can’t always get what you want"). The data sets used represent a wide variety of topics, including geographical and population data, sociological data, and scientific data.

The first chapter begins with a large and complex urbanization map of the world, which is then explored in smaller pieces. Questions are used to guide students in reading and interpreting information as they learn how to interpret and construct bar and pie graphs. The next chapter focuses on how data are collected and how studies are designed. The ideas of samples and sampling methods are introduced and related to the validity of conclusions based on samples of data.

The third chapter, "One number tells the story," introduces mean and median as examples of a single number summary for a data set. Next, population data are presented on the Orkney Islands, small islands off the coast of Scotland. This chapter demonstrates that there are different ways of graphing and tabulating the same data. A real issue that becomes apparent in analyzing the data, is why so few young people and so many older people live on the islands. The authors present graphs illustrating how this disparity can be used to achieve a particular political objective.

The chapter titled "You can always get what you want" reinforces the stereotype that you can always find a way to lie with statistics. Although examples of misleading and incorrect graphs are introduced, students are also guided in developing more appropriate ways of representing the same data.

"Every picture tells a story" is a brief chapter that introduces different ways of presenting large amounts of data. The remaining chapters introduce stem-and-leaf plots, box-plots, and scatter diagrams. The final chapter offers "mixed exercises," a variety of data sets with accompanying questions that build on skills developed in the previous chapters.

Overall, "Data Visualization" provides a nice collection of interesting data sets and representations. The emphasis is definitely on data and graphs, and there is little accompanying text to read. The explanations that are included are well illustrated and very easy to follow. The materials are designed for students in grades 7-12, and could either be used as a small, stand-alone unit on descriptive statistics or as a supplement to a larger course in statistics.

An article in the October 1992 issue of *Mathematics Teacher*, by Martin van Reeuwijk, describes the plotting and evaluation of these materials in some high school algebra classes. A forthcoming book by the same authors, *Learning and Testing Mathematics in Context*, also published by WINGS for Learning/Sunburst, describes in detail the implementation and assessment of this unit in the same high school setting.

The *Data Visualization* student text and teacher answer guide are available for $35 from...
CBMS Societies Receive Career Grant; Information Requested

Acting on behalf of the Conference Board of the Mathematical Sciences (CBMS), the Mathematical Association of America (MAA) has received a three-year grant from the Department of Energy to develop a comprehensive program to prepare and disseminate career information in the mathematical sciences. This initiative will serve as the basis for a sustained effort by the fifteen CBMS member societies to provide up-to-date career information in the mathematical sciences to students, teachers, advisors, and guidance counselors in schools and colleges.

There are four related components to the project:

- Gather information about existing career information.
- Link math community efforts with other organizations that provide career information.
- Develop needed new materials in print and video formats.
- Establish a subscription program for continuing dissemination of career information.

This program will be directed by Dr. Andrew Sterrett at the MAA headquarters in Washington. Responsibility for general policy and project direction will be vested in a steering committee representing the CBMS member societies. The current members of the steering committee and the societies they represent are: Carol Westfall (AMATYC); Samuel Rankin (AMS); Nancy Flournoy (ASA); Jenny Bagliro (AWM); John Alexander (NAM); Linda Hall (NCTM); Frank Trippi (ORSA); and Leon Seidelman (SIAM).

The career information that reaches students should be lively, appealing, and should reflect the great opportunities and real diversity of careers in the mathematical sciences. As the first step in implementing this project, we are urgently seeking information about existing career information materials and programs. Posters, brochures, videos, books, programmatic ideas—please send samples or references for any career material that you or your students have found helpful or useful, as well as your suggestions for where new material is most needed.

All correspondence or inquiries about this program should be directed to: Andrew Sterrett, Career Information in the Mathematical Sciences Project, Mathematical Association of America, 1529 Eighteenth Street NW, Washington DC 20036. Telephone: 202-387-5200. E-mail: maa@hilda.umd.edu

Special Discount

Teaching Statistics...20% discount for NCTM members

As a special service to members, NCTM has arranged with the Teaching Statistics Trust for you to buy their teacher's magazine at a 20% discount.

Judith Zawojewski writes "I included Teaching Statistics in the bibliography of NCTM's Middle School Addendum to the Standards: Dealing with Data and Chance because I have found it to be extremely useful for both classroom practice and teacher education. In general, the articles lend themselves well to the types of classroom experiences advocated in NCTM's Curriculum and Evaluation Standards."

Teaching Statistics contains regular features and articles for teachers of pupils aged 9 through 19. It is designed to help teachers of mathematics and statistics teach in exciting and creative ways—as described in the Standards. The regular features include: Data Bank, Practical Activities, Computing Corner, Problem Page, Project Parade, Book Reviews, Research Report, Letters and Historical Perspective. It is published three times a year in February, May, and September.

The regular price is £19 or US$45 per annum. NCTM members can claim a 20% discount and pay either £15.20 or US$36. Payment can be made by check or Visa or Mastercard. Your credit card is usually the cheapest method since the billing is done on the US dollar equivalent of £15.20. Be sure to quote your NCTM membership number to be awarded the discount. If paying by Visa or Mastercard write your number and expiration date clearly and give the name and address where the card is applicable. Checks should be made payable to Teaching Statistics.

Send your order directly to: Teaching Statistics, Department of Probability and Statistics, University of Sheffield, Sheffield S3 7RH, England. FAX: 742 824 292. E-mail: ST9FH@PA.SHEF.AC.UK

The Statistics Teacher Network

Winter 1993
Quantitative Literacy

Statistics Competitions...

The Center for Statistical Education of the American Statistical Association sponsors two excellent competitions for your students to enter. The “American Statistics Project Competition,” open to grades 4 through 12, is in its seventh year. The “American Statistics Poster Competition,” co-sponsored with the ASA Section on Statistical Graphics, is in its fourth year and is open to students from kindergarten through grade 12. Entries must be received by April 15. There is still plenty of time to get your students to enter either or both competitions. Brochures that further explain the purpose as well as the rules and prizes are available by writing: Kathryn Rowe, American Statistical Association, 1429 Duke Street, Alexandria, VA 22314-3402; telephone: (703) 684-1221; fax: (703) 684-2037; e-mail: TRACEY@ASA.MHS.COMUSERVE.COM.

And don’t forget: Quantitative Literacy workshops are being offered for the summer. Several sites have already confirmed dates for workshops using the highly acclaimed QL program and materials. For more information, contact Kathryn Rowe at the address above.

Statistics Teacher Network
C/o American Statistical Association
1429 Duke Street
Alexandria, VA 22314-3402

Let us know your Zip +4!

Keep Us Informed...

The Statistics Teacher Network is a newsletter published three times a year by the American Statistical Association—National Council of Teachers of Mathematics Joint Committee on the Curriculum in Statistics and Probability.

We need your letters, announcements, articles, and information about what is happening in statistics education! Please send hard copy and, if possible, a disk written in standard ASCII text to the editor:

Jerry Moreno, Dept. of Mathematics,
John Carroll University, University Heights, OH 44118
or moreno@jcu.edu
or fax: (216) 397-3039

Layout & Design: Alison Stern-Dunjak,
American Statistical Association

To be added to the mailing list or make an address change, please send your name and address to: Statistics Teacher Network, c/o American Statistical Association, 1429 Duke St., Alexandria, VA 22314-3402; (703) 684-1221; fax: (703) 684-2037.