The
Statistics Teacher Network

Number 32 ASA/NCTM Joint Committee on the Curriculum in Statistics and Probability Winter 1993

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

continued on page 2

In this Issue...

From the [illegible]

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Thanks to [illegible] letters. The [illegible] follow [illegible] eating [illegible] statistics in the [illegible]

Don't forget [illegible] for the poster [illegible] for all grades [illegible] Rowe, American [illegible] 1429 Duke Street [illegible] VA 22314-3402.

Jerry Moreno
Editor
Stat[illegible]

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 last 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 Shulte
Oakland Schools
Waterford, Michigan

(Editor's Note: *Dr. Shulte 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 SSAE to the STN Editor. Please be sure that your return envelope has a 29 cent stamp affixed. Thank you.)*

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Unit 6 [illegible] The underlying [illegible] to highlight [illegible] outliers give bad [illegible] reviewed; [illegible] standard devia- [illegible] distributions with no outliers [illegible] standard deviation is [illegible] discussion.

Mark Your Calendar Now For...

The 4th International Conference on the Teaching of Statistics (ICOTS). ICOTS4 will take place July 25–30, 1994, in Marrakech, Morocco. Sponsored by the International Statistical Institute, ICOTS is the major international conference concerned with statistical education. Themes include: statistics education for citizens, statistics in the schools, research in teaching and learning statistics and probability, the impact of technology on teaching, and statistical training in universities, industry, and government. The conference will be held in the recently constructed air-conditioned Congress Palace in Marrakech. For further information and to receive later announcements, write to the chair of the program committee, Professor Yves Escoufier, Université Montpellier II, Place E Bataillon-34095, Montpellier, Cedex 5, France.

Book Review

Contemporary Precalculus Through Applications

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

There is an unflattering tale that suggests that 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.

National League

Team	First Half			Second Half			Overall		
	W	L	%	W	L	%	W	L	%
Eastern Division									
Philadelphia*	34	21	.618	25	27	.481	59	48	.551
St. Louis	30	20	.600	29	23	.558	59	43	.578
Montreal*	30	25	.545	30	23	.566	60	48	.556
Pittsburgh	25	23	.521	21	33	.389	46	56	.451
New York	17	34	.333	24	28	.462	41	62	.398
Chicago	15	37	.288	23	28	.451	38	65	.369
Western Division									
Los Angeles*	36	21	.632	27	26	.509	63	47	.573
Cincinnati	35	21	.625	31	21	.596	66	42	.611
Houston*	28	29	.491	33	20	.623	61	49	.555
Atlanta	25	29	.463	25	27	.481	50	56	.472
San Francisco	27	32	.458	29	23	.557	56	55	.505
San Diego	23	33	.411	18	36	.333	41	69	.373

*Qualified for playoff.

American League

Team	First Half			Second Half			Overall		
	W	L	%	W	L	%	W	L	%
Eastern Division									
New York*	34	22	.607	25	26	.490	59	48	.551
Baltimore	31	23	.574	28	23	.549	59	46	.562
Milwaukee*	31	25	.554	31	22	.585	62	47	.569
Detroit	31	26	.544	29	23	.558	60	49	.550
Boston	30	26	.536	29	23	.558	59	49	.546
Cleveland	26	24	.520	26	27	.491	52	51	.505
Toronto	16	42	.276	21	27	.438	37	69	.347
Western Division									
Oakland*	37	23	.617	27	22	.551	64	55	.538
Texas	33	22	.600	24	26	.480	57	48	.543
Chicago	31	22	.585	23	30	.434	54	52	.509
California	31	29	.517	20	30	.400	51	59	.464
Kansas City*	20	30	.400	30	23	.566	50	53	.485
Seattle	21	36	.368	23	29	.442	44	65	.404
Minnesota	17	39	.308	24	29	.453	41	68	.376

*Qualified for playoff.

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

Source Code Available...

Turbo-Pascal source code that demonstrates the Central Limit Theorem may be obtained by sending a request to rjohnson@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

Book Review

Data Visualization

by Jan de Lange and Heleen Verhage (in cooperation with Gail Burrill and Martin van Reeuwijk), published by WINGS for Learning/Sunburst Communications, 1992.

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 piloting 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

WINGS for Learning/Sunburst Communications, 1600 Green Hills Road, P.O. Box 660002, Scotts Valley, CA 95067-0002.

—Reviewed by
Joan Garfield
University of Minnesota
Minneapolis, Minnesota

Information Please!

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 Baglivo (AWM); John Alexander (NAM); Linda Hall (NCTM); Frank Trippi (ORSA); and Leon Seitelman (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 824292. E-mail: ST9PH@PA.SHEF.AC.UK

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. COMPUSERVE.COM.

And don't forget: **Quantitative Literacy workshops are being formed 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.**

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@jcvaxa.jcu.edu**

or **fax: (216) 397-3033**

Layout & Design: *Alison Stern-Dunyak, American Statistical Association*

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