The Statistics Teacher Network

Number 49 ASA/NCTM Joint Committee on the Curriculum in Statistics and Probability Autumn 1998

Software Review ...

Data Explorer

Lois Edwards (1998), Sunburst Communications, $89.95 for one computer; $89.95 for 5 installations; $179.95 for 10 installations. Teacher's Guide–Macintosh/Windows, by Lois Edwards.

System requirements:

IBM-PC — "Windows 3.1 or higher, a 80386 processor or better and a 640x480 monitor capable of 256 colors" (Edwards 1998, p. 7).

Macintosh — System 7.0 or higher, 68040 processor or better, 33MHz, "3.5 MB of RAM, 640x480 monitor capable of 256 colors" (Edwards 1998, p. 8).

This state-of-the-art graphing software for upper elementary and middle-school students was created by the designer of *Data Insights* and *Graphers*, Lois Edwards (1990, 1996). It supports many of the principles for teaching statistics, enumerated in *Guidelines for the Teaching of Statistics: K–12 Mathematics Curriculum* (Burrill 1991). In particular, students are involved in constructing, analyzing, editing, and communicating with graphs and plots. This review focuses on the features of the software and the support documentation.

Also In This Issue...

The Software

There are two main parts to the software—"Survey" and "Analyze Data." "Survey" allows users to create a questionnaire with up to 12 items each with 12 choices and once it is created, it can be completed directly on the computer. "Analyze Data" has five options. Two are exploratory specific to categorical and numerical data, and three are applications specific to categorical, numerical, and mixed data. Each option has an easy-to-follow guided tour. Using the exploratory options, students observe the dynamic nature of visual displays as they make changes in their graphs by adding or subtracting data directly on the graphs. Using the applications options students create graphs from data sheets they construct. A "notebook" feature allows students to write about their graphs, recording impressions, observations, and interpretations that can be saved electronically and printed out.

In preparation for this review, I used the software with fifth graders in an urban public school. The children expressed an interest in conducting a survey to find out their classmates' opinions about favorite actor/actress, favorite movie, favorite singer/singing group, and favorite sport to play. These four areas of interest were selected by the children from a list of more than 20 possible items that they generated as they worked in groups of four. Once they agreed on the four items, they constructed the response categories (e.g., "Leonardo Di Caprio," "Will Smith," "Eddie Murphy," "Helen Hunt," "Whoopi Goldberg," and "Jennifer Lopez," for favorite actor/actress). Using the "Survey" feature of the software, the students constructed the survey and entered their choices, which proved to be very easy for them.

After the students completed the survey, they decided to graph the data to see "what the data look like." Based on the type of data students want to analyze (e.g., categorical, numerical, mixed), certain graphs are available. For example, table, line plot, bar graph, circle graph, Venn plot, and grid plot options are available for use with categorical data; table, line plot, histogram, box plot, stem and leaf plot, scatter plot, and line graph options are available for use with numerical data. Multiple bar graphs, line graphs, box plots, expanded box plots, back-to-back stem-and-leaf plots, and fitted lines on scatter plots may also be created. This desirable feature of the software (i.e., restricting graph types based on appropriate data type) teaches children the appropriate types of graphs that may be used to analyze the type of data they have generated. Users are not permitted to make invalid graphs.

Depending on their preferences, students make selections from a menu bar or directly from "buttons" appearing on the left side of the screen. The software is very user friendly.

Based on students' readiness, teachers may activate or de-activate features of the software. For example, there are preferences that enable users to adjust the scale, create box plots, and calculate standard deviation, among others. Decimal numerals may be set to have 0 to 3 places.

The major features of the software are revealed in the "guided tours" that provide users with examples of categorical and numerical data, the appropriate graph types, and the many tools and options available. It is not necessary for students to take all of the guided tours. Recommendations and pedagogical strategies are included in the *Teacher's Guide.*

Students may customize their graphs, inserting titles and labels. For comparison purposes, more than one graph may be displayed on the screen. A "notebook" feature facilitates writing about observations and interpretations. Graphs and the contents of the notebook may be printed for reports and presentations.

Support Documentation

Similar to the *Teacher's Guide* for *Graphers* (Edwards 1996), the *Teacher's Guide* for *Data Explorer* is very comprehensive and well written. There is an extensive Table of Contents. The Guide is divided into five main sections: "Overview," "Guided Tours," "Data Analysis and Statistics," "Teaching Data Analysis," and "Reference." The "Overview of *Data Explorer*" is very helpful in getting started. The section on "Guided Tours" is designed so that the parts specific to desired guided tours may be made available to students to navigate the tour on their own. Each tour contains sample questions that challenge students to make predictions and extrapolations, that is, to read beyond the data (Curcio 1989).

The section on "Data Analysis and Statistics," refers to important graphing ideas published in *Data Insights* (Edwards 1990) and in *Graphers* (Edwards 1996). The process of statistical investigation including formulating a question, collecting data, analyzing data, and applying the results is discussed.

"Teaching Data Analysis" provides excellent advice for teachers, and includes ideas for obtaining data from various Web sites. An extensive "Reference" section contains explanations and descriptions of the menu features and options. An "Annotated Bibliography" is also included.

Reviewer's Comments

1. Students often use inappropriate graphs to represent data. For example, they may use a bar graph for numerical data and use a line graph for categorical data. This may occur because "careful distinction between discrete and continuous data has not always been made" (Burrill 1997, p. 23). *Data Explorer* takes an important position on this—by restricting graph types to those that are data-appropriate, students learn about the nature of data and appropriate forms of representation. Students become attentive to and differentiate between categorical and numerical data.

2. Having the capability to display multiple graphs on the screen facilitates a comparison of the data displayed in different appropriate forms. For example, being able to view data in a box plot and a histogram reveals important characteristics of the data as well as of each visual display. Students may formulate questions for which answers are more readily revealed in the different graphical displays. Such tasks "tap higher-order thinking" (Curcio and Artzt 1996, p. 669).

3. A very useful option for the circle graph allows students to express segments in fractions, decimals, or percents. This same option is available for table entries. Middle school students need experience viewing parts of a unit in equivalent numerical form. This application makes the experience meaningful.

4. When an error was made in entering survey information, it was not clear how to correct it. The "Edit Survey" option was not "active." Students realized that they could access the survey data and make changes in "Exploring Category Data."

5. Having the "notebook" feature clearly communicates the value of being able to write about one's observations and interpretations. To facilitate note taking, when activated, the notebook appears on the screen with the graph(s).

6. Initially, it was not clear how aggregated data could be entered. In the "Use Category Data," "Use Number Data," and "Use Mixed Data," individual data entries are made directly on a data sheet, and then graphed. After experimenting with "Explore Category Data" it became obvious that aggregated data could be entered in a table and the variables and counts could be modified and adjusted accordingly.

This software is a great contribution to the graphing tools available for middle school students. It is easy to use. As I watched fifth graders using the software it confirmed a statement in the Guide, that is, that "*Data Explorer* is a tool that adapts to students' skills and needs as they develop data literacy" (Edwards 1998, p. 6). Students learn about the nature of data and graphical displays as they create a survey, enter data, graph the data, compare graphs of the same data, and write about their observations, interpretations, and analyses. Computers in middle schools should not be without *Data Explorer*!

Selected Bibliography

Burrill, Gail. (Ed.). *Guidelines for the Teaching of Statistics: K–12 Mathematics Curriculum.* Alexandria, VA: American Statistical Association, 1991.

Burrill, Gail. "Data Analysis in the United States: Curriculum Projects." In *Papers on Statistical Education Presented at ICME-8*, edited by Brian Phillips. Australia: Swinburne University of Technology, 1997, pp. 15–26.

Curcio, Frances R. *Developing Graph Comprehension.* Reston, VA: National Council of Teachers of Mathematics, 1989.

Curcio, Frances R., and Alice F. Artzt. "Assessing Students' Ability to Analyze Data: Reaching beyond Computation." *Mathematics Teacher*, 89 (November 1996): 668–673.

Edwards, Lois. *Data Insights.* Pleasantville, NY: Sunburst, 1990.

———. *Data Explorer Teacher's Guide Macintosh/Windows.* Pleasantville, NY: Sunburst, 1998.

———. *Graphers.* Pleasantville, NY: Sunburst, 1996.

Friel, Susan N., George W. Bright, and Frances R. Curcio. "Understanding Students Understanding of Graphs." *Mathematics Teaching in the Middle School*, 3 (November-December 1997): 224–227.

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Statistics in the Classroom ...

Some Students and a t-Test or Two... Part One

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The Onaway School in the Shaker Heights, Ohio public school system has a special program for all third and fourth graders called "Enrichment Clusters." For six successive Mondays in April and May all third and fourth grade students are enrolled in a single cluster of their choosing. The clusters last for 90 minutes each and the classes are advanced subjects taught by either the teachers or members of the Shaker Heights community or a combination of the two. The cluster subjects are quite varied and run the gamut from human anatomy to understanding the stock market.

In April of 1996 I was asked by Marianne Bursi, the program coordinator, to develop a course on mathematics for the 1997 year. I spent some time thinking about various approaches and finally settled on the idea of teaching the students the proper way to compare averages. Rather than worry about all of the issues surrounding significant differences between two population averages I turned the problem around and focused on the much more common problem of understanding when a difference between two averages does not matter.

While some may wonder at the thought of teaching eight- and nine-year old students statistics at such an "advanced" level, the fact is if you have students who are properly equipped with a few basics and who are really interested in math, the level of difficulty is probably less than teaching the same subject to a room full of PhDs.

The students knew their multiplication tables cold, they had a sound understanding of the concept of graphing numbers, and they were all interested in "doing math." The main hurdles that I faced were teaching the concepts of negative numbers, exponentiation, and square root. With six sessions to use I divided the classes as follows:

First session—I used an M&Ms experiment to get the students accustomed to the idea of variation, histogram plotting and estimation of the most likely outcome.

Second session—The histograms from the first session were reposted and the students were introduced to the concepts of average, median and mode. They were also shown how to compute the average. The session finished with the plotting of a new data set that had the same average as the total M&M histogram of the first session but was bimodal in nature.

Third Session—The class drew real grades out of a bowl and plotted their grades on 6 different graphs depending on their answers to three questions that had been posed in the first session. They then computed the averages of these six histograms and we made some astonishing claims based on just the sizes of the various averages.

Fourth Session—We started with the story of the elephant and the blind men. I made the connection between the issue of describing an elephant and describing a distribution—just as one sentence cannot describe an elephant, one measure cannot describe a distribution. We computed the distances of the various data points from the total M&Ms mean and then added them up and found that they summed to zero. Since the distribution obviously was not of zero width this seemed to be something of a problem.

Fifth Session—We revisited the issue of the "zero width" problem. I introduced the idea of algebraic addition and I showed the students what the square root was and how it worked. We then put in a very tough session of computing the standard deviation.

Sixth Session—I introduced the *t*-test equation and explained what it meant. I gave the students a brief history of Gossett and I provided a sheet with the averages and standard deviations of the various histograms of session three and had the students compute the t values for the various paired comparisons-no significant differences were detected. I then brought out a whole new box of M&Ms and we did the M&Ms experiment again. I computed the averages and standard deviations for the total, red, and blue M&Ms for the new batch and I had the same data for the old batch. We computed the *t* values and found, by luck, that there was a significant difference in the blue M&Ms but none for total or red.

In order to provide more information I have divided this discussion into three parts. I will discuss the first two sessions of my cluster this time. The third and fourth sessions and the fifth and sixth session will be discussed in two later articles.

First Class—For Starters

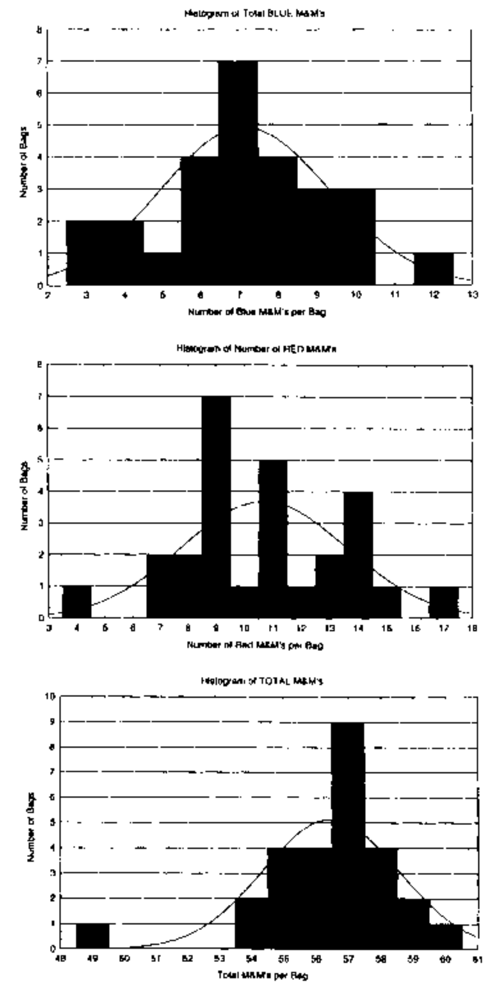
The students were given their first introduction to the idea of measurement uncertainty by measuring the height of a volunteer using respectively, a yard stick, a ruler, and a measuring tape. The results were recorded and I asked if anyone could tell me the volunteer's "real height." I reminded everyone that all who had done the measurements had done their best and that all of the measuring tools were acceptable.

Before moving on to the M&Ms problem I talked to the students about the methods of science-in particular the notion of recording results in lab notebooks and the process of notebook witnessing. The rules for the M&M experiment were as follows:

1. Each student drew two bags of M&Ms from the box.
2. Each student paired with a partner.
3. One student would open one bag of M&Ms, count the red, blue, and total number of M&Ms and record the results on a prepared "lab notebook" page.
4. The partner would then recount and confirm the count by signing off on the notebook page.
5. #3 and #4 were repeated for each bag.

After they had finished, I had each student come up to a large histogram and record their counts of red, blue and total. I also had them write their numbers anywhere on the blackboard. When everyone was seated I covered up the histograms and pointed to the numbers that were written on the blackboard and asked them what the numbers told them. The main point that I made was that the columns of numbers were just data, not information, and that about all one could determine from the numbers was that the total number of M&Ms, the number of red and the number of blue varied from bag to bag.

The histograms (Figure 1,2,3- the normal curves were added to the graphs for the students use in the second session) were uncovered and we discussed the information that this kind of analysis provided. The shape and the extremes were pointed out and we also discussed the issue of "typical" with respect to totals, reds, and



Figures 1,2,3. Histograms of Blue, Red, and total M&Ms per bag.

blues. After this discussion, two additional bags of M&Ms from the same lot were set in front of the students. The students were asked to guess a range for the most probable number of red, blue, and total M&Ms in each of the bags. The guesses were to be based on what we had learned from the plotting. As expected, no ranges were guessed—only the mode.

Second Class—Picture This (Life "Ain't" Normal)

The M&M histograms from last time were posted and the students were asked how the histogram could be summarized with a single number. The concepts of average, median, and mode were introduced. In addition, I introduced the idea of a distribution and the fact that these distributions have names. The word "normal" was introduced and I discussed the idea of the normal distribution. I finished the discussion with a photograph of the current 10 Deutschmark note which has a picture of Gauss, the normal distribution, and its mathematical expression.

After these ideas were expressed I presented the students with the mathematical expression for computing an average-complete with the summation sign. I explained what the summation sign meant and gave them its Greek name. (In case you have forgotten your childhood, mystical looking symbols are nifty particularly when you can make them do something).

The students were divided into groups of two. With one person reading, and one person operating a calculator, the students computed the averages for red, blue, and total M&Ms. The location of the average was noted on each histogram and we spent some time discovering that if the histogram actually was something physical then the average could be viewed as the balance point. Next I introduced the class to the next data set and to the idea of plotting data in time. The students lined up next to a bowl filled with numbers and each in turn drew a number, plotted the number in sequence and connected the number with the previous data point with a single line and then went to the end of the line to repeat the procedure. When we were finished with our time plot I told the class that this method was another way to summarize data. I then asked them if they could see any connection between this graph and the histograms from the last time.

When no responses were forthcoming I turned the graph on end and, with a second piece of graph paper I collapsed the time plot into a histogram (this was done with the aid of one of the students). The resulting histogram was bimodal (Figure 4). I told the students that the data was real deicer fabric data from one of my manufacturing plants. What I didn't tell them was that I had adjusted the data so that the average would be the same as the average for the total M&Ms. With the histogram developed the students again paired off into groups

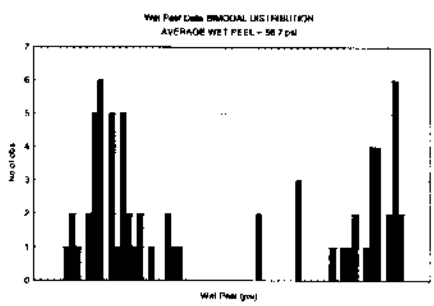


Figure 4. Bimodal histogram of deicer fabric data.

of two and computed the average of this distribution. When they discovered the fact that the average was the same as the total M&M average I pointed out that it was curious that two such differently shaped distributions could have the same average. With some additional discussion I began to introduce the idea that one needs more than just an average to describe a distribution and that, since the data was real-life "ain't" normal.

Since this is the first part of a three part series and since conventional wisdom suggests that such "advanced" concepts cannot be understood by eight- and nine- year olds, the following is worth noting.

In the fall of 1997 I was approached by a fifth grade teacher who was the teacher for one of my former students. After asking if I remembered this student, the teacher wanted to know if there was such a thing as a standard deviation that was used to calculate a thing called a *t*-test. After assuring her that all of the above was true she went on to relate that she had been introducing her fifth graders to the idea of averaging and she had made reference to the size of the averages. At that point my student had practically jumped out of her seat in her effort to tell this teacher about averages and how one should look at them. Of my twelve students, I had four that were quite advanced, two that had to struggle, and six that were in-between. In my estimation, this student was part of the in-between group. Based on what her teacher related to me, I think that it is fair to state that such concepts can be understood by eight- and nine-year old students if they have the proper preparation.

This is not to say that all of the concepts and their ramifications will be understood or retained over time. However, I would consider this effort to be a success if any of my students could just remember that when confronted with two averages, one must do something besides just looking at their relative magnitudes before making any statements about their relative worth.

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Statistics in the Classroom ...

Statistical Errors (Type I and Type II)

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"Data, Data Everywhere, but not a thought to think." —Jesse Shera

The most recent Advanced Placement Statistics Outline of Topics includes the concepts of Type I and Type II errors. The purpose of this paper is to provide simple examples of these error types.

Assume that two samples of people have the indicated ethnic distributions. The sample sizes are 25 and 20, respectively.

	African-American	Native American	Caucasian	Oriental
Sample #1	3	1	15	6
Sample #2	10	4	3	3

Sometimes a visual display of data is helpful. Here are dot plots for each sample.

Sample #1:

African-American	* * *
Native-American	*
Caucasian	* * * * * * * * * * * * * * *
Oriental	* * * * * *

Sample #2:

African-American	* * * * * * * * * *
Native-American	* * * *
Caucasian	* * *
Oriental	* * *

Here is your challenge: Choose one sample at random, then randomly pick one individual from the chosen sample. Based on your observation of the individual, you must make a conjecture as to which sample the chosen individual belongs.

Here is a *null hypothesis*, H_o.

H_o: The individual came from Sample #1.

Based on your observation of the randomly chosen individual, you must decide to either *accept* or *reject* H_o. A rejection of H_o is, of course, equivalent to asserting that the individual came from Sample #2.

There are two types of errors that can be made during this process.

Type I error: H_o is rejected when it is true.

Type II error: H_o is accepted when it is false.

Here are four possible strategies amony many relating to H_o.

Strategy #1: Accept H_o if the randomly chosen individual is Caucasian.

Strategy #2: Accept H_o if the randomly chosen individual is Caucasian or Oriental.

Strategy #3: Accept H_o if the randomly chosen individual is not Native-American.

Strategy #4: Accept H_o if the randomly chosen individual is not African-American.

Let's examine Strategy #1. A Type I error can only occur when H_o is true. Hence, the probability of a Type I error with Strategy #1 is 10/25 = 40%. a Type II error can only occur when H_o is false. In this situation, if Ho is false, then the selected individual came from Sample #2. The probability of a Type II error is 3/20 = 15%. Here is a probability summary for Strategy #1. (In the charts, the probability of a Type I error appears in italics, the probability of a type II error is in bold type.)

Strategy #1:

	Sample is #1	Sample is #2
Accept H_o	60% (correct decision)	**15%** (Type II error)
Reject H_o	*40%* (Type I error)	85% (correct decision)

Here are corresponding probabilities for the other strategies:

Strategy #2:

	Sample is #1	Sample is #2
Accept H_o	84%	**30%**
Reject H_o	*16%*	70%

Strategy #3:

	Sample is #1	Sample is #2
Accept H_o	96%	**80%**
Reject H_o	*4%*	20%

Strategy #4:

	Sample is #1	Sample is #2
Accept H_o	88%	**50%**
Reject H_o	*12%*	50%

Here is a summary chart:

	Probability Type I Error	Probability Sample is #2
Strategy #1	40%	15%
Strategy #2	16%	30%
Strategy #3	4%	80%
Strategy #4	12%	50%

There are, of course, other strategies that could be used. Of the four strategies examined, Strategy #3 produces the smallest probability for a Type I error, but yields a whopping 80% Type II error. Strategy #1 has the smallest Type II error, but also the largest Type I error.

In general, as suggested by the examples above, decreasing the chance of one type of error frequently increases the chance for the other error type. In real-life situations, one can decrease the probability of both error types by collecting more data or having more information available. However, one must frequently decide which error type should be minimized. Here are two simple examples:

Example #1:

In the legal world, a null hypothesis might be "This person is innocent." A type I error would be judging the person guilty when he is innocent. A Type II error would involve declaring the person innocent when he is guilty. If one accepts the thought that it is better to release a guilty person than to convict an innocent one, then it would be important to minimize the chances of Type I error.

Example #2:

In the world of medicine, a null hypothesis might be "This drug will cure an illness." A Type I error would be concluding that the drug does not work when it actually does. A Type II error would conclude that the drug does work when it actually doesn't. One could argue that a Type II error should be minimized here if one agrees that spending time and money on a useless drug would replace what might be some other effective treatment.

Here are two important facts that can help minimize the confusion that sometimes results when working with these error types:

1. A Type I error can only occur if the null hypothesis, H_o, is true.
2. A Type II error can only occur if the null hypothesis, H_o, is false.

It is usually a practical impossibility to work with an entire population. A statistician usually takes samples and "generalizes" his/her results to reach a conclusion about a population. This does involve producing a statement (null hypothesis) which may or may not be true. As noted above, there are two types of statistical errors that can be made. The main purpose of this paper is simply to introduce the two error types and provide some simple examples illustrating them. It is hoped that these examples will be helpful to teachers and students in their Advanced Placement Statistics course.

"Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."—H. G. Wells, 1866–1946

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From the Editor...

Exciting news from ASA!! There has been a restructuring at the ASA home office with Mary Fleming being named Program Director for Services. One of Mary's responsibilities is to oversee ASA's Center for Statistical Education (CSE) which is a resource center for K–12 teachers. Your contact person in this regard is Judy Dill, a former high school teacher from Hawaii, who has been selected as Project Leader for Education. Judy needs to know what your needs are, so get to know her at judy@amstat.org.

Fran Curcio is looking for authors for the 2001 NCTM Yearbook. The topic is The Roles of Representation in School Mathematics. Check www.nctm.org under Publications for details.

Thanks to Linda Quinn of the ASA Cleveland Chapter, *STN* is on the Web! A pilot version may be found at: www.bio.ri.ccf/org/docs/ASA/stn .html. Check it out and let me know if you like it.

Congratulations to last year's poster and project winners. Information on the competitions may be found at www.amstat.org /education/ and click on K–12 Curriculum.

Let *STN* help you advertise statistics workshops for next summer. Send information to me by January 1. Also, I am always in need of articles and reviews. Help your colleagues by sharing your successful statistics activities. Have a wonderful year!

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:

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Printed in the U.S.A

Statistics Teacher Network
c/o American Statistical Association
1429 Duke Street
Alexandria, VA 22314-3415
USA

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1998 American Statistics Project Competition Awards

Grades 4–6 Winners

Second Place Award
How Accurate Is the Lincoln Journal Star's *Weather Forecast?*
Skylin Thompson-Exner & Jennifer Hanus
Advised by Bonnie Rosenberger
Pyrtle Elementary School
Lincoln, Nebraska

Third Place Award
Does Gender Matter When It Comes to Favorite Sport?
Emily Laub, Libby Felts, Derek DeSalme, & Randy Shed
Advised by Susan J. Bates
Rolla Middle School
Rolla, Missouri

Grades 7–9 Winners

Third Place Award
Do Various Distractions Have an Effect on Math Grades?
Allison Lashley, Sarah Kolegraff, Lauren Saunders, & Elizabeth Oppenheimer
Advised by Larry Knode
Fairfield Freshman School
Fairfield, Ohio

Grades 10–12 Winners

First Place Award
Grade Inflation?
Elizabeth Milos & Louis Flynn
Advised by Gerald T. Brown
Henry Sibley High School
Mendota Heights, Minnesota

Second Place Award (tie)
Duracell vs. Energizer: Which Does Last Longer?
Tyler Wilsey & Mike Anderson
Advised by Gerald T. Brown
Henry Sibley High School
Mendota Heights, Minnesota

Second Place Award (tie)
Dextromethorphan as a Clinically Useful Probe to Phenotype Patients at CYP3A4 and CYP2D6 as Demonstrated by Differential Metabolism with the Selective Inhibitor, Grapefruit Juice
Benjamin Ereshefsky & Nevin Gewertz
Advised by Larry Ereshefsky
Northside Health Careers High School
San Antonio, Texas

Third Place Award
Temperature Predictions: Fact or Fiction?
Heidi Cain & Marnie Lindberg
Advised by Gerald T. Brown
Henry Sibley High School
Mendota Heights, Minnesota

Honorable Mention Award
Cracking under Pressure: Does Divorce Hinder Student Learning?
Zewde Demissie & Gillian Fleischer
Advised by Carol Castellon
University Laboratory High School
Urbana, Illinois

Poster Competition information is available on the ASA Web site at
www.amstat.org/education/posterwin.html

1998 American Statistics Poster Competition Awards

Grades K–3 Winners

First Place Award
Our Favorite Foods Fit the Food Pyramid
Ann Kintzell's second grade class
Oakmont Elementary School
Haverton, Pennsylvania

Second Place Award
Are Red and Blue Favorite Colors of Kids
Sue Kirby's third grade class
Clinton Elementary School
Lincoln, Nebraska

Third Place Award
Do People with Big Hands Have Big Noses?
Jonathan Denby, Jessica Goldstein, Michael Wilpiszeski, Mac Hewett, & Teresa Bailey
Advised by Carol Mahoney
Mountain Park School
Berkeley Heights, New Jersey

Grades 4–6 Winners

First Place Award
Are There More Homeless Cats or Dogs in the USA?
Jen Brownhill
Advised by Doris Pickford-Gordon
Jack Jouett Middle School
Charlottesville Virginia

Second Place Award
Which Car Is the Better Choice if We Want to Race One for the Distance?
Jordan Mar & Amanda Vocasek
Advised by Sue Kirby

Third Place Award
Distance Our Paper Airplanes Flew with Flaps Up and Flaps Down
Dylan Floth, Kristina Nimmick, Aaron Edington, & Amanda Willits
Advised by Sue Kirby

Honorable Mention Award
What Exercise Increases Heart Rate Most?
Nathan Flath
Advised by Patricia Dunn
Mary B. Austin Elementary School
Mobile, Alabama

Honorable Mention Award
The Weather Is Unpredictable
Andrea Baker & Bethany Neill
Advised by Marilyn Joy
John Pettibone School
New Milford, Connecticut

Grades 7–9 Winners

First Place Award (tie)
Factors Influencing a Pitcher's ERA
Brian Swartz
Advised by John Thomas
Milton Area Junior High School
Milton, Pennsylvania

First Place Award (tie)
Does Visual Perception Improve With Age?
Brian Burkhardt, Dan Enders, & Caleb Smith
Advised by Maria Mastromatteo
Brown Middle School
Ravenna, Ohio

Third Place Award
1997 Philadelphia Weather
John Blakinger
Advised by A. Gimbal
Radnor Middle School
Wayne, Pennsylvania

Honorable Mention Award
Evidence of Chemoreception in House Crickets Acheta Domestica
Adam Morris
Advised by Joan Warner
Enloe High School
Raleigh, North Carolina

Honorable Mention Award
Do Statistics Support Quarterback Compensation
Michael Vater
Advised by Sherron Lynch
Marshall Middle School
Wexford, Pennsylvania

Grades 10–12 Winners

First Place Award
Who Died in America's Wars?
Janelle Millington
Advised by Cheryl Clasen
Cuyahoga Valley Christian Academy
Cuyahoga Falls, Ohio

Second Place Award (tie)
Do You Trust Your Government?
Tatiana I. Zwerling
Advised by Renetta Deremer
Hollidaysburg Area Sr. High

Second Place Award (tie)
Are Women Left Behind Men in the Financial Growth of Companies?
Allison Miller
Advisor: Cheryl Clason

Third Place Award
Why Is New Hampshire One of the Leading States in America?
Kayson Fu
Advised by Fred Djang
Choate-Rosemary Hall
Wallingford, Connecticut

Poster Competition information is available on the ASA Web site at
www.amstat.org/education/posterwin.html