The Statistics Teacher Network

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Issue #2

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.

THE FIRST INTERNATIONAL CONFERENCE ON TEACHING STATISTICS

Sheffield, England August 1982

After several years of planning, about 600 teachers and statisticians gathered in Sheffield in August for the first conference devoted to the teaching of statistics. For five days everyone tried valiantly, but with not much success, to take in all of the sessions and workshops that interested them. At any one time, plenary sessions excepted, up to five workshops, invited papers, or short talks were being presented. Fortunately, a *Proceedings* will be published and everyone with an interest in teaching statistics should make a point of getting hold of a copy. The *Proceedings* will contain only invited papers. It will not be possible to include the contributed papers or the material presented and discussed at the workshops.

First, a few general observations. One of the sessions was devoted to the use of the calculator and computer in teaching statistics, but no computer firm, except Minitab (the statistics package from Wisconsin), took the opportunity to display its hardware or software. The time is still some way off before the computer becomes an integral part of a precollege statistics course. Perhaps one of the reasons behind this lack of computer equipment is that there is such a wide variety of microcomputers used world-wide. However, a number of speakers referred to applications of computers that they had seen and used and it would have enhanced the conference to have had a greater number of computer displays.

There was wide agreement that basic numeracy in today's world includes many of the things taught as statistics. Some countries are further ahead than others. I refer you to Vic Barnett's new book, *Teaching Statistics Around the World*, published by the International Statistics Institute in Voorbury, Holland, and released at the Sheffield Conference. Another general agreement was that statistics should be taught as an experimental subject which crosses subject boundaries and that this is a difficult task, particularly when faced with an external examination at the end of the year. The latter concern was often heard from the few precollege teachers at the Conference, most of whom came from Great Britain.

The presentations contained a number of items of interest to those of you in this Network.

In the contributed paper sessions, Dr. Kerstin Vannman of the University of Lulea, Sweden, gave a lucid, well-illustrated talk on how to convince engineering students that an estimator is a random variable. The substance of her talk was the Taxi Problem mentioned in Gottfried Noethers *Introduction to Statistics* (Houghton Mifflin). Given that the taxis in a city are numbered serially and you observe the numbers 405, 280, 73, 440, and 79 on five cabs, find an estimate of the number of cabs in the city. Dr. Vannman considered three methods and the question of which method gave the "best" estimate. After this gem of a talk, several people asked her to write it up for Teaching Statistics so it will have a wider audience.

Roger Mead of the University of Reading gave a practical workshop in sampling. Three populations were constructed, one of which was a forest divided into two parts by a river. On a map of the forest were glued a collection of envelopes. Each envelope contained information about the number and size of the trees in a small area of the forest. The population was used to illustrate the differences in the information gathered when different sampling techniques (simple random, clustered, stratified, etc.) were used. This could easily be

adapted for use at the secondary level, particularly in those areas economically dependent on forestry.

The workshop on teaching statistics to 16-18 year olds concentrated on the production of ideas and suggestions for teachers at this level. Over 50 ideas were collected and are being compiled. They should be available early in 1983 and a synopsis will be prepared for this Network. Many of those who attended the conference said that they did so because they could not think of any good ideas for teaching statistics. Such comments illustrate the frustration of teachers who wish to teach statistics. Teachers need a flow of new ideas to keep their classes moving forward. This Statistics Teacher Network was created to fill just that need. Several of those who felt that they had no ideas produced some good ones when they were prompted by others in the discussion groups. So please keep the ideas coming.

An interesting game for elementary school students was described in a lunchtime discussion. Two people play with a single die. Each turn consists of rolling the die as many times as the player wishes. If the player stops rolling before a 1 is thrown, the sum of all the rolls thrown during that turn is added to the player's total. If the player throws a 1, however, the turn is over and 0 is added to the player's total. The winner is the first player to reach 100.

It was abundantly obvious to all who were at this first I.C.O.T.S. that it should not be the last and it was accounced that a decision had been made to hold a conference every four years. Thus, the next conference will be in August, 1986. Applications for hosting this conference will be considered next year and a decision announced late in 1983.

I hope we will meet there, if not before.

—Jim Swift
Nanaimo, B.C.

NEW PROGRAMS

We have a full year academic course in statistics for Grade 12 in Nova Scotia and have been working for the past five years on an integrated math program for Grades 9-12 where statistics is an important component for all students for 3-4 weeks of the year. We have adopted Doug Henderson's new book for Grade 9 (Ginn Publishing Company.) We have been conducting in-service sessions for the past three years based on ideas by Jim Swift, John Tukey, Doug Henderson, and Bill Bissett. We have had a credit course available for math teachers for three years based on the ideas of stem and leaf plots, box and whisker plots, and scatter plots.

I have conducted in-service sessions for teachers in Nova Scotia on:

1. Displaying data using the exploratory data analysis techniques of stem and leaf plot, box and whisker plot, and five number summary.

2. Sampling, including counting a population using capture-recapture, inference in yes-no populations, and misuses of sampling.

3. Newspaper statistics.

We are sure about what we need up to the end of Grade 10, but still need help with Grades 11 and 12. How soon do we get into chi-square, correlation, etc? How much probability should be in an integrated course?

We are convinced that this is the way to go in statistics and are very excited about implementation. It will take a long time, but it's happening in Nova Scotia.

—Charlotte R. Fulton
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LETTERS

Please write to the editor if you would like to share books, articles, ideas, or lessons that have been successful in your classroom.

I supervised, helped, and advised two fifth graders with the following experiment which they performed as a science fair project (a class requirement). They attempted to illustrate the Law of Large Numbers by repeating coin tosses, spinning spinners, taking marbles out of a fish bowl, cards out of a deck, etc. Their hypothesis was that as the number of trials is increased, the empirical probability approaches the theoretical probability. I ran off a mimeo sheet with a table to make it easy for them to record their data. They flipped coins, spun spinners, drew cards from a deck, marbles from a fish bowl, tossed dice, and used a paper cup to toss a thumb tack. For some of the experiments, the probability of success and failure were equal. For some of the experiments, the probability of success was not equal to the probability of failure. The experiment involving tossing the thumbtack

was the only one where an empirical approach would be the only way to determine probability. Hopefully, this enabled them to make the distinction between circumstances where the *apriori* approach can be used to evaluate probability, i.e.

$$\frac{\textit{number of favorable outcomes}}{\textit{total number of outcomes}},$$

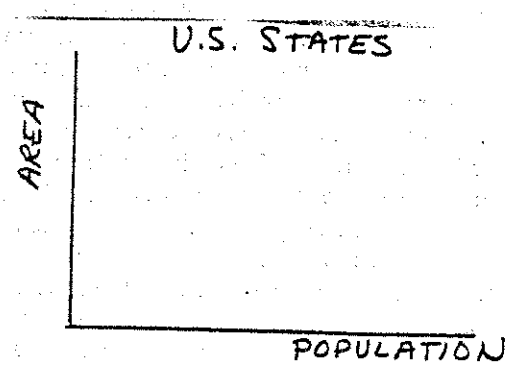
as with the coin flips and circumstances where an empirical approach is warranted such as the thumbtack tossing.

They repeated these experiments again and again, each time increasing the number of trials. With each repetition they computed the ratio of the number of successes obtained to the total number of trials performed. Then they constructed histograms where the heights of the rectangles corresponded to the empirical probabilities. On the same graph, they drew a heavy red line horizontally across the graph which corresponded to the theoretical probability. They were able to observe that in most cases as we moved from left to right across the graph, the heights of the rectangles stabilize around the red line.

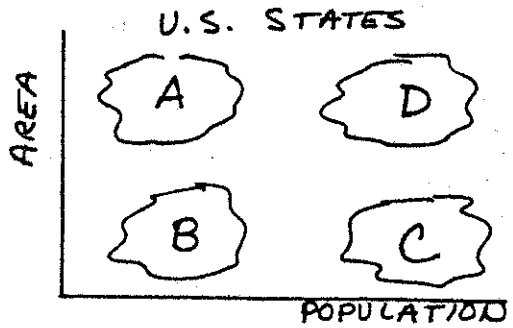
This experience was very gratifying to the children because they won a first prize in their school and the second prize in their category at the regional level. Their chances of doing well were definitely enhanced by the fact that there are generally fewer projects in the applied category (as compared to physical science, etc.) and usually only a very few using mathematics or statistics.

—Beth Bryan
Math and Computer Science
Department
Augusta College

This lesson plan is for fifth through eighth grade and will take one class period. Present an empty, labeled graph:

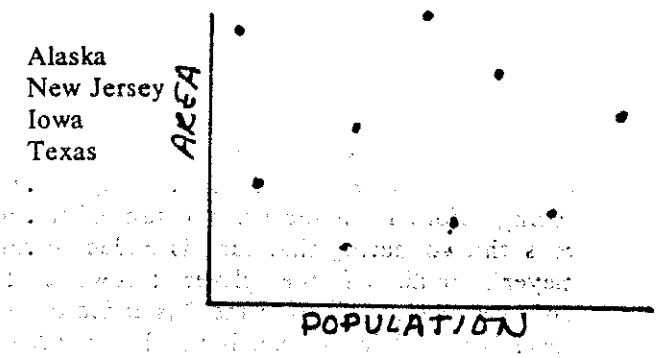


Inquire, qualitatively, about states in certain extreme regions:

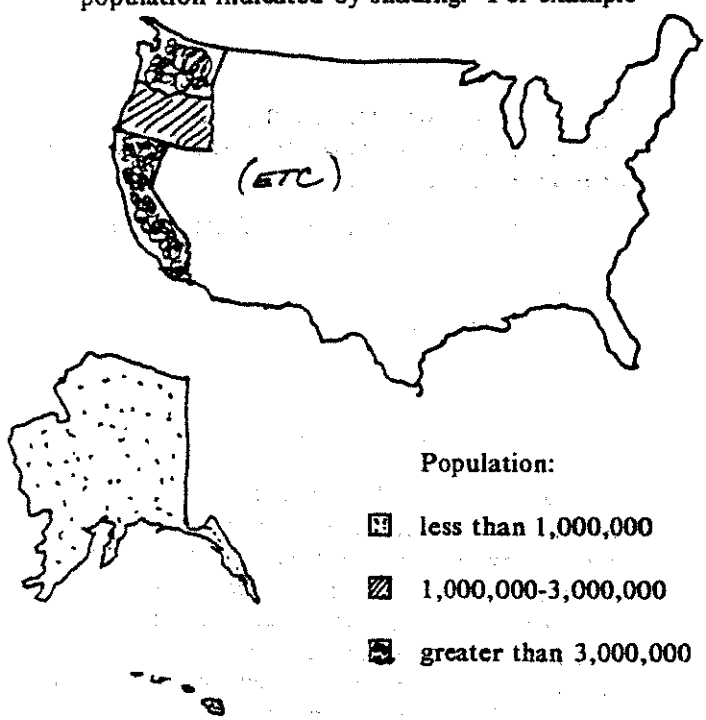


For example, Alaska is in region A, Rhode Island is in region B, New Jersey is in region C, and California is in region D.

As a worksheet exercise, list 9 or so states and accurately plot, but do not label their dots. For example



Provide a map of the United Sates with population indicated by shading. For example



Using the map as area and population clues, match the states listed to the dots on the graph. For the actual worksheet we used, please write me.

—Richard Armstrong
3719 Compton
St. Louis, MO 63118

NEW PUBLICATIONS AND PRODUCTS

Teaching About U.S. Population Trends!
Population Reference Bureau
P.O. Box 35012
Washington, D.C. 20013
1981, $2.00 plus $.50 for handling

This package contains a wall chart full of data for each state from the 1980 census. Included are birth, death, and infant mortality rates, migration, immigration, per capita income, racial composition, population density, and other data. Four accompanying ditto masters with blind answers for the teacher require students to use the wall chart to find such things as the state with the greatest percent of its land in farms. A copy of the newsletter *Interchange* is also included which provides further information and lesson ideas. Teachers may receive a one-year free subscription to *Interchange* upon request.

HELP!

This section of the newsletter is for your questions and requests. Write to the editor if you have any questions of your own. If you help anyone solve a problem, please send a copy of your letter to the editor as there are others who will want the information.

I have begun work on two units for grades K-3 and 4-6 based loosely on the New York State syllabus. Has anyone else developed a sequence of lessons and activities leading to various concepts in probability for grades 1-6?

—John Schluep
R. D. #1 Box 143A
Oneonta, NY 13820

Has anyone written any programs for use in a statistics class for the Radio Shack color computer that they would be willing to share? Are there any commercial programs available?

—Bill Rosen
Los Angeles Pierce College
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The Joint Committee on the Curriculum in Statistics and Probability is preparing four booklets for use by classroom teachers. The titles are *Exploring Data, Introduction To Probability, Simulation,* and *Yes-No Populations.* We would like to have those reviewed and field tested by practicing teachers. If you would like to volunteer, please write me.

—Dick Scheaffer
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CALENDAR

ICME 5 (International Congress on Mathematical Education) will be held at the University of Adelaide, Australia in August, 1984. Lenhart Rade of Chalmers University of Technology in Göteborg, Sweden will be organizing the sections on statistics.

The Mathematical Association of America will hold its 66th annual meeting in Denver, Colorado from January 6-9, 1983. There will be a minicourse on Introducing Statistical Topics in Existing Mathematics Courses given from 8:30 a.m. to 12:30 p.m. on Friday, January 7, organized by Richard Walker of Mansfield State College. The fee is $15 for those who have registered for the meeting.

WHERE TO WRITE

Address all letters, announcements, questions, and requests to get on the mailing list for the newsletter to the editor,

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Please share this newsletter with other teachers interested in statistics. You may photocopy anything in it you wish.