Quantitative Literature

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CSEPA
IUP
Center for Statistics
Education in PA at IUP

In This Issue

From the Director: Jack Shepler

The fall weather and foliage have been exceptionally beautiful this year and the probable settlement of our faculty contract has been a bonus. I hope you have had a good fall as well.

Thanks to the outstanding directors and staff at the regional sites, SEQuaL is able to show the Pennsylvania Department of Education that we are making a significant increase in teachers' content knowledge. According to Elaine Carbone's research, SEQuaL is making a difference in teaching styles — encouraging math teachers to use more hands-on, activity-based lessons, thus making the learning of probability and statistics much more interesting. We are very appreciative of all the teachers who have enabled SEQuaL to become a program that is making a difference in the learning of young people. Thanks for a job well done.

As I contemplate my 36th and last year of teaching, I have many fond memories. I continue to see evidence that when we care and do our best as teachers we can make a difference in our students' lives for the good. I feel so fortunate to be a part of a program that encourages the best in teaching performance by some of the greatest mathematics teachers in PA. Your caring and enthusiasm is contagious and your willingness to share your successes and knowledge with your colleagues is having a significant impact. We are all part of a larger company of colleagues who believe.

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Upcoming Dates . . .

1999
Dec. 7 ARIN IU 28 MAAQL
"Probably Probability"
Renetta Deremer

2000
February 28 Poster Deadline

April 1 IUP Data-Driven Final Session
and
Manheim SEQuaL Final Session

April 8 Mansfield SEQuaL Final Session

April 29 Clarion SEQuaL Final Session

MAAQL Meeting

On December 7, 1999, Renetta Deremer will present "Probably Probability" at the Mathematics Academic Alliance in Quantitative Literacy (MAAQL) meeting at the Rustic Lodge in Indiana, PA. Renetta is currently participating in the Data-Driven Workshop with a team of colleagues from the Hollidaysburg Area Senior High School. She has been a SEQuaL K-12 Faculty member at the Villanova site.

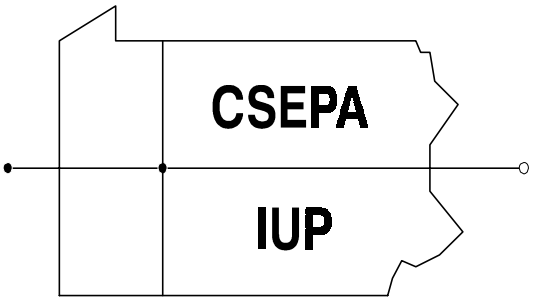
Renetta's presentation will begin at 5:00 p.m. with dinner to follow.

Teachers from school districts within the ARIN service area must make reservations through their school district. Teachers from private schools or other districts are also welcome. Please make your reservations through Isabella Wiggins at CSEPA, 724-357-6239.

MAAQL is an alliance of ARIN IU28 and the IUP Mathematics Department. Meetings are held three times per year. Look for the next MAAQL meeting in March, 2000.

CSEPA to Expand Services

In addition to the SEQuaL workshops currently offered each year, the Center for Statistics Education in PA is planning to offer additional workshops starting in the new year. School districts or Intermediate Units can contract with the Center for workshops in the areas of quantitative literacy for elementary, middle, and secondary levels and calculator and CBR/CBL technology. Contact the Center for additional information.



Pennsylvania Statistical Poster Competition

If you have been meaning to engage your students in statistical projects, here is the perfect motivation to do it now! Once again, Tom Short and Rosemary Reshetar will be chairing the Pennsylvania Statistics Poster Competition. Last year there were a record breaking 613 entries in the competition. Now is the time to plan for your students' entries for the year 2000. Categories include all grade levels K-12.

A statistics poster is a display containing two or more related graphics that summarize data, provide different points of view, and answer some question about the data. All entries are automatically submitted to the Amercian Statsitics Poster Competion sponsored by the American Statistical Association.

To find out more about eligibility and rules look on Tom Short's webpage at **renoir.vill.edu/~short/posters/**. Posters must be delivered to the following address, and must be postmarked by February 28, 2000:

Tom Short
Dept. of Mathematical Sciences
Villanova University
800 Lancaster Ave.
Villanova, PA 19085-1699

Judging will take place at the March Pennsylvania Council of Teachers of Mathematics meeting. Prize winners for the Pennsylvania Competition will be announced by March 31, 2000.

For more info contact:

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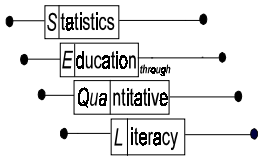
News From the Sites. . .



Clarion

The Statistics Education through Quantitative Literacy summer week at Clarion University was completed Friday, July 2, 1999 with six dynamic presentations. Teams were composed of a combination of elementary and secondary teachers who chose a question of interest to them, gathered relevant data to answer their question, analyzed their data from an elementary level of descriptive statistics to a secondary level of inferential statistics to answer their question. They presented their results orally to the participants and also submitted a formal written report.

The six projects included the following questions:

1. Who is more likely to verbally respond to the Greeter at Wal-Mart, males or females?

2. Are there really 1,000 chocolate chips in each bag of Chips-Ahoy Cookies?

3. What age group and gender of the Clarion area Wal-Mart customers on Tuesday, June 29, 1000 between 7:15 p.m. and 9:30 p.m. were more likely to wear an analog or digital watch?

4. Who is more likely to wear a watch in Wal-Mart--workers or customers, men or women?

5. What is the average amount of sugar in a cold cereal? Which cereals contain the highest and lowest amount of sugar? Does row placement in the supermarket correlate with sugar content and nutritional value?

6. Is there a gender difference among customers with respect to the following methods of payment: cash, credit card, or check? Does the method of payment affect the transaction time? Which method of payment is used most often by customers?

Answers to the questions are summarized below:

1. Using the Chi Square test, the group found that females were more likely to respond. Systematic sampling was used, and the data was displayed in table form, single and stacked bar graphs and pie charts.

2. Yes, the cookie claim is true, although the group doesn't want to see nor eat these cookies for awhile (except for Josh).

3. A random sample of Wal-Mart customers showed that male children are more likely to wear digital watches, but that the majority of the sample population did not wear a watch.

4. The group did an observational study with cluster sampling to look at workers and non-workers in the store who had visible wrist watches. The sample included adults at a Wal-Mart in Kittanning. One may think that watch wearing habits would be different for workers and non workers, but this study showed that there was not a difference. Also, there are no significant differences based on gender.

5. Data for the cereal was collected from all cold cereals at the local Bi-Lo in Clarion. The group ranked them according to sugar content and recorded the shelf location. Data was displayed by the use of stem-and leaf plots, bar graphs, and box plots. The Kruskal-Wallis analysis of variance by ranks and the Chi Square showed that the medians of the sugar contents on the five shelves are not equal.

6. A clustered sampling method of size 119 was used. Data was displayed using pie charts, gar graphs, run charts, stem and leaf, pictographs and box plots. The chi square test concluded that based on the random sample, with the specific time and date, gender type and payment type were dependent. Checks appeared to have the longest transaction time regardless of gender, and cash was used the most often.

During the fall session, we had a guest from Dad's Dog Food in Meadville, Jeff Lang, who gave us an excellent application of sampling in industry. Phyllis Howard introduced Jeff by playing "How Much Is that Doggie in the Window?" and "BowWow Boogie" on her dulcimer. Jeff said that he never had such a wonderful introduction. The final session date will be April 29, 2000.

Data-Driven at IUP

The Data-Driven Workshop premiered this summer at IUP with 23 participants. We were very fortunate to have Pat Hopfensperger and Henry Kranendonk, two of the authors of the new Data-Driven modules, lead the classes that explored the integration of data analysis into the teaching of traditional algebra and geometry topics. Each participant received a graphing calculator and several of the "Data-Driven Mathematics" modules, published by Dale Seymour Publicatons. Pat and Henry worked through many of the activities found in the Mathematics in a World of Data, Linear Relations, Probability through Data, and Exploring Centers modules.

The participants divided into groups according to interest in mathematical area to develop lesson plans for a data-driven activity. The lessons included:

1. Simplifying Rational Algebraic Expressions The TI-83 was used to enter a rational expression which could be simplified.

2. Data Dribbling Students shot a set number of trashballs and recorded the number made. Data was converted to fractions, decimals and percents. The mean percentage for the class was computed manually and with a calculator using three different methods which yielded three different answers.

3. Sailboats A 20 cm piece of spaghetti was broken randomly by participants. An inverted "T" was formed from the pieces. These pieces were the base and height of a triangular sail. The area of the triangle was calculated and the maximum area found.

4. Math Makes Your Heart Beat Participants recorded pulse rates at various types of activities. Data was converted to beats/minute and graphed. Rates of change were discussed.

5. Capturing the Pulse of the Histogram Participants took their pulses and recorded them on a line plot. Participants then took their pulses using a consistent method. This line plot was more consistent. Histograms of each situation were constructed.

6. The Search for Planet X Data from the mean distance from the sun for the 9 planets was used to predict how far a 10th planet would be from the sun using exponential and logarithmic functions and modeling.

7. Taxicab Geometry Using a map grid that shows locations of stores, locate the "best" place for a warehouse. Deciding on the location that minimizes the sum of the distances to the stores involves finding the median of the x-coordinates and the median of the y-coordinates.

A highlight of the week was the MAAQL evening meeting on Tuesday. Pat shared a data-driven activity using the Parker Brothers game of Monopoly. Pat's Monopoly activity is summarized below. One of the participants, Dan Kelly, used the activity at Northern Cambria High School this fall. Bryan Wysocki, a student of Dan's, designed a new gameboard to go along with the activity using his excellent CAD skills. Bryan's five-sided "Coltopoly" board appears on page 5. (Northern Cambria H.S. teams are the Colts.)

Monopoly®

– An Extension

1. With your group, look at a Monopoly game board. What patterns do you notice? Teachers: Suggest that students at least graph the number of squares from Go and price.

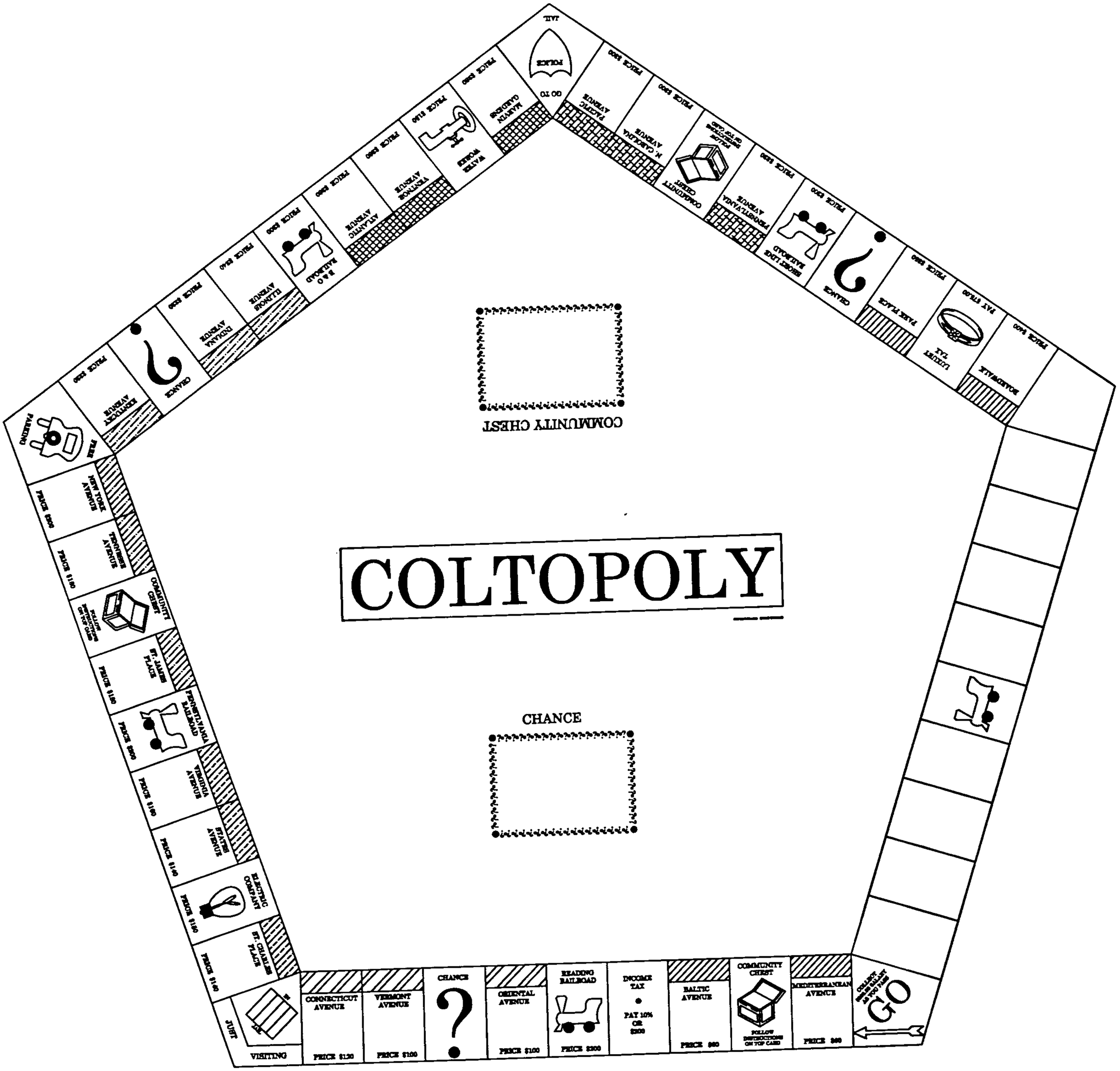
2. Create a fifth side to the game board by inserting the new side between Boardwalk and GO. The new side must contain:

   1 railroad, 1 utility, 1 tax, 5 properties to purchase, 1 other space of your choosing, and a new corner.

3. Maintain all patterns that you have found in the original Monopoly board. The only thing that you may change is the price of Boardwalk to make it more consistent with the patterns you have found.

4. Display your new side and present it to the class.

COLTOPOLY



drawing by Bryan Wysocki, a student at Northern Cambria H.S., Barnesboro, PA.

Projects Keep Math Real

In recent weeks, the topic of projects in the math class has come up in discussion many times. This summer, Henry Kranendonk reported on projects involving school wide surveys that he has been involved with including a study on asthma. Anita Smith commented with some surprise that 100 teachers had attended her recent presentation with Rhonda Foust on projects at NCTM in Pittsburgh. Since its beginning, SEQuaL has promoted statistical projects in the elementary, secondary, and multidisciplinary workshops as a means of making mathematics more lively and meaningful to students.

With that introduction, here is a brief description of the seven projects that teams of teachers developed for the 1998-99 SEQuaL Multidisciplinary Workshop. It is our hope to have portions of these projects available on the web page in the near future.

Effects of Acid Rain on Bean and Corn Growth

Biology, English, Math - Grades 10 and 11

Students followed the scientific method to investigate the effects of acid rain on bean and corn growth. Bean and corn seeds were placed in 4 different pH's ranging from 2 to 10. Seed growth was measured on four occasions in two-day intervals. The students then analyzed this quantitative data to determine if seed growth was affected by the acidic and/or basic solutions. Groups of students produced statistics posters displaying their analysis and supporting their conclusion on the effects of acidity on seed germination and growth. English students created a survey, surveyed a controlled population, tabulated the responses and wrote a short paper on the analysis of their data.

Automobile Statistics

Life Skills, Art, Math – Grades 9 -12

Students in explored various aspects of automobile ownership including insurance, repair costs, prices of used cars, etc. Math students created statistics posters to display data and their analysis of it. The art unit, "Automobile Advertising", explored elements of good design concluding with students preparing an advertisement for a vehicle.

Music in Our Community

Music, Social Studies, Math – Grades 7, 9 - 12

Almost the entire school was involved in this project that focused on surveying the music preferences of the student body and a sample of parents. Social Studies classes created the questionnaire, surveyed the school, and reported the results to local radio stations. Math classes surveyed parents of students in grades 8 through 12 and analyzed the results. Seventh grade music students created their own radio station complete with DJs and sample of music to reflect the music preferred by the segment of the surveyed population assigned to them.

Hot Air in the Classroom

English, Math, Science - grades 9 and 12

As part of a study of weather, students in 9th grade science constructed hot air balloons to explore the principle that warm air rises. Students collected data on the weight of the balloon, time aloft, and height achieved in flight. The ninth grade honors geometry class explored the association between two variables (balloon weight and time aloft) by constructing scatter plots, and using graphing calculators for linear regression techniques. English 12 classes prepared a video of the hot air balloon project.

Does Classroom Attendance have an Effect upon Classroom Success?

World Cultures and Math – Grades 9-12

Students gathered data from their report cards on attendance and overall grade point average. Math students created scatter plots of the data and looked for a relationship between attendance and grades.

Continued on page 7

What's the Sequel to SEQuaL?

Sequel: n. 1. a logical consequence, 2. an inference, 3. a result that ensues, 4. a body of followers

What is the Sequel to SEQuaL? There are many ways to answer that question. One answer is that it was the name of the professional development conference held in October 1998 at IUP. The focus of the day, planned by Dr. Larry Feldman and Dr. Ann Massey, was to prepare past SEQuaL participants and their colleagues to present in-service workshops on quantitative literacy in their school districts and Intermediate Units.

Another answer is the continual spreading and sharing of SEQuaL inspired philosophy of teaching and activities. The in-service workshops presented by Sequel to SEQuaL Conference participants brought SEQuaL's philosophy and activities to 323 teachers and and administrators and touched an estimated 10,000 students in Pennsylvania. Thirty-one teachers acting as in-service leaders completed project reports to the Center. Each report told a story. Here we cite just a few of the remarkable results:

- Ligonier Valley School District and Hollidaysburg Area School District ordered resources for their teachers as a result of the QL workshops
- The Hollidaysburg team provided a detailed analysis of the connections between their text book series and the state probability and statistics standards.
- At one elementary school, a whole school multi-disciplinary unit is under discussion.
- The in-service workshops in one district motivated several teachers to take a SEQuaL workshop this past summer

WANTED: SEQuaL Alumni to be QL In-Service Leaders

Share QL with your colleagues

Present 3 hours of QL in-service in your district

If interested, write a brief plan for your in-service project. Talk to your administrator about the project. Submit your plan to Isabella Wiggins at CSEPA by November 30. Contact CSEPA for more details.

Continued from page 6

The Incredible Edible Tower

Technology, Music, Chemistry, Math - Grades 7, 8, and 11

Teams of 7th and 8th grade students constructed towers in Technology class using Saltine crackers, graham crackers, dry spaghetti, rice cakes, ice cream cones, marshmallows and chocolate. The towers, which had had to meet specific design criteria, were first drawn to scale, then built, measured and eaten. Math students analyzed the data collected. In computer class, students worked on spreadsheets and charts to display the data. Musical themes for the towers were written in music class. The 11th grade Chemistry class analyzed the building materials for sugar and fat content.

The Colors Experiment

Biology I and II and Trigonometry - Grades 9 - 12

Biology students followed the scientific method to explore the question "Does your ability to read affect your ability to perceive?" Using two posters involving blocks of color and color words, students designed an experiment to collect data on their subjects' reading ability and the time needed to name the colors on the two posters. The trig students looked for a correlation between the "reading score" for each student and the difference between the student's time reading the two posters. Graphing calculators were used.

Information on these projects and multi-disciplinary projects from previous years is available from CSEPA.

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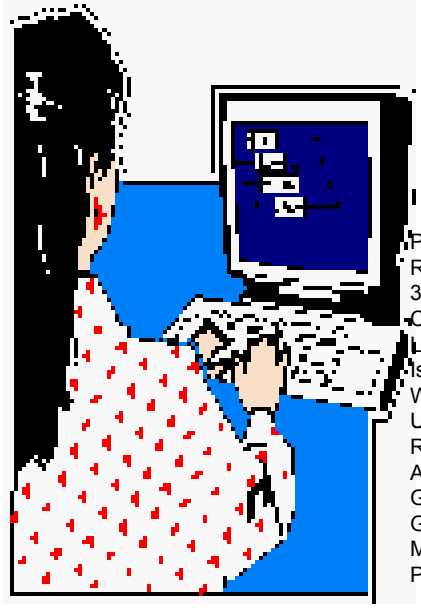

Please send articles for this newsletter or comments to: Editor Isabella Wiggins, Stright Hall Room 211, 210 South Tenth Street, Indiana, PA 15705-1087. Ph: 724-357-6239 or FAX 724-357-2616. Internet: iwiggins@grove.iup.edu. This newsletter is published through the Center for Statistics Education in PA at IUP. **Director:** Jack Shepler:; **Assistant Director:** Larry Feldman; **Budget Coordinator:** Francisco Alarcon; **Program Coordinator:** Isabella Wiggins; **Site Directors:** James Bohan, Elaine Carbone, Patricia Flach, Jean Werner**; Program Development Specialists:** Larry Feldman, Barbara Lamberski, John Uccellini; **University Teaching Faculty**: Ann Massey, Fred Morgan, Caryn Pugliese, Glenn Rock, Allan Rossman, Bernie Schroeder, Tom Short; **K-12 Teaching Faculty**: Brenda Ashanti, John Aufman, James Bogaczyk, Linda Brecht, Chris Brueningsen, Lorrie Bucklen, Glen Butters, John Costango, Marlene Davis, Renetta Deremer, Charles Fleming, Arlene Gaudioso, Phyllis Howard, Wes Hunkler, Barbara Kaufman, Peggy Lunardini, Jill Mackey, Michael McBride, Rita McMinn, Gary Merrick, Mary Lou Metz, Joseph Monteleone, James Preston, Anita Smith, Carol Tanweer, Jennifer Traynor, Mark Zilinskas.