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The Editor's Corner

Greetings, statistics educators! We have a variety of interesting articles for you in this issue. First is an excerpt from an excellent resource for teachers of statistics, particularly in a non-AP high-school statistics course: *Making Sense of Statistical Studies* (*MSSS*) by Roxy Peck, Daren Starnes, Henry Kranendonk, and June Morita. It consists of 15 investigations that align with recommendations from the National Council of Teachers of Mathematics' (NCTM) *Principles and Standards for School Mathematics* (*PSSM*, 2000) and the American Statistical Association (ASA)–endorsed publication *Guidelines for Assessment and Instruction in Statistics Education* (*GAISE*): *A Pre-K–12 Curriculum Framework*. For more information about *GAISE,* see Statistics Teacher Network issue 71 or *www.amstat.org/education/gaise*. Teacher and student versions of *MSSS* are available at the ASA Marketplace, *www.amstat.org/asastore*.

Also in this issue is the article Using Games and Game Shows to Teach Probability, by Sara Paul, who is a sixth-grade teacher in Indiana. This article is based on her teaching experiences with sixth graders.

If you are curious about statistics education across the globe, we have an informative article by Nicholas Horton about a statistics education workshop held in New Zealand. We also have an update on the second Meeting Within a Meeting (MWM) workshop for K-12 mathematics and science teachers at the 2008 Joint Statistical Meetings, written by Katherine Taylor Halvorsen and Rebecca Nichols.

I encourage and welcome any articles or ideas you have for publication consideration. Please email me directly at *dwebb@bemidjistate.edu*.

Best Regards,

Editor
Derek Webb

Bemidji State University

Also in This Issue…

Articles

An Excerpt from 'Making Sense of Statistical Studies'

Roxy Peck
Daren Starnes
Henry Kranendonk
June Morita

Following is an excerpt from *Making Sense of Statistical Studies*, an excellent resource for teachers. It contains many thoroughly presented investigations, complete with student and teacher information. Each investigation is based on an interesting research question (e.g., Are hot dogs unhealthy?) and can be used as a stand-alone resource for teachers, to complement existing curriculum, or in conjunction with other investigations in the publication to create a new curriculum.

The excerpt that follows starts with the student materials for an investigation titled "*Did you wash your hands?*" The teacher's notes come before the student material. A printer-friendly PDF file is available at *www.amstat.org/education/msss*. It contains the student and teacher materials, complete with learning objectives, teaching tips, and answers to the questions posed in the student materials.

Investigation: *Did You Wash Your Hands?*

1. Why should we care whether people wash their hands after using the bathroom?

2. In the Harris Interactive survey, people were contacted by telephone. One of the questions the interviewers asked was, "How often do you wash your hands after using a public restroom?"

(a) Which U.S. adults were not included in this study?

(b) The survey estimated that 91% of all U.S. adults would claim that they always wash their hands after using the bathroom. Do you think this estimate is too high, too low, or about right given your answer to (a)? Explain.

(c) Several people refused to participate in the survey. Give a reason that this might happen.

(d) In any survey, it is possible that some people will not answer a question accurately or honestly. Thinking about the hand-washing survey, do you think this is likely to happen? Explain your answer.

3. The observational study of hand washing was conducted at a baseball field in Atlanta, a museum and an aquarium in Chicago, a bus and train terminal in New York, and a farmers' market in San Francisco.

(a) Observers in the public bathrooms combed their hair or put on make-up at one of the available sinks while they were watching individuals' hand washing behaviors. If the observation had been done by hidden camera instead (with no observer present), do you think the percent who washed their hands would have been greater than, less than, or about the same as 83%? Justify your answer.

(b) Suppose the observational study had been conducted using hidden cameras in the homes of the same 6,336 adults. Do you think the percent of these individuals who washed their hands would have been greater than, less than, or about the same as 83%? Justify your answer.

4. (a) Comment on the conclusion reached in the newspaper headline: "More People Claim to Wash Their Hands than Who Actually Do."

(b) Describe a study design involving only one group of people that might help us better evaluate the validity of the quoted claim in part (a).

5. Both studies were paid for by the American Society for Microbiology and the Soap and Detergent Association. Should you take this information into account when interpreting the results of the studies? If so, how?

6. You have been asked to help design a study to investigate how often teenagers wash their hands after using the bathroom.

(a) Define a research question for your study.

(b) Would you recommend using a survey, an observational study, or an experiment to producethe data? Explain.

(c) Do you think the percent of teenagers who always wash their hands after using the bathroom is higher than, lower than, or about the same as the percent of adults who do so? Justify your answer.

7. For each of the following research questions, decide which method of data production—a survey, an experiment, or an observational study—would be most appropriate. Justify your choice of method.

(a) What percent of teenagers leave the water running while they brush their teeth?

(b) Which of two drugs is more effective at preventing nausea following the onset of a migraine headache?

(c) Do male teenagers or female teenagers tend to have more numbers stored in their cell phones?

(d) What percent of drivers come to a complete stop at a stop sign near a local elementary school?

(e) Does printing suggested tip amounts on the bottom of a restaurant bill increase the average amount that customers leave in tips?

8. A follow-up study conducted in 2007 by Harris Interactive revealed that while 92% of adults said that they always washed their hands after using the bathroom, only 77% of the adults observed in public restrooms actually did. According to Harris Interactive's "Hand Washing Fact Sheet." The overall decline in hand washing observations is largely due to males. The percentage of males observed washing their hands fell from 75% in 2005 to 66% in 2007. Overall, the percentage of females observed washing their hands is down slightly from 90% in 2005 to 88% in 2007.

Did people's hand washing habits improve or get worse from 2005 to 2007? Justify your answer with specific evidence from the reports describing the Harris Interactive studies.

Teacher Notes for Investigation: *Did You Wash Your Hands?*

Overview

This investigation builds on the two hand washing studies that were discussed in the Introduction. The questions posed here are designed to get students thinking about statistics in practice and to provoke discussion in the classroom. We try to alert students to several important issues, such as:

The way in which data are produced affects the kinds of conclusions that can be drawn. Only well-designed experiments can be used to make cause-and-effect conclusions.

> “Many of the questions do not have “right” or “wrong” answers. Students should be encouraged to defend their answers with specific evidence, much as an attorney would in a legal case.”

In a survey, an estimate we obtain from a sample could differ greatly from the truth about the population if:

- Our sample doesn’t represent the population well
- The question we asked is unclear or misleading
- People don’t respond accurately or honestly
- Some people refuse to respond
- The observer influences the observed

Prerequisites

Students should be able to:

- Determine from a narrative description whether data were produced with a survey, an experiment, or an observational study

Learning Objectives

As a result of completing this investigation, students should be able to:

- Decide which method of producing data—a survey, experiment, or observational study—is most appropriate for answering a given research question
- Describe how certain practical difficulties may affect the results of surveys, experiments, and observational studies
- Define a research question

Teaching Tips

Consider whether you want students to answer the questions in this first investigation individually or with a partner. Either way, be sure to allow time for class discussion of these questions.

Suggested Answers to Questions

Many of the questions do not have “right” or “wrong” answers. Students should be encouraged to defend their answers with specific evidence, much as an attorney would in a legal case.

1. Answers will vary

Students might focus on the unsanitary or disgusting nature of not washing hands after using the bathroom. There are also health-related implications. According to the Harris Interactive news release from the hand washing study, “Infectious diseases, many caused by unclean hands, are the leading causes of death and disease worldwide and the third leading cause of death in the United States. The Centers for Disease Control and Prevention (CDC) says that hand washing is the single most important means of preventing the spread of infection.”

2. (a) Those who do not have telephones. Also, if calls were placed only to landlines, then those who only have cell phones would be left out.

   (b) Answers will vary

   Here’s one possible answer. Since adults who do not have telephones would tend to be poor, perhaps even homeless, they might not have access to proper facilities for washing their hands after using the bathroom. Without these people’s behaviors represented in the survey, the 91% estimate would be too high.

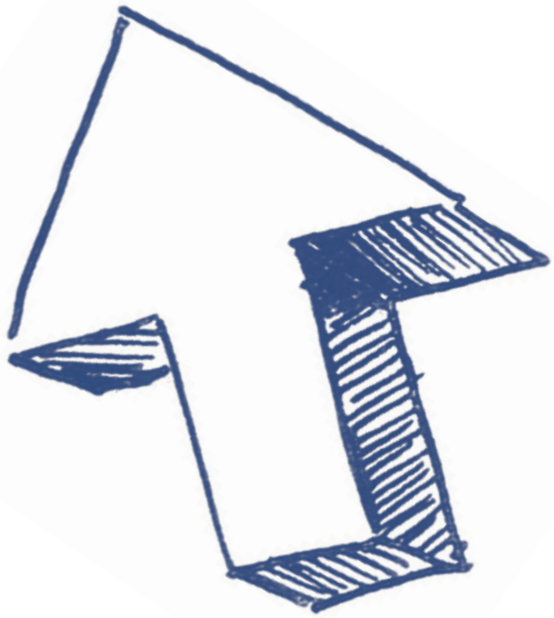
   (c) Answers will vary

   Here’s one possible answer. Some people would be embarrassed to admit that they don’t usually wash their hands after using the bathroom, and so might refuse to answer. Other individuals might feel that they are too busy to participate in a survey.

   (d) Since this survey asks about a potentially embarrassing issue, it seems likely that some people will give a socially acceptable “always” answer even if this were not the truth. It is also possible that some individuals will have inaccurate recollections of their hand-washing habits.

3. (a) Answers will vary

   Here’s one possible answer. When others are present in the bathroom, some people might be more likely to wash their hands due to implicit “peer pressure.” If that’s the case, then a hidden camera would have revealed fewer than 83% who washed their hands.



(b) Answers will vary

Here's one possible answer. People may be generally more likely to follow societal expectations to wash their hands when they are in public than when they are at home. If so, then a hidden camera study would reveal less than 83% who washed their hands at home.

4. (a) Answers will vary

Here's one possible answer. From these two studies, it certainly appears that a higher percent of adults claim to wash their hands after using the bathroom than the percent who actually do so when observed. However, the survey and the observational study involved different groups of people. It is possible that the difference in the results of the two studies (91% who claimed they washed their hands versus 83% who actually did) is due to differences in hygiene habits between the people in these two groups, and not from people's tendency to overestimate their hand washing tendencies. After all, if researchers had observed a different group of 6,336 adults in the same public restrooms on a different day, the percent who were seen washing their hands would probably not have been exactly 83%. Likewise, if researchers had surveyed another sample of 1,013 adults by telephone, it is unlikely that exactly 91% would say they always washed their hands after using the restroom. The difference in the results of these two studies may just be due to the natural variability that occurs from one sample to another.

(b) Answers will vary

Here's one possible answer. Conduct a hidden camera observational study of a sample of individuals in public restrooms. Then survey those same individuals about their hand-washing habits after the bathroom visit.

5. It's always important to know who sponsored (paid for) a statistical study. In this case, the sponsoring agency would likely be hoping to encourage people to do a better job of washing their hands after using the bathroom, thereby using more soap. A study that reveals a lower percent of people washing their hands would suit this agency's purpose.

6. (a) For example, "What percent of teenagers always wash their hands after using the bathroom?"

(b) A survey or an observational study would both be reasonable methods for producing data. An experiment wouldn't be appropriate, since the goal of the study is to record teenagers' normal hand-washing tendencies, not to try to do something to influence those tendencies.

(c) Answers will vary. Here's one possible answer. Teenagers tend to pay less attention to personal hygiene and health than adults do, so the percent of teenagers who always wash their hands after using the bathroom would probably be lower.

7. (a) A survey

Since it would be difficult to actually observe teenagers brushing their teeth, an observational study wouldn't be practical. Because the goal of the study is to record teenagers' normal tooth-brushing habits, not to try to do something to influence those habits, an experiment would not be appropriate. If possible, the teens who participate in the survey should be selected at random from the population of teens in the area. Note that it may be necessary to obtain parental permission before surveying teenagers.

(b) An experiment

If researchers deliberately give drug A to one group of individuals and drug B to another group of individuals, then they can compare the differences in the percent in each group who experience nausea following their migraine headaches. If the decisions about which individuals get drug A and which drug B are made at random, then researchers can determine whether the difference in the percents who experience nausea is sizable enough to suggest a difference in the effectiveness of drug A and drug B. (By assigning the drugs at random to the migraine sufferers, researchers help ensure that the group of individuals taking drug A and the group taking drug B are fairly balanced in all ways that might affect their response to the drug treatments. If the two groups are similar to begin with, then any sizable differences that emerge between the two groups after the drugs are administered can be attributed to the effects of the drugs themselves.)

Note that a comparative observational study using two groups of people—one group who have used drug A and the other group who have used drug B—would not allow researchers to establish any kind of cause-and-effect relationship between the drug administered and people's tendency to have nausea later. Since people have chosen whether to use drug A or drug B, it is possible that the two groups of individuals differ systematically in other ways that might affect their likelihood of becoming nauseous after having a migraine.

(c) Either an observational study or a survey. Asking a (random) sample of males and a (random) sample of females to report how many numbers are stored in their phones will allow for direct comparison of the average number of contacts for the two genders. However, some individuals may report inaccurate values. Actually observing the phone lists of the randomly selected people might result in more reliable data. An experiment would not be appropriate since we only want to observe what is true, not try to influence the state of affairs.

(d) Observational study
Watching the actual behavior of drivers at the stop sign in question would be more effective than asking them whether they stop or not. It would be best if observers could watch without being noticed by the drivers, since the presence of an observer may influence the behavior of the driver. An experiment would not be appropriate since we are simply trying to observe and record whether drivers stop completely, not to influence whether they stop or not.

(e) An experiment, with half of the customers receiving a bill with suggested tip amounts at the bottom and half of the customers receiving no suggested tip amounts. Ideally, the determination of which customers get the bills with suggested tip amounts should be made at random so that the two groups of customers will be as similar as possible in every respect that might influence the amount they decide to tip other than the intended "treatment"—suggested tip amounts on the bill versus no suggested tip amounts on the bill. Then, any substantial difference that emerges between the average tip amounts in the two groups could be attributed to whether suggested tip amounts were printed on the restaurant bill.

8. Answers will vary
The survey results from the two years were very similar—91% of respondents said that they always washed their hands after using the bathroom in 2005, compared with 92% in 2007. However, the observational study results from the two years were quite different. In 2005, 83% of those observed washed their hands after using the bathroom. In the 2007 observational study, only 77% washed their hands after using the bathroom. One possible explanation for this decrease is the decline in the percent of men who washed their hands—from 75% in 2005 to 66% in 2007.

Possible extensions

Ask students to develop a research question that would best be answered by

(a) an observational study
(b) a survey
(c) an experiment

Have students locate an article describing the results of a survey in printed or electronic media. Then ask them to identify the research question, the population, the sample, and any concerns they have about the results reported in the article.

MAKING SENSE OF STATISTICAL STUDIES

Are hot dogs unhealthy?
What percent of people wear their seat belts when driving?
How are peoples' heights and foot lengths related?

These are just a few examples of the types of questions students will explore in *Making Sense of Statistical Studies* (*MSSS*).

The *Student Module* consists of 15 hands-on investigations that provide students with valuable experience in designing and analyzing statistical studies. It is written for an upper middle-school or high-school audience having some background in exploratory data analysis and basic probability.

The *Teacher's Module* includes supporting resources to help teachers use *MSSS* effectively in their classrooms, as well as all the pages from the *Student Module*.

To order *Making Sense of Statistical Studies* or download a free investigation from the module, visit *www.amstat.org/education/msss*.

Using Games and Game Shows to Teach Probability

Sara Paul—Sixth Grade Teacher
Westfield Intermediate School
Westfield, Indiana

Using coins and dice to teach probability has been a staple for many teachers for a long time. Teachers often revert to these items because students are familiar with them and they are usually readily available. Although I have used coins and dice to help with teaching probability to my sixth graders, many times the students are so familiar with these manipulatives I find it valuable to try something new. So I begin with asking my students where they see probability being used in every day activities. We make a list that includes: football statistics, free throws, weather forecasts, board games, gambling, and deciding what clothes to wear to an event. I encourage the students to think of as many real world examples as possible. Once we have some ideas of where probability is seen in everyday activities, I lead the students into thinking about games and game shows. I use this novel approach to grab the students' attention and help them see the significance of understanding probability.

Deal or No Deal is a popular game show on NBC. There are 26 briefcases with dollar amounts ranging from one cent to one million dollars. The contestant chooses one briefcase and then eliminates the other cases by narrowing down the dollar amount which might be in their chosen case. After every few rounds, the contestant has to decide if the current offer is a better deal or if his case might have more money. While watching the game show is fun, I incorporate it into the classroom by having the students play their own game.

On NBC's Deal or No Deal website, you can play a computer version of the game (*www.nbc.com/Deal_or_No_Deal)*. In my classroom, I project the game up on a screen and have the class play the game. The students are engaged because they are familiar with the show and they want to see if the class can win the million dollars or at least a large amount of money. The game lends itself to a discussion of probability as the class plays. We talk about the chance of picking the million dollar case at the beginning of the game. Then as we play, I ask if we are more likely to pick a low or high number based on what numbers are left on the board. When we get down to a few cases, we talk about the probability of getting an amount higher than $100,000 and even convert that chance to a percent. We also use the offers to talk about different scenarios and whether we should take a deal. The game takes about 10-15 minutes to play depending on the length of the discussion. It is a fun addition to a math class, gets the students interested in probability, and provides a way to show the students when probability can be used outside of math class.

Another activity I use to grab students' interest has to do with the alphabet. My goals are for the students to find the most common letter and discuss how that information can be used. So I ask the students to bring something to read to class. I am hoping they bring a variety of reading material

and tell them it can be a textbook, novel, magazine, or any appropriate material. I provide a chart that has each letter on it and room for the students to make tally marks. I allow them a few minutes to make a tally mark for every letter they see in their material. I usually give the students about five minutes to furiously make tally marks. In groups of four, I have them add the tally marks. I project an Excel spreadsheet on a screen to add the group totals. Next we determine what letter is most common by considering each letter's total. We compare the class totals with the group totals to see if the results produce a different most common letter. This leads to a discussion of experimental versus theoretical probability. I point out that we have found the experimental probabilities for the occurrence of each letter. We relate it to flipping a fair coin and how the more times you flip a fair coin the closer you will get to the theoretical probability or 50% heads and 50% tails. Although there may not be a most common letter in theory, the students can see how more data produces a clear favorite. One year the language arts class was reading a book about chimpanzees so we talked about how students that had brought that book to class would have more "Z's" in their data than most students. The students easily see that the more trials you do or the more data you have, the closer you will get to the theoretical probability.

Once we have looked at the data for the entire class, we usually find the letters E and T are the most popular with letters like A, R, and S close behind. I pose two questions "Why would this information be important?" and "When would we use it?" I usually have a student that mentions the game Wheel of Fortune.

The students realize that you should pick the most common letters first since they are more likely to be in a Wheel of Fortune puzzle. We also discuss why a contestant has to buy a vowel instead of receiving money for each vowel. The students realize that vowels are in every word so the contestant would want to buy a vowel to help them solve the puzzle. I ask what letters are specified in the final round of Wheel of Fortune and some students will list R, S, T, L, N, and E. Then we discuss possible words for the final round puzzles. The students notice that the writers do not use common words since the most common letters are given at the beginning. Students will point out that the writers have to think of less common words and phrases so it is challenging for the contestant.

Scrabble is another game we discuss with our newfound alphabet knowledge. I show the students a list of the Scrabble tiles and their values from the Scrabble game website (Frequently Asked Questions, *www.hasbro.com/games/adult-games/scrabble/home.cfm?page=home*). We talk about the number of tiles for each letter. The students notice there are more tiles for popular letters and point out more words are possible with those letters. They also note that the letter's point value goes up as the popularity goes down. We go back to our Excel spreadsheet to see if Q and Z were our least popular letters. Through using the alphabet, we are not specifically calculating probability but rather discussing the relationships and how people use probability to create game shows and other games.

I still use coins and dice to teach probability especially on the TI-73 graphing calculators since you can simulate flipping a coin and rolling dice. I also still use spinners to talk about probability and the chance of pulling something out of a hat. But game shows like Deal or No Deal and Wheel of Fortune help students see probability in a different manner. Students may not relate this kind of reasoning to these shows or other instances in the real world. I spend a class period talking about the alphabet and throughout the year spend ten minutes here and there to play Deal or No Deal. I find it keeps the students interested and gets them thinking outside the box.

Meeting Within a Meeting (MWM)

Statistics Workshop for K-12 Mathematics and Science Teachers

(*www.amstat.org/education/mwm*)

Sponsored by the American Statistical Association (ASA)
2009 Joint Statistical Meetings (JSM)*

★ ★ ★

Based on the *Guidelines for Assessment and Instruction of Statistics Education (GAISE)* A Pre-K–12 Curriculum Framework (*www.amstat.org/education/gaise)*

Dates: Monday, August 3, 2009, 8:00 a.m. to 5:00 p.m., with a visit to the U.S. Census Bureau and JSM activities Tuesday, August 4, 2009

Places: Center City Public Charter School—Shaw Campus, 711 N Street, NW, Washington, DC, 20001 Across the street from the Walter E. Washington Convention Center. Metro accessible via the yellow and green lines. Tuesday activities at the U.S. Census Bureau and Walter E. Washington Convention Center.

Audience: K-12 Mathematics and Science Teachers. Multiple mathematics/science teachers from the same school are especially encouraged to attend.

Objectives: Enhance understanding and teaching of statistics within the mathematics/science curriculum through conceptual understanding, active learning, real-world data applications, and appropriate technology

Content: Teachers will explore problems that require them to collect, formulate questions, organize, analyze, and draw conclusions from data and apply basic concepts of probability. The MWM program will include examining what students can be expected to do at the most basic level of understanding and what can be expected of them as their skills develop and their experience broadens. Content is consistent with *GAISE* recommendations and *NCTM Principles and Standards for School Mathematics*.

Additionally, the MWM 2009 program will include a visit to the U.S. Census Bureau on Tuesday. The interactive presentations and activities will introduce teachers to the 2010 Census, Census in Schools activities, and Census' data and on-line data access tools.

Presenters: *GAISE Report* authors and prominent statistics educators

Format: Monday: Parallel K-4, 5-8, and 9-12 strand sessions
Tuesday: Field trip to the U.S. Census Bureau and activities at JSM
(statistics education sessions, poster sessions, JSM exhibit hall)
Activity-based sessions, including lesson plan development
Monday lunch with speakers

Provided: Lunch and refreshments on Monday, August 3
Field trip to the U.S. Census Bureau on Tuesday, August 4
Complimentary one-day pass to attend the Joint Statistical Meetings on Tuesday, August 4
Lodging reimbursement (up to a specified amount) for teachers from outside the DC metro area
Handouts
Certificate of participation from the ASA certifying professional development hours
Optional graduate credit available

Cost: The course fee for the full day is $30. Please note: Course attendees do not have to register for the Joint Statistical Meetings to participate in this workshop.

Follow up: Follow-up activities and webinars (*www.amstat.org/education/k12webinars*)
ASA chapters network with local teachers to organize learning communities

Registration: Online registration available at *www.amstat.org/education/mwm*.

Contact: Rebecca Nichols, *rebecca@amstat.org*; (703) 684-1221, Ext. 1877

*The Joint Statistical Meetings are the largest annual gathering of statisticians, where thousands from around the world meet to share advances in statistical knowledge. The JSM activities include statistics education sessions, posters sessions, and the exhibit hall.

New Zealand Statistics Education Workshop

Nicholas Horton
Smith College
Northampton, MA

The Auckland New Zealand Mathematics Association had a very successful get-together on Saturday, June 14, 2008. The gathering focused on the latest New Zealand curricular standards for statistics that have recently been unveiled. The standards are innovative and creative, and bear a strong relationship to the *GAISE* guidelines (see *http://tinyurl.com/nzstats* for details). The next step is to flesh out these standards and develop exemplars and classroom materials.

Approximately 100 teachers gathered for a keynote address by **Chris Wild** of the University of Auckland as well as workshops organized by teachers. As an observer in the midst of a sabbatical semester in Auckland, I was struck by the vitality and energy of the presenters and participants (a commendable, common and endearing Kiwi trait). In the discussion below, I've translated New Zealand (NZ) years and levels to US grades.

Chris began the morning with a provocative address about how to introduce informal inference for students in grades 7 through 12. His talk fleshed out the new curricular framework, which develops statistical thinking about descriptive summaries, sampling variability and inferential statements. Chris used a series of animated movies to describe samples from the Census at Schools database (*www.censusatschool.org.nz*) to illustrate his points and motivate the audience. A pointer to his handouts as well as the recorded lecture with slides can be found at *http://tinyurl.com/6bsk6n* (Chris also gave a talk at JSM 2008 on the new NZ curriculum, see *http://tinyurl.com/jsmwild*). After a question and answer period, there were 3 sets of parallel workshops (several repeated in multiple time slots). More information on the workshops and several handouts can be found at *http://tinyurl.com/aucksecmaths*.

Maxine Pfannkuch prototyped a classroom activity for drawing an inference from an experiment, based on her work with secondary students. A resampling method (part of the new standards for grade 12) was used to assess the strength of evidence for making a claim when comparing two designs for a flying object, and workshop attendees were able to replicate the analysis process using the student data.

Slide from *www.stat.auckland.ac.nz/~iase/publications/jsm/08.Wild.pdf*

Maxine and Lindsay fit a line to their datacard scatterplot

Jenny and Anne transfer from hands-on datacards to Fathom to unlock more stories in their data

Free Statistics Education Webinars

Recorded webinars (web-based seminars) on K–12 statistics education topics are free to view at www.amstat.org/education/k12webinars.

This webinar series was developed as part of the follow-up activities for the ASA Meeting Within a Meeting (MWM) Workshop for K–12 Mathematics and Science Teachers (*www.amstat.org/education/mwm*) held in conjunction with the Joint Statistical Meetings. MWM and the webinars are part of ASA's outreach activities to enhance K–12 statistics education. The Consortium for the Advancement of Undergraduate Statistics Education (CAUSE) offers free webinars on undergraduate statistics education topics at www.causeweb.org/webinar.

Pip Arnold presented a workshop called Sleeping Sheep that uses a BBC activity to collect data about reaction times. This activity, targeting students in grades 9 or 10, could be adapted for a variety of ages. Handouts (available at the above URL) on this activity include a teaching plan along with relevant worksheets and a workshop plan for those who might like to use it as a workshop for teachers.

Carolyn Leersnyder described "debatable statistics" for students in grade 10, by posing the question that if tomorrow's weather can't be correctly predicted, how can scientists predict climate in the future? This is a great context for teaching aspects of probability, such as long run averages and the difference between theoretical and experimental results. Carolyn also presented a second workshop on how scientists use time-series data in their real work. She provided a bigger picture for time series, along with several meaningful contexts (many locally based) and stimulating examples of what we can teach in this area (handout available).

Lindsay Smith discussed a second level statistics course for students who wish to continue with mathematics in 11th grade but whose needs suggest a minimal focus on algebra will be appropriate (handout available).

Richard Mackrory, a former chemical engineer, shared thoughts and practical activities for curve fitting, based on his work in industrial research and teaching experience.

Anne Blundell used a series of poorly written articles in the media to motivate a discussion of statistical literacy for all levels. Gal's (2002) worry questions were used to provide a framework for interpreting the news around us.

Murray Black introduced a computer based workshop using excel to construct and interpret confidence intervals for proportions. Examples included manufacturing, the food industry and business.

Beatrix Jones and **Daniel Walsh** discussed a statistical declaration of independence, for situations where observations are not independent. An example based on modeling multiple paternities ("cuckolding") in birds was used to motivate the workshop (handout available).

Other talks included a reprisal by **Jason Florence** of his successful 2007 AMA Statistics day presentation on heuristic probability (a glimpse into the hidden side of probability), while Anna Martin described resampling and confidence intervals.

I was impressed that 100 people would volunteer their time to learn more about what's happening in this realm. I left the workshop full of ideas and activities for my work in secondary and tertiary statistical education.

BAPS – Beyond AP Statistics

Monday, August 3, 2009
8:30 a.m. – 4:30 p.m.

A WORKSHOP FOR EXPERIENCED TEACHERS

Sponsor: ASA-NCTM Joint Committee on the Curriculum in Statistics and Probability

The ASA/NCTM Joint Committee is pleased to sponsor a Beyond AP Statistics (BAPS) workshop at the annual Joint Statistical Meetings in Washington, DC on August 3, 2009. The BAPS workshop is offered for AP statistics teachers and consists of enrichment material just beyond the basic AP syllabus.

Presenters (organized by Roxy Peck, Cal Poly)

Steve Miller of the Bureau of Labor Statistics, "Topics in Survey Methodology"

Tom Short of John Carroll University, "Logistic Regression"

Robin Lock of St. Lawrence University, "Multiple Regression"

Allan Rossman of Cal Poly, "Randomization Tests"

Cost

The course fee for the full day is $50. Lunch will be provided. Please note: Course attendees do not have to register for the Joint Statistical Meetings in order to participate in this workshop.

Location

Center City Public Charter School – Shaw Campus, 711 N Street, NW, Washington, DC 20001. Across the street from the Walter E. Washington Convention Center. Metro accessible via the yellow and green lines.

Provided

Lunch and refreshments, handouts, pass to attend the exhibit hall at the Joint Statistical Meetings, certificate of participation from the ASA certifying professional development hours, and optional graduate credit available

Registration

Online registration is available at *www.amstat.org/education/baps*. Registrations will be accepted until the course fills, but should arrive no later than July 15, 2009.

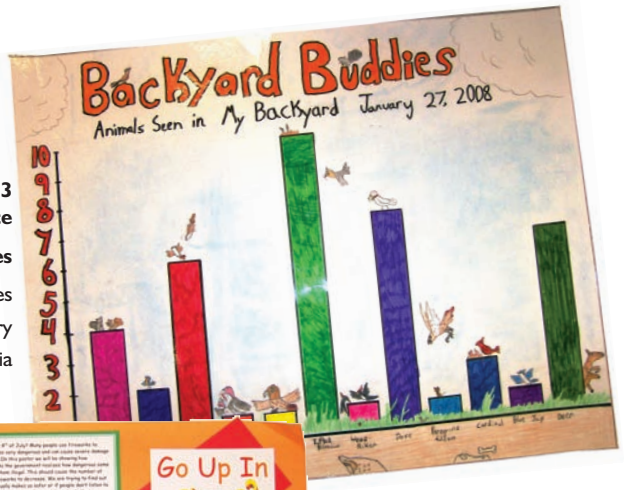
Questions

Contact Rebecca Nichols at *rebecca@amstat.org* or call (703) 684-1221, Ext. 1877

Project Competition Deadline for Grades 10–12 Extended to May 30

Introduce K–12 students to statistics through the poster and project competitions directed by the ASA/NCTM Joint Committee on the Curriculum in Statistics and Probability. The competitions offer opportunities for students to formulate questions, collect, organize, analyze, and draw conclusions from data. The poster competition deadline (grades K–12) remains April 1 along with the project competition deadline for grades 4-6 and 7-9. Projects for grades 10-12 are now due May 30 to accommodate AP statistics students who will be taking the AP statistics exam in early May. Winners will be published in Amstat News and recognized with plaques, cash prizes, certificates, and calculators (donated by Texas Instruments).

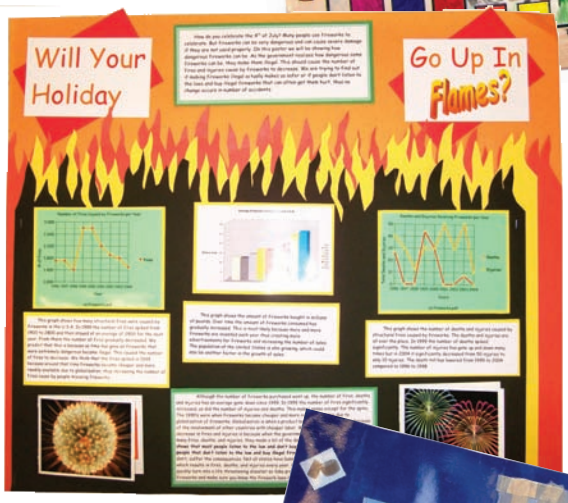
Information about the poster and project competitions, including two instructional webinars, is available at ***www.amstat.org/education/posterprojects/index.cfm.***



GRADES K–3
2008—Third Place

Backyard Buddies

Kailyn Bates
Westtown Thornbury Elementary
West Chester, Pennsylvania



GRADES 4–7
2008—Honorable Mention

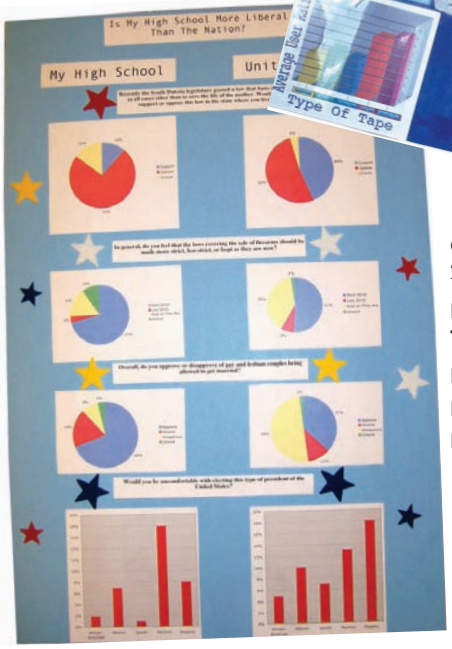
Will Your Holiday Go Up in Flames?

Liz Broene, Catherine Polik, and Hanna Teasley
Holland West Middle School
Holland, Michigan

GRADES 7–9
2008—Third Place

Tape

David Freifelder
Cedarbrook Middle School
Wyncote, Pennsylvania



GRADES 10–12
2008—Second Place

Is My High School More Liberal Than the Nation?

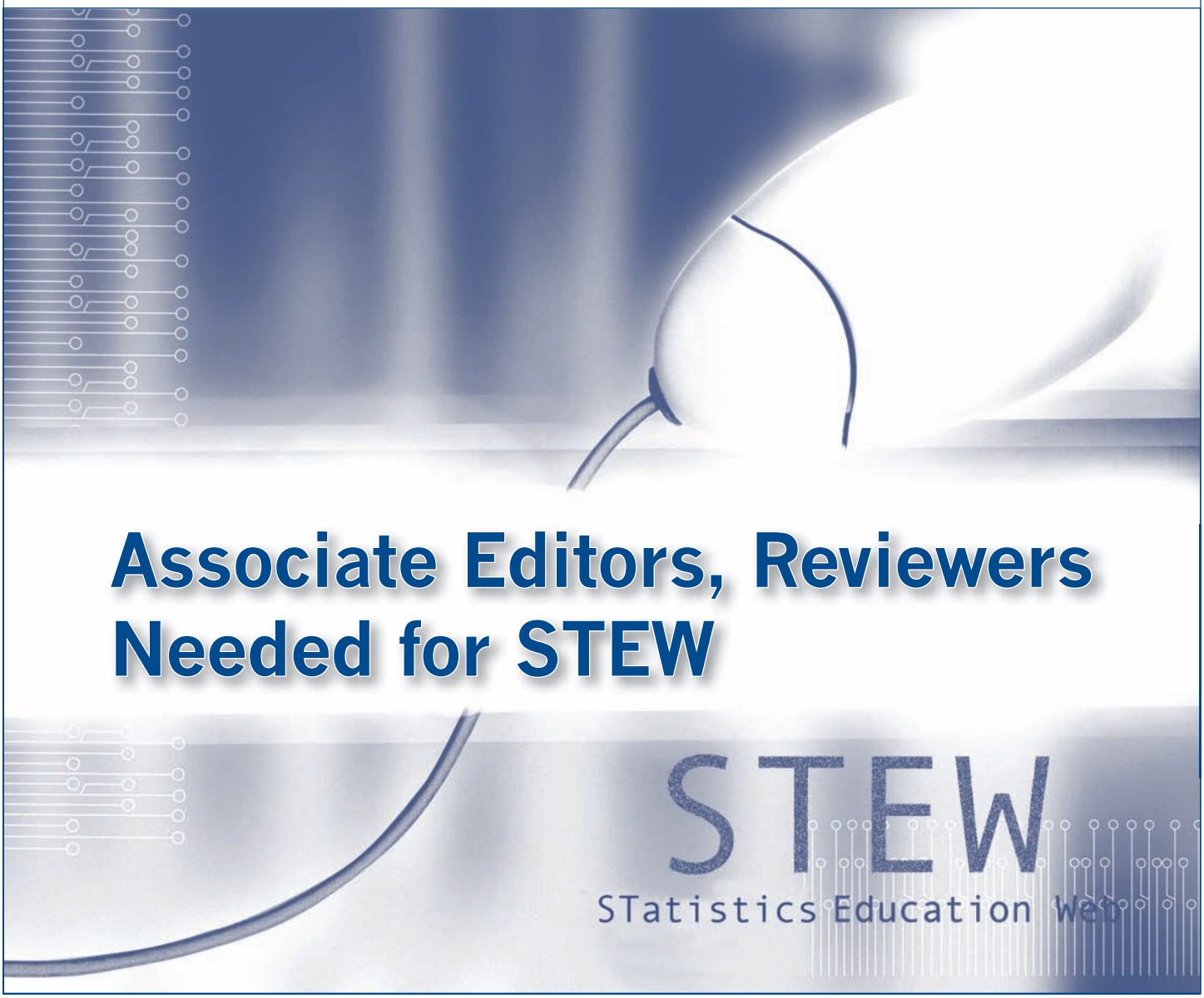
Matthew H. Baron
Beachwood High School
Beachwood, Ohio

Judges Sought for ASA Project Competition

The ASA/NCTM Joint Committee is seeking judges for the ASA project competition. Judging takes place via email during the summer and requires about four hours of your time. If interested, please email Megan Mocko at *mmeece@stat.ufl.edu* or call (352) 273-2975.

STatistics Education Web

The editor of STatistics Education Web, an online bank of peer-reviewed lesson plans for K–12 teachers of mathematics and science, is accepting applications/nominations for associate editors and reviewers. Those chosen will review lesson plans that showcase the use of statistical methods and ideas in science and mathematics based on the framework and levels of the *Guidelines for Assessment and Instruction in Statistics Education* (*GAISE*) *Report*: *A Pre-K–12 Curriculum Framework*. Associate editors and reviewers will be selected for each of the three *GAISE* levels. Interested persons should electronically submit a letter of interest and a current CV or résumé to the STEW Editor, Scott Street at STEW.*Editor@gmail.com* and copy Rebecca Nichols at *rebecca@amstat.org*.



New LearnSTAT OnDemand Resource for Teachers

Emphasizing Conceptual Understanding in Statistics

Facilitated by Bob delMas, University of Minnesota.

Recorded February 26, 2009, running time one hour and forty-two minutes.

This media file will give an overview of the *Guidelines for Assessment and Instruction in Statistics Education* (*GAISE*) recommendations emphasizing conceptual understanding.

The WMV file includes many activities and resources and should be of interest to introductory statistics teachers, AP Statistics teachers, teaching assistants, and university faculty.

This product is a downloadable electronic file. After your purchase, you will be given access to the WMV file to view and also the presentation slides in PDF format to print. You can access this file for 7 days from the date of purchase. Invite your whole department and view the presentation together!

For more information and to purchase, go to:
www.amstat.org/education/amatyc_asa/archives.cfm

Second MWM Workshop for K–12 Mathematics and Science Teachers at the 2008 Joint Statistics Meetings

Katherine Taylor Halvorsen—MWM Program Chair
Smith College

Rebecca Nichols—K–16 Education Manager
American Statistical Association

Meeting Within a Meeting (MWM) 5–8 Workshop during JSM in Denver, 2008

> "One of the primary missions of the American Statistical Association is to work for the improvement of statistical education at all levels."

The American Statistical Association (ASA) held its second annual Meeting Within a Meeting (MWM) August 4-5 concurrently with the 2008 Joint Statistical Meetings in Denver, Colorado. The program for the MWM workshops in 2008 introduced K-12 teachers to the ASA's *Guidelines for Assessment and Instruction in Statistics Education* (*GAISE*) *Report: A Pre-K–12 Curriculum Framework* (see *www.amstat.org/education/gaise*). The workshops gave teachers the opportunity to discuss and apply the statistical concepts embodied in their state mathematics and science standards in the context of the instructional recommendations of *GAISE*. The MWM program emphasized the growth of statistical literacy over three developmental levels that correspond, roughly, to elementary school, middle school, and high school.

Ron Wasserstein, the ASA's executive director affirmed that, "One of the primary missions of the American Statistical Association is to work for the improvement of statistical education at all levels." He added, "We are pleased to reach out to the K–12 math and science community through the MWM workshop and follow-up activities. It is fitting to hold this workshop for K–12 teachers in conjunction with the Joint Statistical Meetings, where 6,000 statisticians from around the world meet to share advances in statistical knowledge. MWM will not only enhance understanding and teaching of statistics concepts in the classroom, but also provide participants with a network of statisticians and educators to assist in developing the quantitative literacy of their students."

The MWM curriculum included hands-on activities designed to enhance understanding of statistical concepts and to strengthen teaching skills. Teachers explored problems that required them to formulate questions, collect, organize, analyze, and draw conclusions from data and apply the basic concepts of probability. The MWM program included examining what students can be expected to do at the most basic level of understanding and what can be expected of them as their skills develop and their experience broadens.

The first MWM was held in conjunction with the 2007 JSM in Salt Lake City, Utah. The one-day pilot program focused on Utah middle-school mathematics and science teachers, and included teachers from six additional states and Canada. The follow-up program was directed by Paul Fields and the Utah Chapter of ASA, and it was funded by an ASA Membership Initiative Grant. The chapter maintained contact between the Utah teachers who attended MWM through meetings and classroom visits during the 2007–2008 academic year. The ASA provided technical support for eight webinars for all participating teachers, and these can be viewed at *www.amstat.org/education/k12webinars*.

The success of MWM 2007 led Martha Aliaga, ASA director of programs, to recommend expanding the MWM workshop in 2008 to include a two-day format with additional workshops for K–4 and 9–12 teachers. Teachers were encouraged to attend the Monday and Tuesday sessions. Separate workshops for K–4 and 9–12 teachers were held on Monday with the 5–8 workshop on Tuesday. The grade 5-8 teachers were invited to observe either the K–4 or the 9–12 workshop, and the K–4 and 9–12 teachers were able to observe the 5–8 workshop. Teachers also had the option of attending statistics education presentations at JSM.

On Monday evening, all participants at MWM 2008 were invited to dinner and panel discussion about careers in statistics presented by the ASA Committee on Career Development. They were joined at the dinner by members of the Colorado-Wyoming Chapter of ASA. Chapter members also joined MWM participants at lunch on Monday and on Tuesday, to meet, mingle, and

discuss how the chapter could act as a resource for teachers and students. The workshops, lunches, and dinner were held at Metropolitan State College of Denver.

The K-4 workshop focused on *GAISE* Level A activities, the 5-8 workshop on Level B, and 9–12 on Level C. Jerry Moreno of John Carroll University planned the K–4 program, which included data collection and analysis activities, probability activities, and poster and project activities. In addition to Jerry Moreno, presenters included Sandra McKenzie of Cherry Creek School District and Metropolitan State College of Denver, Tena Katsaounis of The Ohio State University, and Linda Quinn of John Carroll University. ASA President Peter A Lachenbruch welcomed and addressed the elementary school teachers.

Katherine Halvorsen of Smith College planned the 5–8 and 9–12 programs. The 9–12 workshop aimed to help non-AP Statistics teachers introduce statistics concepts into their traditional math courses. The program included activities on formulating questions for class activities and projects, random selection and random allocation, using Fathom to teach statistical concepts, and using dynamic graphics to teach regression and hypothesis testing. Katherine Halvorsen and Robert delMas chaired the high-school workshop. Presenters included Katherine Halvorsen, Melissa Colsman of the Cherry Creek School District, Chris Olsen of Thomas Jefferson High School, Robin Lock of St. Lawrence University, and Scott Urquhart of Colorado State University. ASA President-elect Sally Morton welcomed the high-school teachers in the morning, and Ken Turner, deputy commissioner of academics with the Colorado Department of Education, addressed the high-school teachers before lunch.

The middle-school workshop focused on the distinctions between one-and two-variable statistics, as well as the distinctions between categorical and numerical data. Participants explored the types of displays and summaries that are appropriate for each kind of data. The workshop concluded with a discussion of lesson planning and assessment. Presenters included Lew Romagnano of Metropolitan State College of Denver, Jerry Moreno, Christine Franklin of the University of Georgia, Gary Kader of Appalachian State University, and Paul Fields of Brigham Young University. ASA Executive Director Ron Wasserstein welcomed the middle-school teachers in the morning before their session began.

Twenty-two teachers attended the K–4 workshop, 32 attended the middle-school session, and 35 attended the high-school session. Most of the teachers were from Colorado, but teachers also came from twelve other states. Two teachers who attended MWM 2007 in Salt Lake City returned to MWM in 2008. The participant evaluations of the overall program were very positive. Some of their comments included, "It was wonderful to have such qualified presenters focused on a specific area" (statistics for K–4). "Hands-on demos of lessons we could teach were especially helpful and kept my interest." "A well planned and executed program. All information was distributed in a timely manner. Thanks."

A follow-up program, including activities with members of the Colorado-Wyoming Chapter and webinars facilitated through the ASA office, will take place throughout the school year. "The Colorado-Wyoming Chapter is taking advantage of the MWM workshop to build connections with teachers in the area," said Matt Pocernich, ASA Chapter president. "By meeting with the teachers, we will learn how they think our members can help encourage more kids to share our enjoyment of numbers and statistics."

MWM has become a reality due to the efforts of the organizers, presenters, speakers, session chairs, participants, and ASA chapter members, primarily in Utah and Colorado-Wyoming, but also chapters across the country that have advertised MWM locally and sponsored teachers to attend. We especially thank Nels Grevstad of Metropolitan State College of Denver, Battelle, Texas Instruments, the ASA/NCTM Joint Committee, Pearson Learning, and Bedford, Freeman & Worth Publishers for their contributions to making MWM 2008 a success.

We are looking forward to JSM 2009 in Washington, DC. Are you or do you know K–12 mathematics or science teachers who are interested in enhancing their understanding and teaching of statistics within their mathematics and science curriculums? If so, we encourage you to apply to attend MWM in 2009. The application process will begin in March 2009 and further information about the workshops will be available at *www.amstat.org/education/mwm*. Questions about the MWM workshop should be directed to Rebecca Nichols, ASA assistant director of K–16 education programs, at *Rebecca@amstat.org* or (703) 684-1221, Ext.1877.

Free ASA Resources for K–12 Teachers

Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report: A Pre-K–12 Curriculum Framework
www.amstat.org/education/gaise

Statistics Education Webinars for K–12 Teachers
www.amstat.org/education/k12webinars

ASA Poster and Project Competitions
www.amstat.org/education/posterprojects/index.cfm

Other Web sites Useful for Teachers of Statistics

www.amstat.org/education/usefulsitesforteachers.cfm

Publications in Statistics Education
www.amstat.org/education/publications.cfm

Careers in Statistics
www.amstat.org/careers

Other Statistics Education Resources
www.amstat.org/education