AP Annual 2015 Conference

Serving the Community through Statistics: A Capstone Project

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Introduction: Motivation for Utilizing Service-Learning

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I. Motivation for Utilizing SL

- Defining Service-Learning:
  - At a basic level, service-learning can be defined as a set of activities that have two characteristics:
    - 1) they enhance either the delivery or the impact of the curricular material, usually, but not always, within the context of a specific course, and
    - 2) they take place within a service framework where additional experience with civic engagement or social contribution will be obtained.
  - Hadlock, C.R. (2005). "Introduction and Overview." In C.R. Hadlock (Ed.), *Mathematics in service to the community: Concepts and models for service-learning in the mathematical sciences*. Washington, DC: Mathematical Association of America.
- In the context of AP Statistics:
  - Identifying a non-profit service agency which requires survey research (program evaluation, client needs assessment, etc.)
  - Students develop a survey instrument, conduct survey, compile and code data, analyze data, present results

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I. Motivation for Utilizing SL

Discussion:

What are your expectations for this workshop? What do you hope to get out of this?

What excites you about implementing a service-learning project in your class? Why do you think service-learning might be a good idea for your students?

What makes you reluctant to implement a service-learning project in in your class? What concerns do you have in undertaking such an endeavor?

Lessons from Experience: Exploring Sample Projects

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II. Lessons from Experience

The Examiner
June 20, 2012 ★ Page 13A

NHS AP statistics students compare volunteerism to county resources in Dyer Mill Fire

Leece Uilkie
NHS Steps Class Project

One of the last projects I did at Navasota High School – the last project, in fact – was a project-based, service learning experience that took our efforts and knowledge of statistics outside the traditional classroom atmosphere. We analyzed statistical data comparing the effectiveness of volunteer versus county effort in assisting the victims to the Dyer Mill Fire.

As you know, citizens of Grimes County and the surrounding areas were cursed with a swarm of raging wildfires during the summer of 2011. A number of victims were left without homes and it was up to the county and other volunteers to provide aid.

Our Navasota High School AP Statistics class, under the instruction of Josh Wilkerson, applied what we learned in class to complete a community service project.

other, but rather highlight the positive things both sides accomplished and explore whether the county can learn from the response of volunteer groups (or vice versa).

Essentially, the results gathered will give others an idea of how efficiently the output exerted by the community is utilized in an emergency situation.

The class elected project managers among our peers. These include: Colton Harris, Julie Reyes, Jacob Malek, Kelsey Kehlenbeck, Trevor Savensky and myself. Assisting with the project were Texas A&M professors Dr. Jamis Perrett and Dr. Laura Stough. Dr. Perrett specializes in experimental design. Dr. Stough specializes in disaster relief.

Maps were obtained displaying the evacuated fire zone. To collect a population to test, Dianna Weissenland, Secretary with the Friends of Grimes County, provided us with a list of victims. Presented with a fairly small population, we decided to conduct a complete census.

We used multiple techniques and variables when creating the survey to insure the data pro-

Examiner photo by Scott McDonald

The Navasota High School AP Statistics Class did a project-based learning assignment comparing the effectiveness of county resources to volunteers in the Dyer Mill Fire. Here, they make a presentation of their findings to the NISD Board of Trustees. Pictured standing are project officers (from left) Colton Harris, Leece Uilkie, Jacob Malek, Trevor Savensky and Kelsey Kehlenbeck. Seated is the AP Statistics instructor Josh Wilkerson.

The survey was also created in a way that it could be completed within 5-10 minutes through either the internet, telephone or in person.

form of food, clothing, toiletries, etc.) provided by both volunteers and the county - no one group stood out over the over in terms of amount of aid

a statistical test was run on the average rating given by victims on the quality of aid provided by volunteers and the county. These results showed that there

have sufficient evidence the volunteer services provided more effective aid to fire victims than county resources. Though, throughout the process of surveying victims, they expressed a great appreciation for everything both groups, volunteer and county, accomplished for them.

Project managers presented these results to the Navasota ISD School Board and Navasota City Council through a formal presentation. Since the results showed the amount of aid (quantitative) was the same and the effectiveness of the aid (qualitative) is where the county fell short, perhaps in the county's disaster preparation they could allocate resources not to securing more items for victims, but in better preparing the people who interact with victims. The county could enhance small improvements in the quality of aide. However, the output exerted from the county and volunteer efforts was praised by the victims in both quantitative and qualitative areas.

This learning process preceded any other method presented to me in my high school career. The satisfaction in tack-

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II. Lessons from Experience

Timeframe

- Introduced in course syllabus at beginning of the year
- Students equipped through fall projects
  - The first fall project is a study in response bias in which students work in teams and gain experience in giving surveys, analyzing bias, and producing a statistical poster.
  - The second fall project requires students to work in different teams to analyze data from the Census at School website. The second project gives students experience in working through real world data sets in Microsoft Excel, creating statistical charts and graphs, and developing an effective PowerPoint presentation.
  - In total by the end of the fall the students have given surveys (both good and bad), examined data sets, worked with Excel, and given two different forms of presentations, all with different classmates as partners.
- Service project starts in full at the beginning of spring semester

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II. Lessons from Experience

Organization: Large Scale

- Organization or cause selected by teacher or entire class
- Teams of students work on components
- More work for teacher but more reliability in community partnership
- Is every student involved in the entire statistical process?

Organization: Small Scale

- Organizations selected by individual student teams
- Teams of students work on separate projects
- Organization is meaningful to students but questions vary
- Is every student involved in the entire statistical process?

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II. Lessons from Experience

- Evaluating the effectiveness of the county in providing aid to wildfire victims as compared to the aid provided by volunteer organizations
  - $\chi 2$ Test of Independence: Type of Aid v. Source of Aid
  - 2-Sample T-test: Average Rating of Volunteer Effectiveness v. Average rating of County Effectiveness

Effectiveness of Grimes County Resources vs. Volunteers in Providing Aide to Wildfire Victims During the Summer of 2011

Hello. This is a survey created by Senior A.P. Statistics students at Navasota High School. As part of our spring project we have decided to create a survey to assess the effectiveness of Grimes County in providing aide to wildfire victims during the summer of 2011. This survey will determine which resource provided the most aid during the wildfire outbreak: Grimes County or Volunteer Services. We ask you to please take the time to answer our survey which should take no more than five minutes.

* Required

Name: *

Phone Number *

Email Address *

1. How were you informed to evacuate? *

- Social media (i.e. Facebook)
- Phone call
- TV/Radio
- Neighbor/Family
- County Resources (i.e fire department, sheriffs department, DPS)

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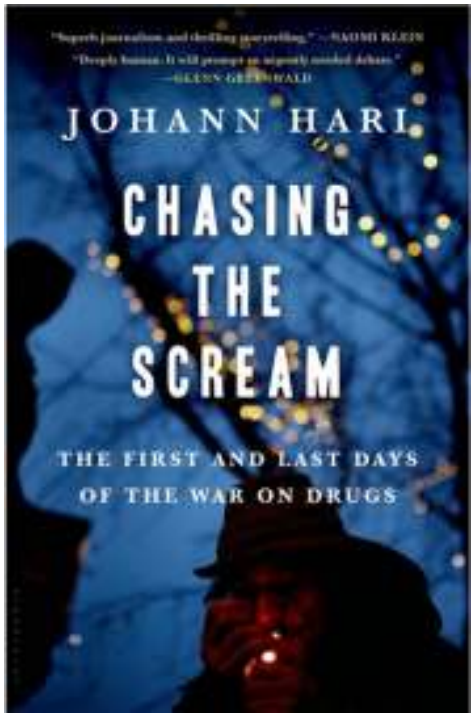
II. Lessons from Experience

- Comparing drug/alcohol abuse before and after establishing residence in an affordable housing community for the chronically homeless (*forthcoming*)
  - Matched Pairs T-Test



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II. Lessons from Experience

- Examining volunteer and camper retention in an inner city after school program
  - 1-Sample Z-Intervals to determine percentage of volunteers and percentage of campers retained for varying amounts of time
- Analyzing adoption trends for a local no-kill animal shelter
  - $\chi 2$ Test of Independence: Willingness to adopt older dogs v. Willingness to adopt larger dogs
  - Linear Regression T-Test for the relationship between the size and the age of the dog in one's willingness to adopt
- Determining community satisfaction in regards to new developments by the city parks and recreation department
  - 1-Sample Z-Interval for proportion of park trail users who are aware of the park trail foundation
  - 1-Sample T-Test for determining the rating of a new restroom facility

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II. Lessons from Experience

Keys to Success

- The Power of Choice
  - Students have a vested interest in a personal topic
  - "How can we apply the concepts learned in statistics to benefit our local community/service agencies?"
- Meaningful Applications
  - Real life scenario with real people
  - The "Aha Moment" - Deep connections drawn from course material to project implementation
- Improving Civic Mindset, Professionalism, and Presentation Skills
  - Obligation is to the community/organization, not just a grade
  - Comfort levels stretched through community interaction
- Required Reflection Beyond Calculations
  - Students chose the topic so they have to defend why it matters
  - Importance of statistics cemented

Discussion:

What ideas come to your mind for your own class after seeing some sample approaches?

Which components seem easy for you to implement? Which components still seem difficult to manage?

What major questions/concerns do you still have?

Lessons from Research: Identifying Keys to Success

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III. Lessons from Research

- The enhancement of curricular impact can derive from different sources:
  - Exposure to new techniques and ideas
  - Motivation from seeing curricular material in action
  - Higher student energy level due to bonding with a client organization and helping meet its needs
  - More extensive discussion of course material due to the interactive nature of most service-learning projects

- Ultimately the motivation for service-learning is not only developing higher-order critical thinking in real-world contexts but also increasing the feeling of engagement on the part of the student

- **KEY TO SUCCESS**: REFLECTION

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III. Lessons from Research

"Some people may think that this reflection process refers to a kind of 'touchy-feely' exercise that might be quite foreign to the mathematics classroom. I prefer to think of it as the processing of a rather complex set of experiences to assure that students share and solidify their insights and thus obtain maximum lasting benefits. This has actually been one of the most important contributions of the service-learning initiative."

- Hadlock, C.R. (2005). "Introduction and Overview." In C.R. Hadlock (Ed.), *Mathematics in service to the community: Concepts and models for service-learning in the mathematical sciences*. Washington, DC: Mathematical Association of America.

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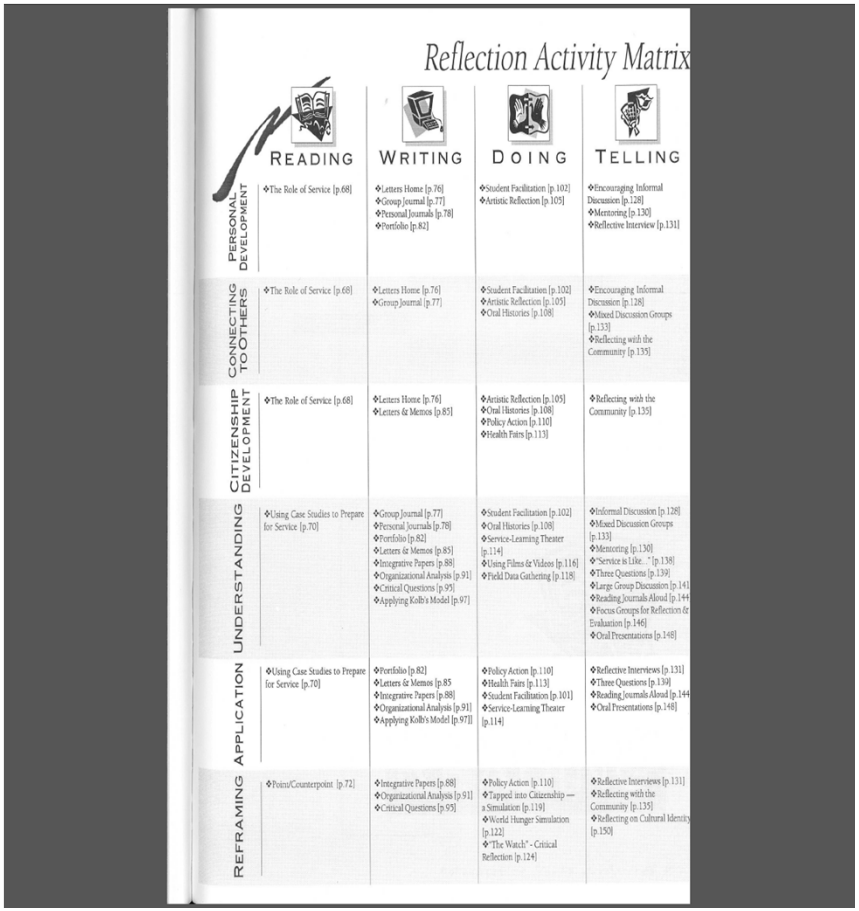
III. Lessons from Research

"Service-learning in its most effective and well-developed sense is more than another name for 'real-world learning' and consists of more than applied work in the public/non-profit sector. It involves a multilayered reflection process that can substantially increase its educational value in a broad sense…. Service-learning reflection asks the learner to become more aware of what he/she brings to the learning process: values, assumptions, biases – many of which are unexamined and potentially problematic….To leave these aspects unexplored would be to miss a vital educational opportunity, for they invariably stir up thoughts and feelings highly deserving of reflection and discussion."

- Zlotowski (2005) Zlotkowski, E. (2005). "Foreward." In C.R. Hadlock (Ed.), *Mathematics in service to the community: Concepts and models for service-learning in the mathematical sciences*. Washington, DC: Mathematical Association of America.

III. Lessons from Research



- Reflection can be more than simply having students respond to a writing prompt that relates to the SL project
- Key is to engage students in reflective thinking
- Eyler, J., Giles, D. E., & Schmeide, A. (1996). *A practitioner's guide to reflection in service-learning: Student voices & reflections*. Vanderbilt University.

Discussion:

What are your initial impressions on guiding students through a structured reflection process?

Do you already have students reflect on their work in any form or fashion? If so, how? If not, what holds you back?

What major questions/concerns do you still have?

Putting it All Together: Implementing Service-Learning in your Curriculum

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IV. Implementing Service-Learning

STEP 1: Determine the learning objectives for your course and think of real-world situations where students can apply the concepts studied in your course (*How can mathematical models and ideas be applied to solve real-life problems?*).

- Identifying a non-profit service agency which requires survey research (program evaluation, client needs assessment, etc.)
- Students develop a survey instrument, conduct survey, compile and code data, analyze data, present results
- These projects synthesize the major concepts of experimental design, data analysis, and statistical inference in the real-world context of community service
- Through these projects students integrate their conceptual understanding of statistics with the practical functioning of their local community

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IV. Implementing Service-Learning

STEP 2: Determine a community partner that has the time to communicate on a regular basis with you and your students and where students will be addressing a real community need.

- The community partner must be viewed as a co-instructor
- Discuss with the community partner:
  - The academic calendar the students are operating under
  - The difference between SL and community service
  - The learning objectives from STEP 1
  - Deadlines for stages of the project
  - Deadline for completion of the project
  - Plan for final presentation of deliverables to all stakeholders
- Students already involved in community service can be an excellent resource

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IV. Implementing Service-Learning

STEP 3: Prepare students for working on a SL project

- Clearly explain to students the learning objectives of the SL project and how they tie into the learning objectives of the course (In other words: be sure to communicate to students what you determined as the instructor in STEP 1)
- Discuss the expectations for the relationship between the students and the community partner from STEP 2 (Students should view this as a consulting project)
- Discuss up front your assessment methods and provide a rubric (Grades should reflect the quality of work produced and the demonstration of the understanding of statistical concepts, not just number of hours spent on the project)
- The instructor needs to treat the SL experience as integral to the course rather than a tacked on project

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IV. Implementing Service-Learning

STEP 4: Equip students to successfully complete the SL project

- Be sure students have and understand:
  - Project description (Stemming from Step 3)
  - A clear hierarchy for the project
  - Calendar delineating phases and important dates
  - Rubric that outlines where the grade is coming from
  - Examples of successful projects and insights as to what made them successful
  - (See handouts)
- Be sure the project is managed in a way that provides students with regular (ungraded) feedback throughout the process (perhaps at the end of each phase)
- Be sure students have sufficient time to work together, both in and out of the classroom (under your guidance or to have interaction with expert consultants)

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IV. Implementing Service-Learning

STEP 5: Reflection

- How often do you want to utilize it?
  - Should at least have a reflection pre-project, mid-project, and post-project.
  - Suggestion from literature is weekly to bi-weekly during the course of project
- Through what means will you utilize it?
  - Student notebooks
  - Handout with questions
  - Google doc
  - Other
- What will you ask or have students do?
  - Reflection on the statistical/mathematical skills involved
  - Reflection on the other skills/experiences involved

Discussion:

What major questions/concerns do you still have?

How can the AP community of teachers be a resource for implementing service-learning into your curriculum?

What other resources on service-learning come to your mind? What ideas do you have?

Resources

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V. Resources

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- Additional Resources:
  - Issue of *PRIMUS* Dedicated to Successful Service Learning Resources (Volume 23, Issue 6, 2013): http://www.tandfonline.com/toc/upri20/23/6#.U4iSufldUmM
  - *Mathematics in Service to the Community: concepts and models for service learning in the mathematical sciences*, Charles Robert Hadlock (MAA Notes Series)
  - Service-Learning Session from JMM 2011: http://www.math-cs.gordon.edu/~kcrisman/SLTalks/