

Vision - Potential

Vision Within Every Instructor - Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*
Number 97, April 2010

Contents

- [1] Contemporary College Algebra at Harris-Stowe State University
- [2] Query on Balancing a Truck
- [3] Unemployment by Education Level
- [4] Visibility Conditions
- [5] Notices

[1] Contemporary College Algebra at Harris-Stowe State University

Ann Podleski

Harris-Stowe State University, located in midtown St. Louis, Missouri, has been in existence for more than 150 years and traces its origin back to 1857 when it was founded by the St. Louis Public Schools as a Normal school established for white students only. This school was later named Harris Teachers College. A second predecessor institution was Stowe Teachers College, which began in 1890 as a Normal school for future black teachers of elementary schools in the city of St. Louis. These two teacher education institutions were merged by the Board of Education of the St. Louis Public Schools in 1954. In 1979, Harris-Stowe was designated as a HBCU and became a member of the Missouri State system of Higher Education. The institution remained primarily a teaching one until new degree programs were added in the 1990's. Currently Stowe-Harris State University offers 12 degree programs in the areas of

* Supported by the U.S. Military Academy.

Accounting, Business Administration, Criminal Justice, Early Childhood Education, Elementary Education, Health Care Management, Hospitality and Tourism Management, Information Sciences and Computer Technology, Middle School Education, Professional Interdisciplinary Studies, Secondary Education and Urban Education. At the start of the millennium, to serve a greater number of students in the metropolitan area, the University went to open admission status. HSSU opened its first residence hall in 2006, which has brought in more traditional age students. The majority of students are first-generation college students and over 95% receive some form of financial assistance. HSSU enrolls more African-American males than any other school in the state of Missouri.

Harris-Stowe began its implementation of Refocused College Algebra in the fall of 2008. A team from Harris-Stowe attended an HBCU Retreat at West Point in June 2008, funded by NSF and the Army Research Office. The retreat consisted of workshops to train teams from several HBCU's in all aspects of the re-focused approach. Key components of the re-focused approach are using real-world problems, a strong emphasis on problem solving, mathematical modeling, and elementary data analysis. Also the course is more student-centered than our traditional college algebra course, involving small group in-class activities, and also focuses on the development of communication skills and appropriate use of technology.

We began the implementation at HSSU in the fall 2008 semester with two sections of refocused College Algebra and three traditional sections. We have continued to have two refocused sections and three or four traditional sections each semester. We also offer one refocused section during one of our summer sessions. During the first year of implementation our mentor, Anthony Johnson, from West Point visited our campus during both the fall and spring semesters. He observed both sections of the refocused class and made presentations to the students in the classes and also to a group of interested faculty and staff. Harris-Stowe also received a mini grant from NSF which allowed us to purchase graphing calculators which we use extensively in the refocused classes.

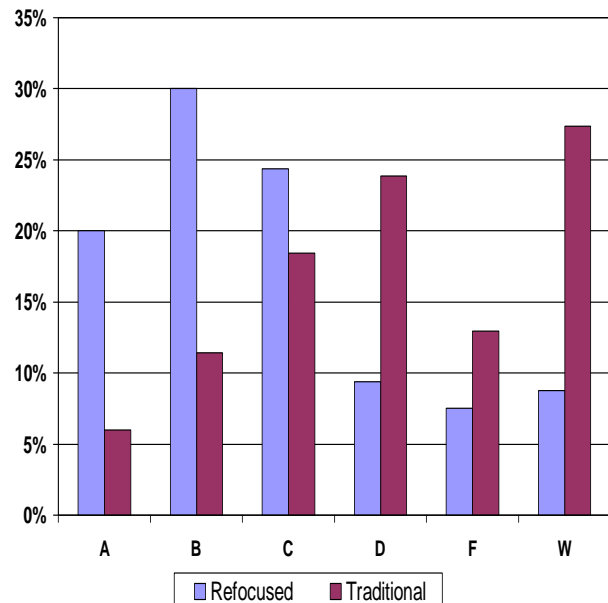
The text used for the refocused sections is “Contemporary College Algebra” by Don Small. The course begins with basic data presentation and analysis, then discusses relations between variables, focusing first on linear relationships. Functions are then discussed from many points of view. Basic algebra topics are spread throughout the course. Most topics are introduced through some type of real life application.

In addition to many in-class activities, which are often done in groups, students are assigned two group projects that are prepared outside of class, but presented in class. The first project usually involves some type of data collection and data summary with appropriate graphs and statistics. The second project also involves data collection, but with the focus on modeling the data with an appropriate function and making predictions.

One example of a group project was looking at trends in gasoline prices. After graphing the data and trying to fit a function to model the data (gas price averages from 1987 – 2008), the students realized that neither the linear nor exponential fit all the data and in

fact, there was a change from linear model to exponential model over time.

Data so far have shown an improvement in student satisfaction and student success in the refocused sections as compared to the traditional sections. Based on three semesters, Fall 2008, Spring 2009, and Fall 2009, 27% of students withdrew from the traditional sections (N=201) and only 9% withdrew from the refocused sections (N=160). Only 35% of students in traditional sections received an A, B, or C, compared to 74% of students in refocused sections received an A, B, or C. Grade distributions are shown below. (The left columns show results of the refocused approach and the right columns show results of the traditional approach.)



In fall 2008, students in all sections of College Algebra were given a math attitude survey at the beginning and end of the semester. The survey consisted of a series of statements where the student marked their level of agreement (1-5 scale). A few comparisons between the refocused and traditional sections are noted below.

*** “Ordinary students cannot expect to understand mathematics ... they simply mem-

orize and apply mechanically without understanding.”

More in refocused sections disagreed with this statement at the end of the semester (42% to 62%); traditional sections went from 39% to 49%.

*** “Mathematics makes me feel uneasy and confused.”

More in refocused sections disagreed with this statement at the end of the semester (36% to 50%); traditional sections went from 44% to 40%.

*** “Mathematics is important for my chosen profession.”

More in refocused sections agreed with this statement at the end of the semester (69% to 80%); traditional sections remained at 67% agree.

*** “Using technology (web/computer) is a good way for me to learn mathematics”

More in refocused sections agreed with this statement at the end of the semester (14% to 32%); traditional sections went from 24% to 21% agree.

At this point, the refocused approach is still being developed at Harris-Stowe. This semester, the graphing calculators were not given to the students until after the first exam. This was done to help ensure that students had an understanding of some of the concepts that were not purely based on using a graphing calculator. In general, the students who take the refocused sections are satisfied with the approach, but we plan to follow up to see how students from all college algebra sections do in future math courses.

[2] Query on Balancing a Truck

A trailer truck has two main parts, the tractor or cab and the trailer. On the tractor, the front axle is called the *steer axle* and the rear wheels are the *drive* wheels. The

(rear) wheels on the trailer are called the *tandems*. On an “18 wheeler” there are two steer wheels, 8 drive wheels, and 8 tandem wheels. In most States, the (maximum) legal weight limits are 8,000 lbs. for the steer axle, 3,400 lbs. for the drive wheels, and 3,400 lbs. for the tandems. When a truck is weighed at a Weigh Station, each of the three sets of wheels are weighed. A truck is *balanced* when the weight on the drive wheels is the same as the weight on the tandems. To help the driver balance the truck, the tandems can be moved forwards or backwards over a span of four feet.

Query: If a truck is unbalanced with too much weight on the drive wheels, which way should the tandems be moved (forwards or backwards) in order to balance the truck? Explain your reasoning.

Hint: Think of the trailer as a see-saw with the tandem wheels serving as the fulcrum. If the left-hand side is too heavy, which direction would you move the fulcrum to obtain a balance?

[3] Unemployment by Education Level

The message clearly displayed in the following table is if *you want to get a job, get an education*.

The New York Times reported (April 3, 2010) the following information on “The Labor Picture in March” with respect to education levels.

Educational Level	Unemployment Rate (March)
Less than High School	14.5%
High School	10.8%
Some College	8.2%
Bachelor’s or Higher	4.9%

Although the unemployment rates have increased since 2008, the ratios of *Bachelor’s or Higher* to the other categories have remained

approximately constant. (In 2008 the unemployment rate for those with a Bachelor's degree was 2.8%.)

Display this data in a bar chart and then draw a horizontal line across your bar chart representing the present unemployment rate for the country. Write a few sentences describing the message you would like readers to understand from your chart.

[4] Visibility Conditions

Visibility conditions are a factor in how fast one drives - you drive slower in a dense fog than you do on a clear, dry day. What is the relationship between posted speed limits and minimum visibility conditions? How does the minimum visibility requirement change as the posted speed limit increases? Is the rate of change linear or increasing or decreasing or ... ? Is the graph of the relation a straight line or is it concave up or concave down or some combination? Explain your reasoning.

Make a scatterplot of the following data and then fit a curve to the scatterplot. Does the graph confirm your earlier analysis? If not, explain the apparent contradiction with your reasoning.

MINIMUM VISIBILITY (ft) FOR POSTED SPEED LIMITS (mph)

Speed Limit (mph)	Minimum Visibility (ft)
20	175
25	215
30	270
35	325
40	390
45	460
50	540
55	625
60	715

Over what domain is your model valid? Explain your reasoning.

[5] Notices

1. Mathematics Invitational Conference held in conjunction with The Eleventh Annual West Point Diversity Leadership Conference, April 7-9, 2010, will be held at the U.S. Military Academy, West Point, NY. Contact LTC Donald Outing [donald.outing@usma.edu] for details.

2. The MAA's *MathFest* 2010 will be held in Pittsburgh, PA August 5-7, 2010.

3. Information on the MAA Professional Enhancement Program (PREP) for the summer of 2010 can be found at www.maa.org/prep.

4. The sixth edition of *Contemporary College Algebra: Data, Functions, Modeling* by Don Small is now available. Contact Kathy Kilburg (563-584-6322, Kathyj_Kilburg@mcgraw-hill.com) for an examination copy.

5. Past issues of the *Vision - Potential* Newsletter are available on our website: www/ContemporaryCollegeAlgebra.org

6. Deadline for contributions to the September Newsletter is September 1, 2010. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, announcements, etc. are welcomed.

7. To subscribe to this Newsletter, contact Don Small via e-mail at don-small@usma.edu.