

Vision - Potential

Vision Within Every Instructor – Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*

Number 40, March 2002

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[1] **An Urgent Call to Improve Traditional College Algebra Programs**

Traditional college algebra is *not working*. That was the strong consensus of the participants in a recent Conference to Improve College Algebra held at the U.S. Military Academy, February 7-10, 2002 and supported by the HBCU Consortium for College Algebra Reform. This assessment of traditional college algebra was made on the basis of (a) high FDW rates, (b) outdated and inappropriate content for other disciplines, society, and the workplace, (c) the small percentage of college algebra students that eventually take calculus I, and

* Supported by the National Science Foundation and the U.S. Military Academy.

(d) the effect of the course in turning students away from mathematics. One participant who is a Dean of Mathematics and Science said

Traditional college algebra is a boring, archaic, torturous course that does not help students solve problems or become better citizens. It turns off students and discourages them from seeking more mathematics learning.

The 2000 CBMS survey shows that college algebra has the largest enrollment of any credit bearing mathematics course. In fact, its enrollment is approximately equal to the combined enrollments in all calculus courses. However, fewer than 10% of the college algebra students ever take calculus I. In objecting to the content of traditional college algebra courses, Arnold Packer, Senior Fellow and Chair of the SCANS 2000 Center at Johns Hopkins University, Institute for Policy Studies, said

Interpreting data has become more important than manipulation of algebraic skills that can be computerized.

The vision espoused by the participants at the Conference is to create programs in which all students become confident problem solvers. These

programs are rooted in real-world problems that address the quantitative needs of other disciplines as well as those for citizenship and the workplace. They incorporate strong communication components and employ technology to enhance conceptual understanding and computing. These programs should empower and encourage students to take additional quantitative courses.

The participants recommended the following as major characteristics of an improved college algebra program:

- a. Real-world problem based: - topics are introduced through a real-world problem and then the mathematics necessary to solve the problem is developed. Example problem: Schedule a multi-faceted process.
- b. Modeling (transforming a real-world problem into mathematics): - using power and exponential functions, systems of equations, graphing, and recursive sequences - primary emphasis is placed on creation of a model and interpretation of the results. Example: Model the stopping time versus speed data presented in a driver's manual by plotting the data and fitting a curve to the plot. Interpret how well the resulting stopping time function models reality for slow speeds. Revise the model, if necessary, to account for zero stopping time at zero speed. Use the (revised) function to predict stopping times for speeds not given in the data. Revise the model to account for different road surfaces.
- c. Emphasize communication skills: as needed in society and the workplace as well as in academia - reading, writing, presenting, and listening. Example: Students learn how to read, understand, and critique news articles that include quantitative information and to make informed decisions based on the articles.

- d. Small group projects: involving inquiry and inference. Example: Analyze the soda preference of students by conducting a survey and comparing the results with data from their school's dining hall or a local fast food restaurant.
- e. Appropriate use of technology to enhance conceptual understanding, visualization, and inquiry as well as for computation. Example: "What-if" a model for paying off a credit card debt by changing the monthly payment, interest rate, size of debt, etc. Plot the results to visually compare the different scenarios.
- f. Student centered rather than teacher centered pedagogy: hands-on activities rather than all lecture.

Collaboration with faculty in other disciplines and with representatives from the workplace is important to the improvement of college algebra and in on-going assessments of the program. This collaboration helps ensure that content will better align with student needs which is often lacking in the traditional college algebra program. This collaboration also establishes bridges to other disciplines that enhance embedding quantitative literacy throughout the academic program.

In the final analysis, curricula and syllabi are local in nature, as is the means for implementing change. Thus, the task of everyone involved with college algebra is to engage colleagues, administrators, and local business people to improve the role of college algebra in our educational system and the effectiveness of the present programs.

The following members of the HBCU Consortium participated in the Conference: Della Bell (Texas Southern Univ.), Laurette Foster (Prairie View A&M Univ.), Joel Williams (Central Campus of the HCC System), Dorothy Hunter (Huston-Tillotson College), Sarah Bush (Wiley College), Alexander Fluellen (Clark Atlanta Univ.)

[2] Wiley College Receives NASA Grant

Congratulations to Sarah Bush! She is the Project Director of a \$300,000 NASA grant that was recently awarded to Wiley College. The College will use the three year grant to establish a Computer Based Mathematics Center, establish a Science Academy for Kids, and develop a technology course for education majors. This course will incorporate several aspects of the Contemporary College Algebra program. In particular, the course will emphasize the use of technology, small group projects, and real-world applications.

Sarah has been the driving force to integrate the use of technology into the mathematics program. She is responsible for securing mathematics software currently being used by students and faculty in Wiley's mathematics area. An expert with graphing calculators and calculator based laboratories, Sarah is often called upon to instruct in faculty development workshops. Last June, she co-directed a technology workshop for faculty in the Montana Tribal Colleges.

[3] "Quickies"

- a. A cylindrical juice container is four inches in diameter and one foot tall. If the empty cylinder is being filled at the rate of one quart per minute, how fast is the fluid level rising?
- b. (Suggested by Lyle Andersen, Montana State University) Suppose you are going to make a pup tent from a rectangular piece of canvas that measures 8.5 by 11-feet. Assume that the front and back ends are to be left open. How long should the front and back poles be in order to maximize the volume under the canvas?
- c. What is the largest area that can be contained inside a right triangle when the combined lengths of the two legs and hypotenuse is 100 feet?

**[4] "The Mathematics of Economics"
Interview with Dr. Carla Feldpausch-Siegle
Professor of Economics**

(This is part of an on-going sequence of interviews with faculty in partner disciplines discussing the role of college algebra in their disciplines. Ms Dorothy Hunter of Huston-Tillotson College conducted this interview.)

When asked for an interview, Dr. Carla Feldpausch-Siegle said that she welcomed the chance to discuss the integration of the disciplines in teaching College Algebra and Economics. She said that she was very impressed with the efforts of the College Algebra Reform project to use algebra to make mathematical models of economic situations.

Ms Hunter: Why is College Algebra required for majors in your discipline?

Dr. Siegle: Economic theory is a technical language that is expressed in mathematical form. It is important for students to be able to create mathematical models for economic theory. The use of algebra adds rigor to the understanding of the economic models.

Ms Hunter: How are skills obtained in College Algebra used in your discipline?

Dr. Siegle: Skills in working with percents, creating and interpreting graphs, understanding the effects of changes in slopes of lines, modeling economic situations using basic equations, solving equations, and solving systems of equations are used throughout courses in economics.

Ms Hunter: What do you expect students to know and be able to do after taking College Algebra?

Dr. Siegle: Students should develop the skills I mentioned in my previous answer. Mathematics is very useful in showing what happens when certain changes occur.

Ms Hunter: Thank you, Dr. Siegle.

Dr. Siegle: You are very welcome. I want to close by encouraging students not to be afraid of the subject matter of College Algebra or economics; rather

to begin and continue working on the problems. I believe the time spent will illuminate what is going on in economic situations that are being modeled in terms of College Algebra.

Dr. Siegle received her BA in Economics from the University of Texas at Austin and a PhD in Economics from American University in Washington, D.C. Dr. Siegle taught at American University where she was the Director of the Economic Policy Seminar Program for two years. She also taught at Southwestern University in Georgetown before coming to Huston-Tillotson College.

[5] **Interpreting Plots**

Pair the following four scenarios with the appropriate graph shape.

1. The Gross Domestic Product (GDP) is the sum of all the goods and services produced by the United States. The GDP is increasing and all the major economic indicators that forecast future economic activity are positive.
2. The GDP is increasing and the major economic indicators that forecast future economic activity are negative.
3. A graph of the temperature immediately above a burner of a gas stove that shows the effect of turning off a lighted burner.
4. A graph of the temperature graph immediately above a burner of an electric stove that shows the effect of turning off the burner.

[6] **Notices**

1. The fourth edition of *Contemporary College Algebra* by Don Small is now available (ISBN: 0-07-256439-3). Examination copies may be obtained by contacting the McGraw-Hill Publishing Co (1-800-338-3987).
2. Persons interested in hosting or attending a dissemination workshop for the Contemporary College Algebra program should contact Don Small, Dept. of Math. Sciences, U.S. Military Academy, West Point, NY 10996 [don-small@usma.edu]
3. The next issue of the *Vision - Potential* Newsletter will appear in April 2002. The Deadline for contributions to the April Newsletter is Monday, April 8, 2002.
Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Queries, CBL activities, announcements, and so on are welcomed. Please send material to Dr. Della Bell, Chair, Department of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.
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