

Vision - Potential

Vision Within Every Instructor – Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium

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[1] **Our Vision**
Della Bell
Texas Southern University

Greetings. Welcome to the First Edition of the *Newsletter of the HBCU College Algebra Reform Project*. We approach the twenty-first century with several visions, many of which can become a reality through our efforts to “reform” College Algebra. Among our visions are:

1. **Students** “empowered” with the necessary mathematical knowledge, confidence, and skills, enabling them to continue in more advance mathematics or quantitatively based courses, to get degrees in these areas, and to be successful in mathematics – dependent careers;
- 2.) A **curriculum** that changes from one of symbolic manipulation, skill building and emphasis on mechanics, and memorization of algebraic techniques to one that emphasizes variables and functions, mathematical models and representations, data based interdisciplinary applications that are relevant and meaningful, and more and better use of technology;
3. **Energized and enthusiastic teachers with high expectations**, who are using multiple approaches, teaching and learning with technology, accomplishing learning objectives using exercises, small group activities, and projects connecting mathematical ideas within the discipline and across disciplines, using a variety of assessment methods, and discussing issues, questions, and ideas with colleagues;
4. **Students** who are actively involved in learning algebra through individual and group activities which involve mathematical modeling, who are solving problems arising from a variety of disciplines, and using computers

and calculators to generate numerical examples, graph data points, and, conjecture and reason about mathematics;

5. Small class sizes.

The participants of the Historically Black Colleges and Universities (HBCU) College Algebra Reform Consortium are working to ensure that these visions become reality. Our goals will be facilitated through Retreats focused on certain objectives, the Consortium Newsletter, Interdisciplinary Lively Application Projects (ILAPs), attending workshops, interacting with others within mathematics as well as in other disciplines, and forever learning.

We recognize the need for support and participation of students, our mathematics department colleagues, colleagues from other disciplines, and the administrations of our respective schools. We will actively seek the support of these various entities. As a result of our collective efforts, we will “change the culture” surrounding the College Algebra course.

We have begun and we forge ahead to make our visions a reality. “For God has not given us the spirit of fear, but of power, and love, and of a sound mind.” (2 Timothy, 1:7)

[2] A Window of Golden Opportunity – HBCUs College Algebra Project

Jackie Giles
HCCS Central College

Education is a process that empowers individuals to access information for the attainment of personal, economic, and spiritual goals. The joy of understanding the world in which we live is enabled by our ability to represent and process information. Who is educated depends on where we are, our experiences, the situations in which we are naturally positioned, and the conditions over which we seek to control, manage, and tweek (change or perturb) to improve our lives.

Our society is technological. The opportunity to become a full and participatory citizen who takes responsibility for personal growth in this dynamic, changing world is aided by an improvement of mathematical thinking which underlies technological, scientific, economic, and social phenomena. College algebra serves as the first gateway, while calculus serves as another at a different level. The merit and benefit of calculus reform and other reform movements have not impacted the communities which are naturally diverse. The stratification of educational populations requires a well-thought out and well-partitioned strategy to provide intervention and inspiration for new curricula. This is why we need the HBCU Consortium for Texas and Louisiana.

My participation in the (Wiley College) HBCU College Algebra Retreat provided experiences I needed to accelerate the restoration of my hope and belief in the potential of American education. The strategic plan to organize HBCUs in Texas and Louisiana is timely and appropriate for a student population comprised of sincere, gifted, and dedicated students and faculty who want to become more active in every echelon of American life.

The achievements of HBCUs have been outstanding. The acceleration of achievement in information dissemination, technology, and networking is at a rate that makes the pace of some institutions appear to be falling behind. The truth is our HBCUs are excellent, but the hidden constraints, challenges, and even hinderences are cleverly veiled and insidious. So, what can we do?

The Retreat inspired me in many ways. My experiences with the Consortium were rich and clear. The friendly and enthusiastic involvement of the experienced and outstanding educators in the Consortium will spur change in how we view ourselves and our students. For example, Laurette Foster’s definitive presentation on the CBL and TI-82, applied to curve fitting of data from the real-world, was exemplary of the spirit of reform.

I learned that we will be using the computer, CBLs, TI-82, 83, 92, and other technological tools

to inspire symbolic, graphical, and verbal communication. Interdisciplinary applications will season our curricula and whet the appetite of our students.

We will continue to bind ourselves together and move in synergism. We will continue to identify and support the marvelous talented professors such as those who made presentations at the Retreat (Della Bell, Sarah Bush, Laurette Foster, Jackie Giles, General Marshall, Don Small, Eugene Taylor, and Lawrence Woodard).

Eugene Taylor, of Grambling State University, shared his views on the use of writing in college algebra and showed the work of his students. His presentation demonstrated how teacher preparation and attitude can create a comfortable and inspiring climate for learning. The compassion and radiance that permeates the climates of institutions of which Eugene and others are a part is precisely the collection of attributes we stress in the pedagogy of calculus and algebra reform.

I learned that we will continue to e-mail, fax, and telephone each other to share ideas on what works best for our students. We will thrust forward with more instructional power because we are wrapped and bonded together for the common good of all students. Our clarity, explicitness, rigor, and deep understanding will be shared with students who are naturally positioned before us in our classrooms at the Consortium schools. If we rise to the occasion of excellent educational service to our communities, we will reduce the decaying elements of affirmative action and other unstable designs for creating access to excellence and equality.

Our collective expertise, dedication, and vision will be the true “window of golden opportunity” for all students from diverse cultural and racial communities. Once the window is opened, the bright and golden sunshine of academic achievement will offer opportunities for those students to capture the American dream of freedom, hope, and prosperity.

[3] **TSU’s Report to the Department
Graphing the “Happy Face”
Using a TI-82 Graphing Calculator
Maurice Ekwo and Michael Udofia
Texas Southern Univefsity**

This report describes a follow-up activity from the HBCU College Algebra Retreat held at Wiley College. The Retreat participants from Texas Southern University made a presentation to their department faculty and along with some of their mathematics students. Maurice Ekwo and Michael Udofia presented the topic on “Graphing the Happy Face Using a TI-82 Graphing Calculator.” This topic was selected and presented by the participants from TSU as a small group activity during the Retreat. Tong Wu also demonstrated the use of the Calculator Based Laboratory (CBL) in the collection of datapoints and in graphing the exponential regression curve to represent the “Cooling Equation” during the presentation at TSU.

The graphing activity involving the Happy Face had as its objectives

1. Assist students in distinguishing between graphs of relations representing functions and relations which do not represent functions;
2. Assist students in developing skills in graphing;
3. Assist students in transferring graphing skills obtained in a mathematics course to other courses in which graphing skills are needed.

Activities involved in the implementation were as follows

1. Draw a Happy Face by hand;
2. Determine the numbers and types of functions required to draw a Happy Face;
3. Graph the functions to produce the Happy Face.

The following seven functions were used to graph the face with the two eyes and the mouth.

$$y_1 = \sqrt{r^2 - x^2}, y_2 = -\sqrt{r^2 - x^2}$$

$$y_3 = k + \sqrt{r_1^2 - (x - h)^2}, y_4 = k - \sqrt{r_1^2 - (x - h)^2}$$

$$y_5 = -k + \sqrt{r_2^2 - (x + h)^2}, y_6 = -k - \sqrt{r_2^2 - (x + h)^2}$$

$$y_7 = -c - \sqrt{h - k^2}$$

where $r_1 = r_2$ (radius of the eye)

h = horizontal shift and k = vertical shift
(center of the eye)

c = vertical shift for the mouth.

In addition to the above functions, four lines with points, $L_i : (X_{1i}, Y_{1i}, X_{2i}, Y_{2i})$ for $i = 1, 2, 3, 4$ were produced using the DRAW MENU to get the nose.

The window used was: Xmin = -7, Xmax = 7, Xscl = 1, Ymin = -7, Ymax = 7, Yscl = 1.

The coordinates selected for the above functions were as follows

$$r = 5, h = 2, k = 2, r_1 = r_2 = 1, c = 3$$

$$L_1 : (0, 1, 1, -3), L_2 : (0, 1, -1, -3),$$

$$L_3 : (-1, -3, 0, -2.5), L_4 : (0, -2.5, 1, -3)$$

[4] Quick Question

Jeb invites four friends to celebrate his birthday and share his birthday cake. After Jeb blows out the candles on his cake, a lively discussion erupts as to how to fairly divide the cake (so everyone gets the same amount). The discussion is interrupted

when one says that she will take $1/5$ of the cake and a second person quickly claims $1/4$ of what is left. A third person then demands $1/3$ of the cake that is left. This leaves Jeb and the remaining friend to split the remains of the cake. Is this a fair decision? Explain why or why not.

[5] 10 Minute Writing Topic

Write a 10 minute essay on the topic "My Favorite Number." Describe the characteristics of your favorite number (e.g., even, odd, prime) and why they are appealing to you.

[6] Activity: Doubling on a Checkerboard

(This is a small group in-class activity that involves working with large numbers, converting from one measurement system to another, and is calculator intensive. Several calculator results will use scientific notation. Each group of students should have at least one calculator)

Consider an 8 by 8 checkerboard with the blocks numbered 1 through 64. Mentally place 2 pennies on the first block, 4 on the second block, eight on the third block, and so on doubling the number of pennies as you move from one block to the next. The last block will have 2^{64} pennies. Answer the following questions

1. Guess the height of the stack of pennies on the 64th block. Would the stack be taller than the tallest member of your group? Taller than the height of the room? Taller than the building you are in? Taller than the campus flag pole?
2. Measure a stack of pennies to determine the thickness of a single penny. If all the pennies on the 64th block were placed in one stack, what would be the height of the stack? Give your answer in feet and in miles. (There are 5,280 feet in a mile.)
3. Compare the height of the stack of pennies in question 2 to the distance to the moon

(approx. 248,560 miles), to the sun (approx. 93,210,000 miles), and to Proxima Centura (approx. 4 light years), the closest star to Earth. (Light travels approx. 186,000 mi/sec.)

4. How much money in terms of dollars is on the 64th block?
5. How much money in terms of dollars is on the 63rd block?

[7] Project: Lawrence's Bouncing Tennis Ball Revisited

During our September 1996 Retreat at Wiley College, Lawrence Woodard had us all involved in an excellent small group project determining how high a tennis ball would bounce when dropped from a given height. Each group taped a meter stick to the wall, dropped a tennis ball and measured how high it bounced. This experiment was repeated several times, data points on height dropped versus height bounced were plotted, and a "line of best fit" was determined using the TI-82 calculator. Additional drop and bounce heights were then measured and compared to the predicted results from the "line of best fit." We now offer two extensions to this project.

The first extension is to develop a distance function whose input (independent variable) is the height of the dropped ball and whose output (dependent variable) is the distance the ball travels before stopping.

The second extension is to repeat Lawrence's project using a stop watch to record the time elapsed between the release of the ball and when it reaches the top of its first bounce. Generate several data points of height dropped versus time elapsed, plot the points, and determine a "line of best fit." Compare additional height drop – time elapse data points with the predicted results from the "line of best fit."

An extension to the second extension is to develop a time function whose input (independent

variable) is the height of the dropped ball and whose output (dependent variable) is the time elapsed until the ball stops bouncing.

Query: how do you tell when the ball stops bouncing?

[8] Thanks

1. Thanks to the Exxon Education Foundation for providing "start-up" funds to the HBCU College Algebra Reform Consortium. Mr. Bob Witte is the Program Officer who arranged for our funding.
2. Thanks to Texas Instruments Corporation for donating a CBL unit to each Consortium school and a view screen and calculators for our Retreat. Mr. Nathan Dodge arranged for these donations.

[9] Notes

1. Deadline for contributions to our November Newsletter is Wednesday, November 13, 1996. Opinion articles, suggestions for writing assignments, small group in-class activities, small group out of class projects, Quick Questions, CBL activities, announcements, etc. are all welcomed. Please send material to Della Bell, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.
2. Joint Mathematics Meetings in San Diego, 7-11 January 1997. Particular sessions of interest:
 - a. Thursday, 7-8:30 PM: Calculus Reform Workshop Participants Reunion;
 - b. Friday morning: HBCU College Algebra Reform Local Coordinators meeting;

- c. Friday 7-9:00 PM *CRAFTY* Panel on College Algebra Reform (Panelists: Della Bell, President Hicks(Grambling State Univ.), Linda Kime, Benny Evans; Moderator Don Small);
- d. Saturday morning: NAM panel on Calculus Reform (Panelists: Della Bell, Lawrence Woodard, Don Small; Moderator Jackie Giles).