

# *Vision - Potential*

*Vision Within Every Instructor – Potential Within Every Student*

Newsletter of the HBCU College Algebra Reform Consortium\*

Number 11, February 1998

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### **[1] The Second HBCU College Algebra Reform Consortium Local Coordinators' Meeting**

**Della Bell  
Texas Southern University**

The Second HBCU College Algebra Consortium Local Coordinators' Meeting was held Friday, January 9, 1998 in the Douglas Room, Hyatt Hotel, Baltimore, Maryland. The meeting was held in conjunction with the Annual Combined Winter Meetings of the National Mathematical Associations and Societies. Individuals present included Eugene Taylor (Grambling State Univ.), Jackie Giles (Houston Community College Central Campus), General Marshall (Houston-Tillotson College), Laurette Foster (Prairie View A & M Univ.), Della Bell, Tong Wu, Victor Obot (Texas Southern Univ.), Sarah

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Bush (Wiley College), Bill Echols (Houston Community College Northwest Campus), and Don Small (U.S. Military Academy). Mr. Bob Witte, Senior Program Officer of the EXXON Education Foundation, Irving, Texas also attended a portion of the meeting.

Agenda items for the meeting included the following (1) announcement concerning the National Science Foundation Grant received by the Consortium, and implications for future plans; (2) reports from the Local Coordinators on college algebra reform activities implemented during the Fall semester; (3) discussion of "Fun Projects" implemented during the Fall semester; (4) review of proposed textbook material for Chapter One; (5) presentation of Evaluation report by Bill Echols; (6) presentation of plaques of recognition and appreciation to Dr. Don Small and Mr. Bob Witte; and (7) discussion of future plans.

While at the MAA meeting, Local Coordinators participated in several sessions. Laurette Foster was one of the presenters at the Interdisciplinary Lively Applications Project (ILAP) Minicourse. Laurette Foster, Sarah Bush, and Eugene Taylor were presenters at the Calculus Reform Workshop Participants Reunion coordinated by Don Small. Della Bell and Tong Wu participated in a Poster Session. The Poster Session involved a display of a Calen-

dar of Events of the HBCU College Algebra Reform Consortium, features or themes of the College Algebra Reform, sample ILAPs, student projects, and copies of the *Potential - Vision* Newsletter. Jackie Giles, member of the Board of Directors of the National Association of Mathematicians (NAM), and Associate Editor of the NAM Newsletter, participated in various NAM activities and in various MAA subcommittee meetings. In addition, Local Coordinators visited the various exhibition booths and attended other sessions.

## [2] Writing In The Mathematics Curriculum

**Eugene J. Taylor**  
**Grambling State University, LA**

I wish to show by answering several questions why writing is important in teaching mathematics. The answers I give to these questions serve as my justification for giving writing assignments in my mathematics classes.

### I. How Did I Get Started?

I attended the Calculus Reform Workshop hosted by Texas Southern University during the summer of 1995. Dr. Don Small and Dr. Willie Taylor were instructors. Dr. Della Bell was the coordinator. During the workshop the use of computers, calculators, writing, and group projects were stressed. After the workshop I wanted to come back to my institution and apply some of these activities immediately. I found that I could use writing instantly. So I immediately included writing assignments in my algebra, calculus, and trigonometry classes.

### II. Is Writing a Type of Technology?

If we view technology as machinery such as computers and calculators then the answer is no. If we view technology broadly as any type of reform in the curriculum then the answer is yes. I view writing as a reform technique in the broad area of mathematics reform. So including writing questions on quizzes, tests, homework assignments, and exams then would qualify writing as a kind of technology.

### III. Is Writing a New Concept?

The answer is no. But making writing an essential part of our exams and homework assignments does create a new way of teaching and testing. That is, it is very essential that students respond to phrases like: Explain, Justify, Write a Paragraph, as opposed to doing only computation.

IV. Do Writing Questions Require More Time of the Instructor? Not always. To construct a good writing question requires no more time than to construct a good computational problem. However, grading a writing question might require a little more time. But it is worth it if it increases the students' understanding of the concepts.

### V. How Do I Grade a Writing Question?

This may vary. To grade a writing problem may require making written comments rather than just marking the answer right or wrong. For example, let  $f(x)=3x-1$ . Find  $f'(x)$ . The answer is  $f'(x)=3$ . But, if  $f(x)=3x-1$  and the question or problem is explain how to find  $f'(x)$ , then the answer is a written statement or statements.

When we give questions or problems that require students to explain a concept or process or justify an answer in writing, we are better able to understand their thinking process and respond to any misunderstandings. In conclusion, three advantages and one disadvantage (which is also really an advantage) may be observed.

By reading their written remarks we can see where their thinking is off and better serve the students in terms of correcting wrongful thinking.

### The Advantages of Writing

- a. By having students explain, justify, or express the meaning of statements in writing, teachers are able to understand the students' thinking.
- b. Writing Questions cause students to THINK rather than give quick responses like  $2+2=4$ .
- c. Writing develops students' communication skills. Since we all are in different professions and

have to communicate, we need to be able to express what we know not only orally but in a written manner.

### Disadvantage of Writing

The only disadvantage is that it requires more time for us as teachers to grade a Writing Question. But this is actually an advantage, since we pay more attention to reasoning details and thus focus more on the student's analytical growth.

## [3] Small Group Activity: Recursive Sequences

**General G. Marshall**

**Huston-Tillotson College, TX**

The Fibonacci sequence is a sequence of positive integers named for an Italian mathematician, Leonardo Fibonacci (1175-1250). His study of rabbits and their reproduction led him to discover the pattern 1, 1, 2, 3, 5, 8, 13, ... in which the third number is the sum of the first two and thereafter each term is the sum of the two previous terms. Let us assume that a pair of baby rabbits is too young to reproduce their first month, but produces a pair of baby rabbits every month thereafter. Each new pair of rabbits will follow the same rule for reproduction. The resulting pairs of rabbits for the first five months are 1, 1, 2, 3, and 5. If the birthrate pattern continues, then the Fibonacci numbers are generated (Bennett & Nelson, 1989).

Computer science students have generated the Fibonacci sequence using the recursive formula  $F_n = F_{n-1} + F_{n-2}$  with  $n > 2$ . The sequence also occurs in nature with daisies, sunflowers, cones, and pineapples (Bennett & Nelson, 1998). Given the problem set below, try to discover additional properties of the Fibonacci sequence. Some of the problems are taken from a textbook for elementary mathematics teachers (Musser & Burger, 1997).

### Problems

1. Write out the first fifteen terms of the Fibonacci sequence.

- a) Notice that the third term of the sequence (called  $F_3$ ) is even:  $F_3 = 2$ . The fifth term (called  $F_5$ ) is odd:  $F_5 = 5$ . Look for a pattern in the terms of the sequences and describe which terms are even and which terms are odd;
- b) Which of the following terms of the Fibonacci sequence are even and which terms are odd?

$$F_{38}, F_{54}, F_{150}, F_{300}$$

- c) Look for a pattern in the terms of the sequence and describe which terms are multiples of 3.
- d) Which of the following terms are multiples of 3:

$$F_{45}, F_{72}, F_{196}, F_{379}, F_{1000}$$

2. Observe the following pattern:

$$\begin{aligned} 1 + 3 &= 5 - 1 \\ 1 + 3 + 8 &= 13 - 1 \\ 1 + 3 + 8 + 21 &= 34 - 1 \end{aligned}$$

Use the pattern you observed to predict the answer to

$$1 + 3 + 8 + 21 + \dots + 377$$

3. Observe the following pattern:

$$\begin{aligned} 1^2 + 1^2 &= 1 * 2 \\ 1^2 + 1^2 + 2^2 &= 2 * 3 \\ 1^2 + 1^2 + 2^2 + 3^2 &= 3 * 5 \end{aligned}$$

Use the pattern you observed to predict the sum as a product

$$1^2 + 1^2 + 2^2 + \dots + 144^2$$

without actually computing the sum.

4. Observe the pattern:

$$\begin{aligned} 1 + 2 &= 3 \\ 1 + 2 + 5 &= 8 \\ 1 + 2 + 5 + 13 &= 21 \end{aligned}$$

Use the pattern you observed to predict the sum

$$1 + 2 + 5 + 13 + \dots + 610$$

without actually computing the sum. Use your calculator to check your result.

5. Use the principle of **Mathematical Induction** to prove the following property for terms of the Fibonacci sequence with  $n \geq 3$  (Pederson, 1993).

$$F_{n+1}F_{n+2} - F_nF_{n+3} = (-1)^n$$

6. Examine Pascal's Triangle carefully, and find the Fibonacci numbers:

This is a 10-15 minute small group, in class activity. Each group should have at least one calculator. At the end of the time period, the instructor calls on different groups to present their work and explain their reasoning. At the end of the session, the instructor can invite students to bring to class other problems based on information taken from the Web.

The following data was down-loaded from the web (<http://www.census.gov/cgi-bin/popclock>)

### POPClock Projection

According to the U.S. Bureau of the Census, the resident population of the United States, projected to 2/2/98 at 12:46:26 PM EST is **269,087,468**

### Component Settings

One birth every	. . .	8 seconds
One death every	. . .	12 seconds
One international migrant (net) every	. . .	39 seconds
One Federal U.S.citizen (net) returning every	. . .	4473 second
Net gain of one person every	. . .	15 seconds

Questions:

1. Is the final entry (Net gain of one person every 17 seconds) consistent with the other Component Settings? Justify your answer.
2. In the January issue of this Newsletter, the Class Activity article on the "1998 U.S. Population" stated that "the Census Bureau projected (on December 28, 1997) the U.S. population would be 268,921,733 on January 1, 1998." Is this projection consistent with the above Web information? Justify your answer.
3. Assuming that the population on January 1, 1998 was 268,921,733 and that the rate of increase of one person every 17 seconds holds for the entire year, what will the population be at the start of January 1, 1999? Justify your answer.

### References:

Bennett, A.B., Jr. & Nelson, L.T. (1998) Mathematics for Elementary Teachers: A Conceptual Approach, 4<sup>th</sup> ed. Boston: McGraw Hill.

Musser, G. & Burger, W. (1997). Mathematics for Elementary Teachers: A Contemporary Approach. 4<sup>th</sup> ed. Upper Saddle River. Prentice Hall

Pederson, F.D. (1993). Modern Algebra: A Conceptual Approach. Bubuque: Wm.C. Brown

[4] **Class Activity: Population Growth**

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## Notices

The Deadline for contributions to our March Newsletter is Friday, March 6, 1998.

Please send material to Dr. Della Bell, Chair, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.

ILAP Workshop at Wiley College, 19-21 Feb. '98. Sarah Bush is the Local Host and Don Small is the Instructor.