Vision - Potential

Vision Within Every Instructor – Potential Within Every Student

Newsletter of the HBCU College Algebra Reform Consortium*

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[1] The Second Annual Retreat of the Historically Black Colleges andUniversities Consortium for College Algebra Reform

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The Second Annual Retreat of the Historically Black Colleges and Universities (HBCU) Consortium for College Algebra Reform was held October 2-4, 1997 at Wiley College, Marshall, Texas. The focus of the retreat was the development and use of small group projects as a "stepping stone" to interdisciplinary cooperation through ILAPs (Interdisciplinary Lively Application Projects).The small group projects implemented and discussed were: (1) "Stacking Pennies or the BIG Box of Beans" project led by Della Bell; (2) the "Homecoming Parade" project, a version of the "Decked Out" ILAP, led by Laurette Foster; (3) "Measuring Heights" activities led by General Marshall; (4) a "Projected Sales" project involving calculating percent of increase and decrease using features of the TI-82 and TI-83 Graphing Calculators, led by Sarah Bush; and (5) the "Walking the Plank" project led by Don Small. All participants were involved in each of the projects. Mrs. Jackie Giles made a presentation on Student Growth.

Other activities on the agenda included a discussion of the "Survey of the College Algebra Requirements" conducted on each of the campuses, and a presentation on the Use of Mathematical Modeling in predicting costs of goods and services in the Food Service industry.

Mr. William Echols, project evaluator, presented findings from surveys of faculty and students involved in the HBCU College Algebra Reform Project. The HBCU faculty survey was conducted September 28, 1996; the HBCU Coordinators' survey was conducted January 10, 1997; and the student survey was conducted during the spring semester, 1997. Mr. Echols also conducted another

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survey of the faculty attending the Second Annual Retreat.

Retreat participants included Jacqueline Giles, Herbert Hamilton, and Joel Williams from Houston Community College Central Campus; Dorothy Hunter, Maryam Fatehi, and General Marshall from Huston-Tillotson College; Laurette Foster and Tommie Hill-Nater from Prairie View A&M University; Rosia Edwards, Texas College; Della Bell, Maurice Ekwo, and Carrington Stewart from Texas Southern University; Sarah Bush, Wiley College; William Echols, Houston Community College System Northwest Campus; Don Small, U.S. Military Academy, West Point, New York; and Janis Harland, A.A. McCardell Academy, Pleasant Grove Missionary Baptist Church, Houston, Texas.

The Retreat was a very worthwhile and positive experience. The activities moved participants a step closer in the direction of reforming the College Algebra Course.

[2] Course Goals, Syllabus, Assessment, and Accountability

The most important aspect of preparing a course is to create course goals and then use the goals to inform the syllabus and to determine the methods of assessment. Many times there appears to be a disconnect between stated goals and the course syllabus or between the goals and the assessment. The purpose of this editorial is to encourage establishing, using, and being accountable to course goals.

Every course is constrained by factors over which the instructor has no or only partial control. For example, the course may be a prerequisite to another and thus the following course dictates a portion of the content. When several instructors are teaching the same course, there is a constraint for the instructors to work cooperatively. This usually means that each one gives up a certain amount of freedom for the sake of presenting a "uniform" course. The size of the class and the number of class meetings are constraints as is the preparation of the students. State, regional, and national tests that students must take constrains an instructor's choice of material and possibly the pedagogy. A starting point in establishing goals is to understand the constraints and the level of influence we have in modifying the situation(s). Our time and energies are finite, let us focus on the possible.

Understanding the purpose and preparation of our students, i.e., where they are coming from and where they are headed, is important in establishing course goals. The category of "where they are headed" not only includes their following courses, but also post graduation. How do we prepare students for the world they will enter after graduation? For example, a large and growing number of employers include on their list of employee prerequisites the ability to work in small groups, to communicate, and to use technology. Should our courses address these issues?

We need to be realistic in developing course goals. In particular, we need to be aware of the educating, training, and certifying aspects of a course. Although ideally we might wish to concentrate solely on the educating aspect of helping our students prepare to solve unknown problems of the future, reality says that a certain amount of training in the sense of drill work is necessary to develop computational skills and self-confidence. We also need to realize that certification is part of every course whether in terms of student transcripts, follow-on courses, or state and national exams. The question is thus one of balance between these three aspects.

Syllabus

Our attitude and emphasis are crucial in conveying course goals to students. The instructor who engages students on a weekly basis with applied problems based on newspaper or magazine articles or happenings in the neighborhood underscores the importance of the goal of relevance in the students' minds. In a similar fashion if communication is a course goal, then students need to be asked to write and present on a weekly basis. An-

other example is small group work. For students to understand that working in small groups is an important goal of the course, frequent opportunities for small group work need to be provided. Yes, all of this takes time! And Yes, all syllabi are already over crowded. How do we make time for students to collect data, make presentations, work in groups, and so on?

The answer lies in using the statement of course goals to inform the syllabus. Too often I allow my syllabus to become over crowded with content that is not necessary or even germane to the course goals. ("Old habits linger on through the best of intentions.") Implementing reform requires acceptance of the fact that course goals have a time priority in the syllabus.

My suggestion is that in forming our syllabi we *begin* by explicitly scheduling time for the items in our list of course goals (e.g., out-of-class group projects, use of technology). We then schedule an "Honesty Day" each month. These are classes when we let our "formal hair" down and talk with the students about what is going on, what the large picture is, and what the most important three ideas are so far in the course. No new work is scheduled for these days. Students are expected to actively participate in the Honesty Days. For example, a student could be given five minutes to explain the most important idea that has been taken up in the course to that point. The objective is to help students gain a sense of the large picture and to put daily homework exercises into perspective.

A trap that many of us fall into is spending class time redoing the assigned lesson. By expecting and insisting that students prepare lessons before coming to class, time is freed up for things like small group projects, student presentations, Honesty Days, and so on. It is very difficult for most students to be able to prepare the lesson on their own and thus we need to help them learn how to do it (there goes more class time). Four suggestions are: 1) reduce the amount of drill homework to allow more time to be spent on preparing the lesson; 2) assign questions that refer explicitly to a portion of the assigned reading; 3) require students to write their questions on the board at the beginning of class (showing what they were able to do); 4) occasionally take class time to discuss lesson preparation (share our experiences).

When all the above is done, there is still probably far more content that we would like to cover than time allows. How should we wield the ax? I suggest meeting with colleagues, both in mathematics and in the follow on courses in other disciplines, to discuss the importance of the "excess" content. A discussion focused on the applicability of the material in follow on courses, comparison with content that is already included in the syllabus, and the importance of the material for student life after graduation, will usually resolve the excess content issues.

Assessment

Our course goals should provide the basis of our assessment. Students value what is graded and often times, do not value what is not graded. Thus we need to include written essays on our tests, insert columns for group projects, class activities, and use of technology in our grade sheets, and so on. Students should understand that grades on group quizzes, lesson preparation, term papers, and so on will be incorporated into the final course grade. The practice of determining course grades based on three hour tests and a final exam needs to give way to grading over a broad spectrum of student activities. What portion of the grade is determined by the hour tests and final exam is an open question. I suggest the amount be 50%.

Accountability

How can we keep ourselves honest with respect to honoring our course goals? Publication of our goals to our students and colleagues will help. (For political as well as academic and pedagogical reasons, we should share our goals with our Chairs at the beginning of the semester.) We could ask a colleague to critique our hour tests and final exam with respect to our goal statement. We could also

show a colleague our grade sheet and ask the person to describe what he/she thinks our course goals are based on our grade sheet. A final suggestion is to ask our students what they think our course goals are or, at the end of the course, give the students (another) copy of our goal statement and ask them to grade the course on addressing the goals.

In my experience, receiving the critiques resulting from the assisnment in the preceding paragraph have been a humbling and, in the short term, discouraging experience. However, such critiques underscore for me the importance and difficulty of setting and implementing course goals. No one claims the task is easy. Confucius probably once said that *The importance of a task is directly proportional to the difficulty in achieving it.*

[3] Questions from NY Regents Exam

In September 1997, the Times Herald RECORD reported "In October 1995, the Board of Regents established the requirement that all students in New York State pass the Regents' exam as a condition for high school graduation." The following questions were taken from a pilot Regents math test.

a. For what values of x will 8 and x have the same average (mean) as 27 and 5?

b. There are 12 tomato plants in a garden. Each plant has 7 branches and each branch has 4 tomatoes growing on it. If one-third of the tomatoes are picked, how many tomatoes were picked?

c. Laura goes shopping. She spends one-fourth of her money on a pair of shorts, and one-third on a belt. If Laura has $42 left after these two purchases, how much money did she have when she started shopping?

d. The tailgate of a truck is 2 feet above the ground. The incline of a ramp used for loading the truck is 11 degrees. Find, to the nearest tenth of a foot, the length of the ramp.

[4] Two College Algebra Activities

The purpose of these in-class activities is to help students become aware of everyday activities that we model with (mathematical) functions. For example, how fast a cool can of soda warms when sitting on a table is dependent on (i.e., is a function of) the temperature of the room.

Activity I: Students are divided into groups (3-5 students/group) and challenged to describe as many "everyday" situations that can be modeled by a mathematical function. The students should describe the domain and range as well as the relationship between the independent and dependent variable for each of their functions.

If the students need help getting started, suggest that they think of some *cause-effect* relationships. (Is there a cause-effect relationship between how well one plays a piano and the amount of time they practice?)

After the groups have had time to compile their list of functions, ask each group to share one example with the rest of the class. When presenting a function, a group should describe the domain and range as well as the relationship between the independent and dependent variable.

Activity II. Students are divided into groups (3-5 students/group) and challenged to answer the following questions. A man's six grandsons have challenged him to a seesaw contest. The kids claim that they can keep Grampa "up in the air" if they all sit on one side of a seesaw and Grampa sits on the other side. In order to be fair, the kids let Grampa determine where they sit. The respective weights of the kids are 30, 40, 50, 60, 70, 80 pounds. Grampa, who weighs 175 pounds, selects a 12 foot seesaw with the fulcrum at the center point and places the kids one foot apart. The lightest grandson sits one foot from the fulcrum, the second lightest two feet from the fulcrum, and so on with the heaviest sitting six feet from the fulcrum. Grampa then sits at the far end of the other side of the seesaw. Is Grampa up in the air? Explain your reasoning.

Repeat the previous question with a seesaw 16 feet long and the kids placed as in the previous setting. Is Grampa up in the air? Explain.

[4] Oh No!

Is 2 really equal to 1? Have teachers been misleading students for hundreds of years? Have we been misled? Are we misleading our students? Is there a flaw in the following argument?
Let $a = b$, then

a	$=$	a	
a^2	$=$	ba	multiply by a
$a^2 - b^2$	$=$	$ba - b^2$	subst. ba for a^2
$(a-b)(a+b)$	$=$	$b(a-b)$	factor
$a+b$	$=$	b	divide by $a-b$
$b+b$	$=$	b	subst. b for a
$2b$	$=$	b	
2	$=$	1	

A consequence of the preceding argument is that every integer is equal to one.

Theorem. If n is an integer, then $n = 1$.
Proof. We illustrate the proof for $n = 3$.

$$\begin{aligned} 3 &= 2+1 \\ &= 1+1 (\text{because } 2=1) \\ &= 2 \\ &= 1 \end{aligned}$$

[5] Writing Assignment

Some people mistakenly use the terms:

function, equation, expression

interchangeably. The purpose of this assignment, in addition to the writing, is to get students to think about the differences between these terms.

Assignment

Write a one page essay on the meanings and differences of the three terms. Include examples to illustrate your understanding. Conclude your essay by stating and explaining your answer to the following question

Is a matrix a function?

If your answer is yes, describe the domain and range of the matrix function.

Matrices can be used in solving systems of equations. A system is expressed as a matrix equation and then solved using matrix algebra. Is the coefficient matrix in the matrix equation of a system of equations a function?

[6] Notices

• The Joint Mathematics Meetings will be held in Baltimore, Maryland January 7-10, 1998.

a. Professor Laurette Foster, Prairie View A&M University will co-lead MAA Minicourse #2 "Interdisciplinary Lively Applications." The course meets Friday 8:00-10:00 AM and Saturday 3:15-5:15 PM.

b. The Reunion for participants in past Calculus Reform Workshops will be held Thursday evening 7:00-9:00 PM. Everyone who has attended a Calculus Reform Workshop is invited to attend and bring along a friend. Anyone who would like to give a 10-15 presentation on what they have done as a result of attending a Calculus Reform Workshop is urged to send a short abstract to Don Small, Dept. of Math. Sciences, U.S. Military Academy, West Point, NY 10996 (email ad5712@exmail.usma.edu)

• The Deadline for contributions to our November Newsletter is

Friday, November 14, 1997.

Opinion articles, suggestions for writing assignments, small group in-class activities, small group out-of-class projects, Quick Questions, CBL activities, announcements, and so on are all welcomed. Please send material to Dr. Della Bell, Chair, Dept. of Mathematics, Texas Southern University, 3100 Cleburne St., Houston, TX 77004.