Sinclair Mathnet

February 2005 Volume 11, Issue 3

FROM THE CHAIR

In the last two *Mathnets* I discussed the difference between an education and a product and between a student and a customer. I defined education as a process in which a student changes himself in the state of his knowledge and understanding by studying. I suggested that studying to change the state of his knowledge requires the student to read, listen, observe, experiment and think. This implies that the teacher's role is to give direction as to what to read, what to listen to, what to observe and what to think about, and to provide original material, translations, interpretations or synopses of the material of others and to guide students through experimental procedures. In this article I promised to address the development of understanding aspect of acquiring an education.

Development of understanding is the more difficult and more important part of education. It is the part that distinguishes education from training (which might be described as the establishment of a sort of stimulus response mechanism arising from the acquisition of knowledge). But it is difficult to even describe what we mean by understanding. The dictionary resorts to the use of such words as *perceive* and *comprehend* to define understanding, but this just shifts the problem to that of defining words that are equally mysterious. (Indeed, the dictionary I consulted went on to use the word *understand* to help define *perceive* and *comprehend!)* Such definitions do, however, serve to demonstrate that understanding a thing, such as the word *understand,* has something to do with relating it to another thing which you may already understand. And so when a student can identify a relationship between some knowledge that has been acquired and another bit of knowledge previously acquired, it reveals that some degree of understanding is occurring.

For example, if a student is told, "If f and g are two functions, f composed with g is not necessarily the same as g composed with f," and the student then goes on to say, "Oh I see, just like $a - b$ is not the same as $b - a$ for two numbers a and b," then we can deduce that some understanding has occurred. Understanding is also in evidence when a student can recognize a bit of knowledge as a special case of a previously learned general principle, such as when he can note in the above example that these are both cases of

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the non-commutativity of the operations of composition and subtraction respectively. Better yet, understanding is in evidence when the student can hypothesize a general principle from some specific examples, such as when he observes that if $2 + 3 = 3 + 2$ and $4 + 5 = 5 + 4$ then just maybe $a + b = b + a$ for *any* two numbers a and b. The foregoing identifies three mental activities that mark the presence of what we call understanding:

1) Noting a connection or similarity between two things that appear different
2) Deducing a special case from a general principle
3) Hypothesizing a general principle from a special case

The question then becomes, what must the student do in order to bring about this change in himself that we call understanding? *(Cont'd on Page 4)*

Faculty Feature – Glen Lobo

Please join me in welcoming Glen Lobo, one of the newest members of the Sinclair Community College Math Department faculty. Glen joined us in the fall of last year after teaching at the University of Dayton from 1999 to 2004. Prior to that Glen resided in Big Rapids, Michigan, where he taught at Ferris State University for eight years.

Glen's wife, Wiebke Diestelkamp, works at UD in the Department of Mathematics. They met while attending graduate school at the University of Wisconsin-Milwaukee. Glen says that he and his wife are big Green Bay Packer fans, and adds, "When we first moved to Dayton, we actually did not like the place at all, probably because we really loved Milwaukee and the Packers. Over time though, we have grown to really like the area and everything that it has to offer and we decided that we were going to try very hard to settle out here. The winters in Dayton are a lot shorter than in either Wisconsin or Michigan."

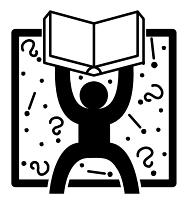
Glen holds a B.Sc. and a M.Sc. in Mathematics from the Indian Institute of Technology, Kharagpur, India, in addition to an M.S. in Mathematics from the University of Wisconsin-Milwaukee. Since moving to Dayton, Glen has been working toward a Masters Degree in Computer Science at UD. He has completed 21 credits so far towards the degree.

When asked what he wants his colleagues to know about him, Glen says, "I grew up in Bangalore, India, and came to the United States in 1985. My wife grew up in Freden, Germany and came to the United States in 1990. We met on the day she arrived, since I was one of the persons who was given the responsibility of helping the German students upon their arrival in the U.S."

Welcome to the department, Glen!

Susan Harris ■

DEPARTMENT COLLOQUIUM



We will have a Department Colloquium on Friday, February 11, 2005 at 2:30 p.m. in Room 1001. All members of our full- and part-time faculty are welcome, as well as anyone who is interested in mathematics. The speakers and titles are as follows:

1. Harvey Chew, Ed.d., Sinclair Community College Professor of Mathematics

   "A Brief History of π"

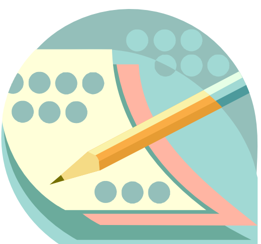
2. Alan W. Johnson, PhD, Associate Professor of Logistics Management at the Air Force Institute of Technology

   "Mathematical Education – A Three-legged Stool?"

Refreshments will be served.

Dolores Williams Coaches Winning Team

Sinclair Math Department part-time faculty member Dolores Williams has good reason to be proud of the Beavercreek High School Mathematics Team that she coaches - they recently placed first overall at the Mu Alpha Theta Regional Competition in Maryland.



Mu Alpha Theta is the national high school mathematics honor society, which sponsors three competitions annually. Schools are divided into four geographic clusters, with Beavercreek High School being in the region that covers the northeast portion of the country. The competitions are also broken down into three divisions based upon students' grade levels. The Beavercreek team has consistently done well in these contests and is a tribute to the dedicated faculty of the Beavercreek High School Mathematics Department, whose motto is, *"It is our philosophy that each student should have access to as much mathematics as they care to learn."* The fact that the team has *56 members* speaks to Dolores' and the other teachers' success in encouraging Beavercreek's students to see math as much more than just a challenging subject in school. ■

Reminders

- Remember the Testing Center requires 24 hours lead time. When sending tests to the Testing Center, be sure to plan ahead so the test is ready for the student when he/she comes to take it.
- Please do not cancel classes even if you have completed the material. Find some way to make good use of the time. If it is impossible for you to make a class please get a substitute.
- Please remember to turn in a copy of your test as well as your grade distribution to your course coordinator.
- Be sure that unregistered students are not permitted to attend your class.
- Everyone makes mistakes, but if you are making more than one or two mistakes per week, especially if they are serious ones, then maybe you should spend more time preparing for class.

The **AMATYC Student Mathematics League Round II Exam** is on Saturday, March 5. Please remind your students and encourage them to register. Students who have taken as a minimum, or are currently taking, MAT 116 are especially encouraged to participate. More flyers are located in the department office. Local prizes are awarded.

(Continued from page 1) And what does this imply about the teacher's role? I would offer three activities the student should emphasize to assure that the three marks of understanding noted above occur. First, the student's acquisition of the pertinent knowledge must be thorough and well established. If he is to make the connection between composition and subtraction described in the example above, he must know well that "*f* composed with *g* is not necessarily the same as *g* composed with *f*." He must at least be able to make the statement. So he should first memorize it. But he should also observe illustrations of what the statement says and do a number of examples of calculating *f* composed with *g* and *g* composed with *f*, on his own, observing that they are not always the same. In other words the pertinent acquired knowledge should be observed intently and it should be embedded in the mind using some form of repetition.

Secondly, the student should observe others perform the mental activities that mark the understanding listed above. He must see and hear someone else offering connections and similarities between things that are different, but that both illustrate the thing learned. And he should observe someone else deducing special cases from general principles and hypothesizing general principles from special cases.

Finally, and perhaps most importantly, he should spend a lot of time *thinking* about what he has just learned and observed. He should contemplate and meditate upon all of this, seeking to make his own connections and to deduce his own special cases or hypothesize his own general principles.

I believe this all makes it clear what the teacher's role is. He should require the student to memorize the appropriate knowledge; he should offer illustrations of it and require the student to perform exercises that will embed it in the mind. He should suggest connections, special cases and hypotheses and then, most importantly, advise the student to spend time thinking. Then he should ask the student to produce connections, special cases and general principles of his own. Over and above all this, because the student's task is hard work, which is a thing our human natures do not always embrace, the teacher should provide the student with a lot of encouragement.

To summarize, in the last three *Mathnet* articles, by thinking of students as students (that is, people who study to acquire an education) instead of customers or clients, and by defining education as changing oneself through the acquisition of knowledge and understanding, and by investigating what it takes to acquire knowledge and understanding, I have arrived at the following conclusions about what I think our role as teachers calls us to do: we should give direction as to what to read, what to listen to, what to observe, what to think about; we should provide original material, and translations, interpretations or synopses of the material of others; we should guide students through experimental procedures; we should require students to memorize things they are to learn and give illustrations of these things, require them to perform exercises and to spend time thinking; we should make connections for them between things learned, deduce special cases from general principles and hypothesize general principles from special cases and assign them to do the same; and we should offer them encouragement.

Al Giambrone ■

Harvey's Joke Corner

Test directions: "Closed notes, closed book, closed neighbor!"

The census taker was hired because he could be "counted on."

Q: What are the three most important considerations when buying a home?
A: (Location)^3

What one out of ten cows is: Ten percent.

A citizen is this at tax time: A "paytriot.