TexMATYC News

Texas Mathematical Association of Two-Year Colleges Spring 2014

TCCTA Conference – Math Section

By Sharon Sledge, San Jacinto College.

Welcome Spring!

It is exciting to see an end to our winter weather and look forward to the spring blooms. Many of us have had (or are enjoying now) our Spring Break. With the arrival of daylight saving time my body is still adjusting to springing forward but my mind is excited about new beginnings. I had three opportunities that provided professional growth for me during spring break:

1. I was asked to provide input on a mathematical paper, so I dusted off some of my old books (and parts of my brain) and reviewed some math that I hadn't seen in a long time. It was exhilarating to feed my brain--to go through the problem-solving process and rediscover mathematical concepts in new perspectives.
2. I spent time considering a pedagogical approach to use in my classroom: How can I use my tablet to really enhance my teaching? What apps are available that can increase student understanding?
3. I heard a talk about the importance of spending quiet time with yourself – to think, to listen to your thoughts, to rejuvenate. Close off all distractions and spend time with yourself – make time for yourself to do nothing. Wow – it was enlightening (and no, I did not fall asleep!)

In spring we think about new growth – sprucing up our homes – refreshing our lawns. The beauty of the flowering plants and trees bring excitement and pleasure. I encourage you to find time for some spring cleaning for yourself. Renew, refresh, replant - for your brain, for your courses and for yourself.
Happy Spring!

AMATYC has much to Offer

By Kathryn (Kate) Kozak, AMATYC Vice President for the Southwest Region

The American Mathematical Association of Two-Year Colleges (AMATYC) is the main professional development organization for mathematics teachers at two-year colleges. Part of its mission is to "offer multiple opportunities for the preparation and continuing professional development of a competent and diverse mathematics faculty skilled in a variety of teaching modalities addressing different

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learning styles." To fulfill this, AMATYC offers an annual conference, webinars, traveling workshops, an online community for members to discuss topics, a mathematics journal (*Math*AMATYC *Educator*), and a newsletter (AMATYC *News*). In addition, AMATYC has several position statements and guidelines that range from mathematics teaching to preparation of mathematics faculty.

If you were able to attend the AMATYC annual conference in Anaheim, I hope that you enjoyed it. I liked seeing all of you who were there. If you weren't able to attend, next year's conference will be in Nashville, TN, so you may want to start planning. Proceedings from the Anaheim conference are available online at amatyc.org. So if you missed the conference, or wanted to attend a session and weren't able, go to the website and look to see if the proceedings are posted.

There was a webinar in December on how to get a job at a community college. If you weren't able to attend, or know someone who would benefit from this webinar, you can still view it. All webinars are posted on the amatyc.org site. In addition, if your college has some funds for professional development but can't send everyone to a conference, consider bringing a traveling workshop to your campus. This way you bring the conference to you.

The current and previous issues of the AMATYC *News* are available at amatyc.org. Abstracts for the *Math*AMATYC *Educator* are also available there. Currently, the *Educator*'s past issues are not available, but with the redesign of the AMATYC website, there is now the ability to have a members-only section of the website. There is a task force that will be working on what items would be appropriate for a members-only section. Look for details in a future *News*.

The Developmental Mathematics Committee is working on a position statement called "The Appropriate Use of Intermediate Algebra as a Prerequisite Course." In addition, AMATYC has a task force work on revising the "Guidelines For The Academic Preparation Of Mathematics Faculty At Two-Year Colleges." Both drafts of the position statement and the guidelines have been sent to the affiliate presidents in the Southwest Region. Please contact your affiliate president to obtain a draft and give input.

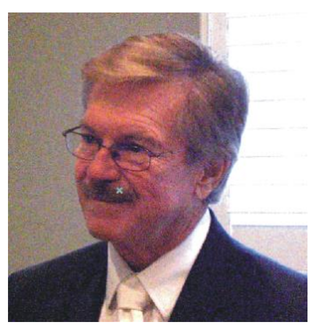
As you can see, AMATYC is more than the annual conference. Consider joining or renewing your membership to AMATYC. It is easy to join, and you would be helping to support the mission of AMATYC.

TexMATYC Conference Abstracts:

PowerPoints from many of the presentations are available at www.TexMATYC.org

1: Personalized Remediation Programs and Mini-Bridging

Don Allen, Department of Mathematics, Texas A&M University



In our talk we discussed two ongoing projects on precalculus remediation. The first is our **Personalized Precalculus Program**. Using the results from our Math Placement Exam, we target those at risk incoming students by providing to each a Personalized Study Program (PSP) of highly focused mathematical tasks by which they will augment and supplement their pre-calculus skills and position them for success in college mathematics. This program of

study is delivered to the student before attending college and while still at home during the summer is mediated via four principal technologies: (1) Conferencing software for direct synchronous contact with an experienced instructor; (2) Videos of important topics in pre-calculus and solved problems; (3) Applets to enhance student visualization abilities and for added interactivity and depth of understanding; and (4) An online course management system to monitor the student's progress through the PSP. For those students we reach, about 60-100 each summer, the program is highly regarded and successful in placing the students into calculus.
Recurrent problems include the following typical type problems for summer programs.

- Recruitment
- Length of the program (normally 6 weeks but going to 4 weeks.)
- Retention within the program (Getting them to come the next day.)
- Students' perceptions of their needs

The other and rather new program is our **Mini-Bridging Program** for Caclulus I students transitioning to Calculus II. The program substantially targets those that received a "C" or "B" in Calculus I. The scope of the program is to cover the important and difficult to learn topics in Calculus I in one week at three hours/day – and all online. This past January (2014), our first time operating this program, seems to have been a great success. More than 120 students were enrolled in one of four cohorts and more than 60 students completed the course. Post session reviews were very good. For the 180 minutes of instructional time, there was an 82% attendance rate.
The **format** of the sessions follows. (a) Instructor does about 15-20 minutes of explaining with examples. (b) Instructor gives the class about 10-15 minutes to work on similar problems. One can be routine and the other more challenging. (c) Students return to the class online, and instructor elicits what she can from the students and what they did, but then gives a clear solution to all. (d) This should take about 45-50 minutes. Now give some more homework-type problems and a short break and reconvene for the second hour. Repeat with different materials.

The **curriculum** for all five sessions was:

- Day 1:
  Hour 1 – **Derivative** rules with algebraic functions
  Hour 2 – Derivative rules with exponential and logarithmic functions
  Hour 3 – Derivative rules with trig functions

  Day 2:
  Hour 1 – Derivative rules with inverse trig functions
  Hour 2 – Trig identity rewrites (recognize trig derivatives as part of trig statements/expressions)
  Hour 3 – Right triangle trig prep for trig sub integrals

  Day 3:
  Hour 1 – **Basic integration**
  Hour 2 – Integration with u-substitution
  Hour 3 – Integration with trig, exponential and logarithmic functions

  Day 4:
  Hour 1 – **Partial fraction** decomposition
  Hour 2 – Integration with inverse trig functions
  Hour 3 – Definite integration with change of limits

  Day 5:
  Hour 1 – Properties from derivatives (critical points, inc/dec, concavity, etc.)
  Hour 2 – Algebra for calculus
  Hour 3 – Limit rule refresher

We plan to extend the mini-bridging paradigm to Calculus II → III, and Precalculus → Calculus I this summer. Mini-bridging is a relatively inexpensive and most effective way to enhancing the student's prospects of success. It can be applied for the bridge between any two continuation courses.

2: Not Quite College Ready … New Options to Support Learners

Jan Case, Professor of Mathematics, Jacksonville State University

Jacksonville State University (JSU) is a regional university serving northeast Alabama. As a learning-centered university, JSU strives to challenge students academically in a responsive environment, meeting students' educational, career and personal goals. Many of our students are low-income, first generation college students who are frequently under-prepared for college mathematics courses. In seeking to improve the 50% success rate of our developmental mathematics program, we accepted a pilot membership opportunity with The NROC Project in 2011 and began a two year study of the materials when used in three different classroom contexts. NROC is a non-profit open educational resource project of The Monterey Institute of Technology and Education and is funded by The Gates Foundation, The Hewlett Foundation, and supporting institutional members from the academic community. At the end of the pilot period, JSU committed to full membership.

The educational materials consist of videos, practice problems, assessment (pre and post) and an ebook, all of which are provided at no cost to the students. The impact of the materials was examined when used as (1) optional, supplementary lessons, (2) homework grades, and (3) in a flipped classroom environment. Compass scores were used to control for initial ability differences, and in each case, we found that students with the most frequent use of the materials experienced greater success in mathematics achievement. Students are presently being tracked to determine their success in future core mathematics classes.

Based on these results, JSU is in the process of incorporating NROC into all of our developmental mathematics courses. The newly launched EdReady system will customize a personalized learning plan to assist in a streamlined approach to moving our students through the developmental stages in a more efficient manner. JSU is encouraged that these changes will benefit our students and increase the retention rate of the university.

Find more information at: http://nrocmath.org/ and http://edready.org/.

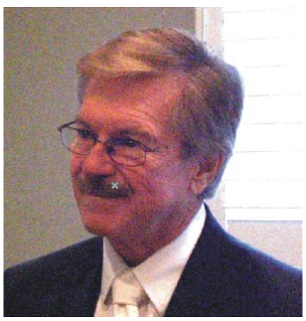
3: Math in Real Life

Eric Gaze, President National Numeracy Network and Director Quantitative Reasoning Program, Bowdoin College

In this talk we will explore the components of a Quantitative Reasoning (QR) course. Starting with discussing what is meant by QR and articulating how this differs from traditional mathematics instruction; with particular emphasis on the mathematics for informed citizenship distinguishing between QR and algebra. Spreadsheets are at the heart of the speaker's own QR course and will be introduced as a better way to teach algebraic reasoning and modeling. Fundamental QR topics such as proportional reasoning are discussed with an eye toward developing students' quantitative literacy and ability to reason effectively from evidence and make decisions in their personal, financial, and civic lives. The talk will end with a look at assessment of QR with results from the speaker's current NSF project.

Adding Fractions the Wrong Way (and Getting the Correct Answer)

Don Allen, Department of Mathematicse, Texas A&M University



Introduction. We all know the rule for adding fractions.

$$\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$$

We also know what we all too often see in the classroom from our students.

$$\frac{a}{b}+\frac{c}{d}=\frac{a+c}{b+d}$$

Of course we mark it wrong. We extol to our students how and why it is wrong. But students are persistent, even into calculus and beyond! In this note, we will show when it is correct. We restrict ourselves, however, to positive numbers, $a,\ b,\ c,\ d>0$. The answer here doesn't involve special cases when $\frac{a+c}{b+d}$ and $\frac{ad+bc}{bd}$ are mathematically equal. They cannot be. (See Problem 2 below.) So, agreeing the first expression is the true sum of two fractions, how can the second also be correct?

The Context. In any win-lose game of multiple attempts such as baseball, one has always the number of games played b and the number of wins a. The percentage of wins is computed from the fraction $\frac{a}{b}$.

For the team, suppose a and b are exactly these numbers during the month of June. Suppose that during July and August the number of games played is d with c of them as wins. What is the cumulative percentage of wins, i.e. the sum? The only answer is the new fraction the percentage is computed as

$$\frac{a+c}{b+d}$$

In this way, it is perfectly natural and intuitive for the student to add the numerators and denominators to conclude

$$\frac{a}{b}+_c\frac{c}{d}=\frac{a+c}{b+d}$$

We use the notation $+_C$ to indicate this is a different type of, but very important, sum. We call it the *cumulative sum*. There is no other way to achieve the overall percentage of wins. It cannot be achieved with just the numerical percentages as we don't know the number of games played in both segments of the season. In this simple but real-world example we see vast differences afoot when we regard ratios as fractions.

A Little Math. Here is a little bit of math for students to examine. There are relationships of the parts to the whole, very simply stated and not at all difficult to prove.

Theorem 1. Given $a,\ b,\ c,\ d>0$. Then

$$\min\left(\frac{a}{b},\frac{c}{d}\right)\le\frac{a+c}{b+d}\le\max\left(\frac{a}{b},\frac{c}{d}\right)$$

Of course, we can generalize to multiple ratios. Suppose that $a_1,\ a_2,\dots,\ a_n>0$ and $b_1,\ b_2,\dots,\ b_n>0$. Then it is possible to consider the glorified cumulative sum

$$\frac{a_1 + a_2 + \cdots + a_n}{b_1 + b_2 + \cdots + b_n}$$

The generalization of our theorem is

$$\min\left(\frac{a_1}{b_1}, \dots, \frac{a_n}{b_n}\right) \le \frac{a_1 + a_2 + \cdots + a_n}{b_1 + b_2 + \cdots + b_n} \le \max\left(\frac{a_1}{b_1}, \dots, \frac{a_n}{b_n}\right)$$

The proof follows from the Theorem and a bit of induction.

Back to Baseball. In terms of baseball, if one divides the season into segments with $a_1, a_2, \dots, a_n$ wins in $b_1, b_2, \dots, b_n$ games played respectively and computes the winning percentage of each segment (i.e. $\frac{a_k}{b_k}$, $k = 1,2, \dots n$), then the overall winning percentage $\frac{a_1 + a_2 + \cdots + a_n}{b_1 + b_2 + \cdots + b_n}$ is smaller or equal to the maximum of all the segment percentages and larger or equal to the minimum of all the segment percentages.

Conclusion. The so-called *cumulative* sum is very important in any sort of win-lose gaming and other venues as well. It involves fractions (as percentages) and the overall percentage. This illustrates that fractions are so wrapped up with internal contradictions, the struggling student may simply "feel lucky" when he/she gets the correct answer. Learning and lucky are terms themselves in conflict.

Problems.

1. Find conditions for which $\frac{a+c}{b+d} = \max\left(\frac{a}{b}, \frac{c}{d}\right)$. This will show you that equality happens only rarely.
2. Show that if $a, b, c, d > 0$, then $\frac{a+c}{b+d} - \frac{ad+bc}{bd} < 0$.
3. Does the Theorem hold when one or both of the numerators equals zero?

Student Work

Write your own statements for p and q. Then, express the following in words using your statements.

19. $\sim p \wedge q$

I do not like big butts, and I cannot lie.

20. $\sim(p \vee \sim q)$

I do not like big butts and I can lie.

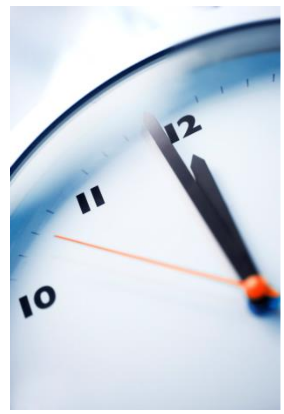
$\underbrace{\text{I like big butts,}}_{p}$ $\underbrace{\text{and,}}_{\wedge}$ $\underbrace{\text{I cannot lie.}}_{q}$

TexMATYC Annual Financial Report For 2013

Description	Expenses	Income
Previous Balance		$9,975.66
Membership (Cash)		$570.00
Membership (PayPal)		$413.04
Proceeds from SWRC		$507.77
Interest		$10.39
AMATYC Hospitality	$150.00	
SWRC Door Gifts	$150.00	
2013 TCCTA Internet (for workshops)	$309.32	
iPage (web-site)	$0.00	
Balance		$10,867.54

Joke of the Month

Question: "How many seconds are there in a year?"



Answer: *"Twelve, January second, February second, March second, ..."*

Got News?

If you know of any exciting news in mathematics, have it published in your TexMATYC newsletter. Submit articles to Heather Gamber at heather.a.gamber@lonestar.edu.

Visit us at www.texmatyc.org