



California Mathematics Council Community Colleges

President's Report

James Sullivan, CMC³ president, Sierra College



This January not only marked the beginning of a new year, it also coincided with the one year anniversary of my term as CMC³ President. My goodness – how time flies when you are extremely busy. I'm sure many of you can relate to this sentiment as well, especially our President-Elect and Fall Conference Chair Cortney Schultz. She planned and organized the CMC³ 50th annual fall mathematics conference which recently took place in Monterey. On behalf of the CMC³ membership, I want to publicly offer Cortney our sincere gratitude and appreciation for all the time, energy, and effort she dedicated to putting this conference together. We thank you very much for a thankless job well done. Please allow yourself a moment to reflect, admire, and take pride in your accomplishment. Then turn your attention to planning the Fall 2023 conference.

Good luck trying to outdo yourself!

While I still have your attention, I also wanted to notify you that the CMC³ board voted to approve a proposal at our January board meeting to hold one mathematics conference in person and one mathematics conference online each year beginning this year. As a result, we will hold our Spring 2023 conference virtually via Zoom in April and our Fall 2023 conference in Monterey next December. This decision allows CMC³ to offer our members the benefits of both options every year. Offering a virtual conference allows us to provide a lower cost professional development and networking opportunity to our members who find it challenging to travel to an in person conference. Offering an in person conference allows us to continue the tradition of connecting with our colleagues from around California to interact and exchange ideas in a way that is more conducive and authentic than in an online environment. We hope you will find the value in providing more options to appeal to a wider variety of California Community College mathematics educators.

This year was to be the 27th annual CMC³ Spring recreational mathematics conference held in South Lake Tahoe. I would like to take this moment to recognize Dr. Larry Green of Lake Tahoe Community College for his many years of service to CMC³ and leadership supporting the Spring Recreational mathematics conferences. Larry was a driving force and contributed greatly to the success of these conferences. Thank you Larry for all that you have given us.

In the coming weeks, be on the lookout for announcements and messages from CMC³ detailing the new online format of our 2023 Spring mathematics conference.

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This CMC³ newsletter wants to know how your school is doing! Our community is always proud to see developments in other departments and campuses across Northern California, but unfortunately, this editor has been unable to contact anyone interested in writing up what has been happening on their campus recently. I would love to share how campuses are moving as we head into this new era of teaching. Please email me at newsletter-coordinator@cmc3.org if you are interested in being featured in your usual "What's Happening" article so we can all take a look at the magnificent progress we as a Mathematics teaching community continue to make.

CMC³ Virtual Spring 27th Annual Recreational Mathematics Conference

Larry Green, Lake Tahoe Community College



This spring, we will have our 27th recreational mathematics conference. Our board got together at the last CMC³ board meeting and discussed the logistics of the conference. Since it is a long drive to Tahoe and the cost of staying in a hotel can be costly, and the online conference setting that we have used the past couple of years was much more convenient for everyone we decided that the CMC³ Spring Conference will be held online this year and for all years in the future.

The conference will be held via Zoom on April 29 and will feature great speakers and virtual networking. Since it is online, the price will be just \$25 for CMC³ members and \$50 for non-members. If you have a full-time student at your college who is interested in join the conference, it will be free to all full time students.

The virtual conference will close with a virtual mathematics presentation by this year's Tahoe Student Speaker. If you have a student who may be interested in being this year's Tahoe Student Speaker, please encourage them to apply. The committee will begin reviewing the applications on March 20. Students can apply online at: <http://www.cmc3.org/students/speaker/>. There is also an associated scholarship that comes with it. Also, students can also receive a half unit of college credit if

they register for the associated applications of mathematics course, MAT 119, at LTCC which is basically a course that just involves virtually attending the conference. For more information about this class, please contact me at DrLarryGreen@gmail.com. We are still working out the details of registration, but all the information about how to register for the conference will soon be found on the CMC3 webpage at <http://www.cmc3.org/>. I look forward to virtually seeing you all on April 29 as we get together virtually to learn about mathematics and mathematics teaching.

Upcoming Conferences

27th CMC³ Spring Conference: April 29th, held virtually

49th AMATYC Annual Conference: November 9-12, 2023 in Omaha, Nebraska

Opportunities for Service in CMC³

Leslie Banta, CMC³ Treasurer



I have been serving as Treasurer for CMC³ for the past 10 years and have enjoyed working with others on the board and serving our members. At the 50th Anniversary Fall Conference, we had a poster board up where people could share what they love about CMC³. People noted that they enjoyed the conferences, meeting new people, networking, finding support among fellow faculty, and making new friends. These are

some of the very things that I see as the benefits of serving on the CMC³ Board!

During the 10 years of my tenure, we've moved to online

registration, developed a social media presence, held conferences online, shared faculty opinions with legislators and their staff, and more. We've seen some exciting developments and there are more wonderful opportunities ahead!

We'd like to ask you to consider joining us by serving on the board. We'd like to expand the number of voices on the board and we are always looking to diversify the voices and experiences that contribute to the decisions that we make and the professional development opportunities that we provide. Our board meetings are held online so travel for the meetings is not required. There are a number of positions that are great for new board members and many have a minimal time commitment. If you are interested in learning more about serving on the board, please contact [President James Sullivan](#).

We currently have two immediate needs on the board. The first is for a Social Media Coordinator. I developed an active social media presence shortly after joining the

board. Later, that role was taken over by Cortney Schultz, our current President-elect. Now, we're looking for a new coordinator who can manage our Facebook page and Twitter feed (and maybe even add Instagram) by making 2-3 posts each week that would be of interest to our members. If you are interested in serving in this role, please contact [Cortney](#) to learn more about the position.

The second position is a new one – Assistant to the Treasurer. This is a position that trains someone to eventually serve as Treasurer for the organization. It involves helping

with registration at conferences and learning about the required tax filings for the organization. While the Treasurer job is a big one, I've found others on the Board to be supportive and helpful. This is a great opportunity to see if the Treasurer position is one you would enjoy (without the all-in initial commitment). If you are interested in this position, please [contact me](#) for more information.

I hope that you will give thoughtful consideration to joining the board. It is rewarding work and the organization needs you!

CMC³ Foundation Report

Ekaterina Fuchs, City College of San Francisco



It was great to see everyone at our Fall conference in Monterey! We were excited to roll out some new merchandise, including zippered pouches, stickers, tee-shirts, and a jacket. We will be making a limited selection of merchandise available for sale at registration for our Virtual Spring Conference, so, if you wanted to grab a shirt or some stickers or a pouch but didn't get around it, now is your chance! Prices will include a shipping charge, and merchandise will be shipped directly to the address you provide.

We are excited to announce our Student Speaker Contest for the Spring 2023 Virtual Conference! If you mentored a student for the Student Poster session, and your mentee is interested in fleshing their poster out into a 20 minute talk, encourage them to apply! If a student has approached you about exploring a topic in mathematics or applied mathematics, encourage them to enter the contest as well! Applications will be accepted through April 14, 2023. The Student Speaker Contest winner will receive a \$500 scholarship, paid for by generous donations from members like you! [Click here](#) to see more details about the contest, and for the link to apply!

No mention of the Student Speaker Contest is complete without expressing deep gratitude to former president Debra Landre, who sponsored the contest for a great many years, in large part making it possible. Thank you Debra!

As always, I would like to remind you that every dollar donated to the Foundation (both through direct donations and through Merchandise sales) goes to students. From our Student Poster contest in the fall, to the Student Speaker contest in the Spring and our scholarships every year, we are deeply committed to support students' mathematical journeys. Consider donating today! You can make support us through Amazon Smile, make a one-time donation, or set up monthly donations in any amount you're comfortable with. [Click here to donate!](#)

As we look ahead to our virtual Spring conference, I wish to thank everyone who has been able to donate to the Foundation in the past. Looking forward to seeing everyone in April!

The History Corner

Joe Conrad, Solano Community College



Not long ago, I volunteered in the fifth-grade class that my daughter teaches. The class had recently learned the long division algorithm. As I approached the door, a student was showing my daughter some work and

asked her to check it. The student had invented a larger than average long division problem and wanted to know

if she had done it correctly. This incident brought back memories for me because my earliest indication that I was not typical in my appreciation of mathematics was when I learned long division and would make up examples where the divisor and dividend would stretch across the width of the paper. Prior to that I was unexceptional mostly because I was more interested in being the first one done with the drill-and-kill exercises than getting them all correct. (Interestingly, my brother who was one year behind me in school always got them correct which led our teachers to think that he would be a mathematician. They

thought I would be a scientist since I was more analytical. He had a long career in a profession that requires accurate arithmetic – he was an accountant!) This incident led me to choose to look at the history of division methods in this column. Note that the methods are not the same as the definition which has also evolved as the understanding of number systems has developed.

Dating from over 3000 years ago, the Ahmes Papyrus includes the Egyptian method of division. For multiplication, the Egyptians used successive doubling, often referred to as duplation. For example, to multiply 27 by 21, they would double 27 to get 54, double again to get 108 and double again to get 216 and again to get 432 which is 27 times 16. Noting that 21 is 16 plus 4 plus 1, they would add 432 and 108 and 27 to get 567. For division, they would reverse the process by doubling the divisor. So, to divide 567 by 27, they would double 27 repeatedly until they could form 567 and note that it required the sum of the results from 16, 4 and 1 times 27. They could conclude that 21 was the result. Clearly, I have used convenient numbers here to show the process, but they were quite adept at using their fraction system (recall they used fractions with only 1 in the numerator except for $\frac{2}{3}$ and $\frac{3}{4}$) to do the process for nastier problems. In fact, Problem 70 in the Ahmes Papyrus is to divide 100 by $7 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8}$. The result turns out to be $12 + \frac{2}{3} + \frac{1}{42} + \frac{1}{126}$.

In the same time frame, the Babylonians used their sexagesimal system in a more modern way to do division. They did not separate division as its own operation, but used multiplication by the reciprocal. Since $\frac{2}{10}$ is the reciprocal of 5 in base 10, we could divide by 5 by multiplying by 2 and moving the decimal place. They divided by 5 by multiplying by 12 and moving the sexagesimal place since $12/60$ is the reciprocal of 5 in the base 60 system. They had multiplication tables and tables with the values of reciprocals that helped them to do this.

Greece and Rome were handicapped in developing divi-

sion methods by their numeration systems. They probably used a repeated subtraction method, but little has come down to us about anything more general. Meanwhile, the Chinese were using counting rods to perform multiplication and division. In a set of textbooks written by 500 AD by Sun Zi entitled The Mathematical Classic of Master Sun, methods for doing all the operations of arithmetic using counting rods was described. The texts viewed division as the reverse of multiplication and only showed the method for divisors less than or equal to 9. Eventually, the counting rods gave way to the abacus in China. This led to a set of rules for division that included a rule for each two-digit divisor up to 99 that was memorized and performed by rote. It made the process faster, but less thought provoking.

The development of the Hindu-Arabic number system produced significant changes in division methods. There were some intermediate methods, but the most popular method of division for nearly a thousand years is known as the galley, batello or scratch method. It was known to al-Khwarizmi (c. 780 – c. 850) by 825 AD and other Arabic scholars used it for centuries thereafter. It is thought to have been developed in India, but some historians suggest that it was taken directly from the Sun Zi texts and adjusted for the Hindu-Arabic numbers. It arrived in Europe in the Liber Abaci of Fibonacci (c. 1170 – c. 1250) in 1202. Below I have inserted a picture of a completed galley division from the 16th century by an unknown Venetian monk. (It appears on page 138 of Smith.)

This example shows where the name galley method came from as the form ends in a shape that is reminiscent of a galley or boat (or batella in Italian.) Many extant examples include drawing a boat around the numbers. The galley method was used by most people until the 1600's and was still used by some into the 18th century. In fact, it is still taught in some Arabic regions. Here is an example that is more readable where I divide 33487 by 146:

```

  1
 14
235
440
13263
33487|229
14666
 144
  1

```

```

  1
 14
 235
 440
13263
33487|229
14666
 144
  1

```

```

      229
146)33487
   292
   ---
    428
    292
    ---
    1367
    1314
    ---
     53

```

I have shown it in two forms: with and without the slashes. I also show the same problem done in the modern long division format. To set up the problem in the galley method,

we write the dividend with the divisor immediately under it and flush to the left. A vertical bar is placed after the dividend and the quotient will be located to the right of

that. Intermediate work is done above the divisor. In the version with the slashes, the only unslashed values at the end of the process are the quotient and the remainder which appears at the end of some horizontal lines above the dividend. Originally, this was done on sand tablets and what appears here to be slashed out was erased in the sand. Hence the alternate name: scratch method. As printing became more widespread, the slashes were hard to typeset, so later books did not show them. This you can see in the second version.

I do not have the space to explain the method. I learned it by comparing various versions both in print and online. An important concept is that a digit's horizontal position is not so important. If you compare the numbers in the galley method with the long division version and keep in mind that a particular number may appear spread over multiple lines in the galley method, you will see many of the same values in both methods.

References

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Windsor, Will, Booker, George, *An Historical Analysis of the Division Concept and Algorithm Can Provide Insights for Improved Teaching of Division*, Griffith University, 2005. Downloaded from <http://hdl.handle.net/10072/2509>.

Do Introductory Courses Disproportionately Drive Minoritized Students out of STEM Pathways?

Hal Huntsman, Antelope Valley College



The answer is, yes, according to a September 2022 [study published by the National Academy of Sciences](#). The authors write that “the association between low performance in an introductory STEM class and failure to obtain a STEM degree is stronger for URM [underrepresented minority] students than for other students, even after controlling for academic preparation in high school and intent to obtain a STEM

degree.”

Working with an impressive sample of 109,070 students at six different large research universities across the country, they found that, “The probability of obtaining a STEM degree for a STEM-intending white male student with average academic preparation who receives grades of C or better in all introductory courses is 48%. In contrast, for an otherwise similar URM female student, the probability

is not possible to pinpoint a date when our modern long division method first appeared because it evolved slowly among the Arabs and the Europeans especially in Italy. The earliest printed version appeared in 1491 in Florence. They called it a danda which means “by giving” which corresponds to our direction to “bring down” the next number. The following century this method became more widespread but mostly as a novelty rather than a better method than the galley method. It was not until the 17th century that it began to replace the galley method as the method of choice for doing division. It became especially useful as the decimal point became more prevalent because it automatically located the position of the decimal point in the quotient. For a time, an abbreviated version of long division was in vogue among mathematicians. This omitted the products that are made at each step and only had the results of the subtractions. As you can imagine, the mental arithmetic that was required omit these steps doomed this format.

is merely 35%.” African-American female students had a particularly low probability (28.2%) of graduating with a STEM degree. If students receive less than a C in even one introductory STEM course, the probabilities drop to 33% for white male students and 21% for URM female students.

They conclude, “Given the size of our data set and conservative methods of analysis, a gap of this magnitude demonstrates how far we have to go before achieving equity in STEM education. To put our results more plainly, female students and URM students are essentially penalized for attributes over which they have no control.”

These results may be an echo of the study I wrote about for this newsletter in 2019: “[STEM faculty who believe ability is fixed have larger racial achievement gaps and inspire less student motivation in their classes](#).” In other words, faculty expectations of women and URM students in STEM courses could be part of why students are pushed out of STEM degrees.

But another possible place to put the blame is on the fact that faculty at large research universities do not have the time or incentives to give the same quality of classroom experience that many of us in community colleges provide. Indeed, I know from my own undergraduate classes and from many students I've talked with about their experience after transferring to four-year schools that we, the faculty in CA community colleges, often make our students feel cared for and noticed in ways that their professors at large universities cannot.

Yet, the situation at the universities described by the

study's authors is eerily familiar: For decades, higher education's efforts to address STEM disparities have focused on 'fixing students,' with interventions such as bridge programs, undergraduate research experiences, and remedial/developmental courses. These approaches are rooted in perceived deficits in student preparation or interest; they attempt to mold students to better navigate the higher education system as it exists. Despite good intentions, these programs have not reduced attrition among underrepresented minority groups.

This almost exactly parallels my own career. When I started working in the California community college system, we taught many levels of remedial courses and 80-90% of traditionally underrepresented students were placed into remedial math when they started college. I helped run a self-paced arithmetic course that enrolled hundreds URM students every semester, with pass rates around 25-35%. African-American men were especially unlikely to succeed – literally a couple of handfuls would pass each term.

We tried all kinds of interventions – additional workshops, extra tutors, making it not self-paced, etc. – and while we made marginal improvements, the overall success rate for these classes remained very low. For African-American, Latinx, Native American, Filipino/a, and other underrepresented students, it was worse.

It's not hard to see that if a student came to my college and wanted a STEM degree, but was placed into that course, that student was unlikely to ever reach their goal. Es-

entially, most underrepresented students were prevented from pursuing STEM degrees because of the structure of our system.

As math teachers, data like these cut to the core of what we do and why. We want more folks studying STEM, and we know that we especially need more women and people of color in STEM. To think that courses we are teaching might be pushing those very students out of STEM is a blow to our purpose.

Fortunately, we have stopped offering courses like those, considering the chances students from those classes had of ever completing a transfer-level math course. But eliminating remedial courses is not enough.

As the authors suggest, "Our study shows that we need to move beyond the 'fixing students' mentality. We suggest as a starting point the critical reflection and examination of department, school, college, and university policies and cultures."

If we want more students, especially more women and URM students, in STEM, we need to continue to examine ourselves, our courses, our departments, our colleges, and our systems. Of course, we need to support students in STEM through corequisite courses, tutoring, and other resources. We also need to change our expectations of students and change the way we teach. We need to make women and URM students welcome in STEM courses and support their success in every way we can.

Questions? Comments? Want to connect? Reach Hal at: shuntsman1@avc.edu.

What's Happening at Mendocino College

Leslie Banta, Medocino College



The Mendocino College Math Department launched a new course this spring – Mathematics in Native American Cultures. The course was developed as a survey mathematics course that honors and celebrates the

mathematics used by Native Americans as seen in practices and cultural objects that are part of the rich history of Native Americans and Indigenous Peoples. Students enrolled in the course explore the use of mathematics in topics such as counting, measurement, beadwork, basketry, methods of record keeping, games, and contemporary issues facing Native American populations. The mathematics involved includes concepts such as number theory, bases, geometry, probability, and mathematical modeling. The course is recommended for liberal arts students, educators, and others who are interested in cultural studies.

The course uses free online materials and is taught in

a collaborative learning community format that honors Native American practices of community and storytelling. Student responses to the class have been positive. One student commented that her heart "leapt with joy" at seeing a math class she thought would be meaningful for her as an art major and a person interested in addressing racial injustices. Another said that she had "never really found a math class I could connect with" and that this class joined together her desire for a degree in Ethnic Studies and her role as a cultural practitioner within her tribe.

According to data from the Chancellor's Office DataMart, Mendocino College has the highest Native American student count (279) within the 116 California Community Colleges, as well as the highest percentage of Native American students (4.76%). These enrollments have provided the college with opportunities to strengthen educational pathways that serve these students.

In response to the needs of Native American students, Mendocino College developed the Pomo Pathway program, a two-semester sequence of classes that supports students in completing transfer-level Math and English within their first year and prepares them to pursue a degree. This semester, Mathematics in Native American Cultures became part of that program (the course is CSU transferable).

In addition to an academic pathway, the college welcomes the Native American community through activities such as the annual Native American Heritage Event that brings

over 200 community members to the college to participate in cultural activities and provides space for Native American vendors.

Mentality, Mindset, and Math

Joshua Rhodes, College of San Mateo



During my fall semester I was a part of the **Science Faculty Institute for Teaching and Learning (SFIT)** at College of San Mateo where I had the privilege of working independently alongside other colleagues to try and put into place Scientific Teaching. My office mate, and fellow SFIT researcher suggested

I share this experience with our teaching community as well, so I set out to give you an idea of the project, the work I did as well as some conclusions my colleagues found to hopefully pique your interest to try something yourself to share!

The general idea of Scientific teaching is to measure the effects of activities, lessons, and methods of instruction to come up with data that can show how effective or ineffective these may have been. This is of course something that instructors already do, whether measuring scores from exams, quizzes, or homework, or through student reaction in class or conversation. If a class is not meeting expectations in these regards we take note of it and adjust or address any issues we might see. However, with scientific teaching, the practice becomes much more deliberate and measured. Sure, I will look at grade distributions after exams, incorrect answer frequency of questions, and work to correct any gaps in learning I see, but with scientific teaching you are aiming to make clear the impact of some new instructional method or concept. The typical method to measure this is through before and after assessment – essentially you are creating an experiment. And like any good experiment, frequent and pertinent measurements throughout the process help you get a better picture of the effectiveness.

There are, of course, limitations to this. You might be reading this and wondering how one utilizes the sparse class time we have to implement some of these techniques or measure their effectiveness. This is a challenge that you will likely have to design around. The way you collect your data is important, not only because you need reliable data, but also because you need it to be readable. The way to tackle this issue will likely be different depending on what you are trying out. If you are trying some new method of teaching a particular concept, it might be best to give a quick assessment to the students before and after then measuring the improvement. If you have 2 of the same class, you might consider trying it in only 1 of the

classes while using your usual methods in the other as a control group. You might compare your next assessment or exam to those of previous semesters. You might just measure how well they answer a few questions on the concept you taught through the new method just to get *any* measurable results. You will likely also have a backdrop of previous experience to call upon to see if the method worked, but having data to back it up or see its efficacy is highly important.

Seeing the measurements after attempting something feels like a very important part of what makes teaching rewarding. To put more succinctly, feedback determines everything. As I mentioned before, if the students' feedback is they did not grasp a concept well enough (poor assessment, conversations do not present understanding, etc.) then I change my plan and try to hone in on what is missing. Feedback changed my behavior. But there is also a very real sense of satisfaction that comes from positive feedback, (which is scarce as educators anyways). Seeing, through the data, that something new clicked for my students better than the way I was doing it before is invigorating and rekindles my drive for this profession.

However, feedback is not just important for us as educators – it is the defining feature for most students on how to learn. Students won't feel confident they understand a concept until they get feedback through homework, peers, problems, instructors, or exams. But feedback can come in many forms and doesn't need to be exclusively in the realm of teaching or grades either. Feedback for participation, being on time to class, and accepting when things are not known are all important parts of creating a learning environment.

At any rate, my goal last semester was to try to incorporate more pre-lecture videos for students so that I can spend more class time working on problems. I was not going to have (even close to) enough time to create a flipped classroom, but I did want to try something new. I decided that I would give a flipped lecture for review classes before examinations. I would give 3 types of reviews: A full fledged review with example problems (high effort, long video), a concept only review with topics and formulas examined but no examples (short, overall conceptual review), and then no video beforehand. All three of these were followed up with in-class review sessions where I would have students work in groups to solve important problems. I would then send a survey to these students at different times (before the video lecture was sent, before the exam, and after the exam) to see how they felt about the exam, preparedness, performance so far, and any other topics related to the classroom. I also was lucky that I had two of the same courses (statistics).

I sent these surveys through google forms as it would com-

pile answers easily into a spreadsheet to then follow up with some analysis. I also had to reinforce that students actually watched the video before coming to class, so I let them know that if they did not show up with notes from the video at the start of class (a quick walk by to check their notes while they worked on problems in class sufficed) they would be considered absent and have to leave the class to watch the video instead of participating. However, I also let them know that this is a part of me trying something new and so their full participation would make my teaching method much better and the information I get much more clear. This is a time where I provide the students with feedback – they get the feedback of being a part of research and something new, which might be novel and inspire them to exchange those 5 extra minutes of their time to do the survey as well as take good notes from the video.

The results from my experiment was fun to analyze. I found that students were not keen on video reviews at first, but their opinions improved slightly after exams, and that detailed review videos are more conducive to student performance and student confidence. When comparing the first exam (fully detailed review) to the second exam (concept-only review), the exam score drops significantly for students, and remained about the same for third exam (no video review). This of course could be that the further exams were more difficult and/or covered more topics and that caused the score to drop, but my previous statistics courses have usually had worse results for the first exam and improved results for the second exam as students get used to how the exam will function. I also want to make a note that I am aware this may not reflect actual learning for these students, but having a clear, example oriented review of topics for students to view before exams does seem to improve student performance (not surprising, now that I typed that sentence).

When I was looking back at the data for writing this, something interesting came up in the qualitative answers as well. I had mentioned to only one of the classes that the purpose of these surveys was to give data on this method of teaching to share with other instructors, while the other class only knew that I was trying something new. This last separation was not intentional, but when I look back at the data I see some interesting differences. Those who knew they were a part of an experiment gave much more detailed explanations of what parts they liked and didn't like from the video and the classroom structure so far. They also were more likely to give a response to the optional questions asking for comments about the course so far. I believe that the feedback of knowing that they were a part of an experiment had them interact with the course and research more because they knew that they might have a significant impact on my methods of teaching, and

that it would be shared might had lead them to be more forthright with their thoughts. I also got the feedback of seeing how engaged they were and what small aspects of the class they notice or don't seem to care for.

I presented my findings (with some more data and graphs on a poster) to my other SFIT colleagues, who tried new things to address other aspects of teaching such as: encouraging cameras through zoom by forcing instructor only video (so students cant see each other), weekly questionnaires about the class to encourage students to reach out and feel safe to discuss topics with the instructor (students gave more in-depth answers as comfort grew, but some students were still reticent throughout), an assessment of mastery based learning vs standard learning (it looks like many students are passing that aren't mastering), and many other lesson plans for those in the sciences (like an interactive genome tool online to find how classification works!). The thing that stuck out most to me was that, for all these different methods we tried, we were giving students different types of feedback to enable them to try and include themselves in a learning environment.

I seek to continue my scientific teaching journey and use measurements to see what is and is not working. However, I find including my students in the act of research also improves classroom participation. I am doing a small experiment this semester to address an interesting issue about students asking (or more accurately, not asking) questions during lecture and how to encourage them. My current experiment is to simply keep a tally on the board every time a student asks a question. In three of my classes I let them know I am keeping track of the number of questions each day to analyze, one of them I am just keeping the tally on the board, and my last class I am not showing them the tally on the board. I am excited every time I get to add a tally, and the students asking the questions get the feedback that they are contributing, not only to the class by asking a question, but also to a tally or total that I am interested in. I mention every time a daily total record is broken (it is quite exciting!) and that seems to give them the idea that questions are important – at least important enough to be measured. I don't have any data before I started this experiment, unfortunately, but I will be glad to report that the 3 classes that are aware of the data's intent are averaging 9.6 questions per hour, while my simple tally course is averaging 6.5 per hour (lower enrollment is a confounding factor), and my no tally course is averaging 7.9 (cohort class is confounding factor).

I would love to hear about any ideas or questions you might have in incorporating scientific teaching to your math class. Let me know (and if you want to have it some of it shared as a follow up in our next newsletter) at rhodesj@smccd.edu

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