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California Mathematics Council Community Colleges

President's Report

James Sullivan, CMC^3 president, Sierra College

Summer is rapidly approaching as another academic year has come and gone. It is during these moments of transition that I routinely take time to reflect upon the struggles and successes of the past term in order to identify opportunities to elevate my teaching in the upcoming term. Over the course of my career, I have always made little tweaks and adjustments to my instruction in pursuit of improving my teaching. I learned this approach from my mother. For as long as I can remember, my mother instilled in me and my brothers the importance of setting goals and high standards for ourselves and working towards them incrementally, step-by-step. Her actual saying to us was "lilly-by-lilly". She got this saying from her immigrant grandmother who was trying to say "little-by-little", but it sounded like "lilly-by-lilly". After 35 years of teaching mathematics at Sierra College, those little tweaks and adjustments have resulted in tremendous improvements in my teaching. I highly recommend you consider adopting this approach into your teaching practices.

My mother was very influential in not only making me the person I am, but also the teacher I have become. She dreamed of pursuing a career in teaching, but she did not possess the means to go to college. Instead, she became a stay at home mom and raised me and my brothers. In the process, we became her students and she was our lifelong teacher. Her teaching style was subtle, immersive, natural, and effective. Everyday occurrences became opportunities for teaching and learning. My mother would naturally integrate math, science, art, and history lessons whenever we were baking brownies, walking to the park, playing on a playground, driving in a car, shopping for groceries, and making things out of Play Dough. She made learning fun and easy.

My brothers and I have all had careers that involve teaching in some capacity at various levels. When we talk about our teaching with each other, we all share a common experience where we have been talking to our students while we hear our mother's voice in our mind. I was extremely fortunate to have such a wonderful mother. If you are wondering why this article has focused on my mother, it is because she passed away a few weeks ago, and I would not be in the position I am without her guidance and support. She deserves a lot of the credit and recognition for my successful career as an educator. Thank you, Mom. I am eternally grateful.

Contents

This CMC^3 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.

Another Wonderful CMC^3 Virtual Spring Recreational Math Conference

Larry Green, Lake Tahoe Community College

We had another amazing spring conference that took place via Zoom again and included a wonderful group of speakers.

The conference started out with a presentation from Forrest Day, the student speaker from Modesto Junior College. He presented on how he used Python to optimize solar energy. His presentation was relevant and engaging. It made me feel so good to hear such a beautiful application of mathematics from one of our own California Community College students.

We then had a chance to join breakout rooms to network with each other and discuss what is happening at our colleges. There have been so many changes lately statewide to what math classes we can offer, it was helpful to hear from math faculty at other colleges about what they are doing to make the best of this situation.

We next has our session where we had the choice of joining Lori Lewis' talk on RStudio and the Statistics class or joining India White for her talk on closing the equity gap. Both speakers were well received and presented on topics that are important for us math instructors.

The next talks were from Pat McKeague, who presented on interesting math applications that came from Ramanujan and Hardy, and from Lily Lum and Matthew Bertens who presented on a collaboration project that SJSU and CCSF are doing that involves incorporating the Python programming language into their statistics classes. Both talks helped the audiences understand some unique opportunities for their own math classes.

Our final keynote speaker was Patrick Phillips, who presented on how statistics was used to analyze medical trials and help determine what the best practices should be in medical decisions. This was a wonderful application of the statistics classes that we teach.

I sincerely give thanks to the CMC^3 board who worked together to put this informative conference together. Although we have not yet made our final plans for next year, we are considering having multiple online webinars in the spring next year instead of the full day online conference. This will allow us to not have to be on Zoom all day, but still learn about the newest mathematics applications and teaching ideas.

Make Learning Visible

Hal Huntsman, Antelope Valley College

"Make learning visible" is one of my favorite teacherisms. For me, this means that students need to be doing things in class that reveal what they are learning and what they aren't. With rare exceptions, I build time into all my classes for making learning visible, time when students are working on problems together, ideally on vertical non-permanent surfaces (VNPS) such as white boards or chalk boards.

There are many benefits to the VNPS approach, and I discussed it in more depth in my column in the Spring 2020 CMC^3 newsletter. At that time, I was only just beginning to explore the use of VNPS in class. Unfortunately, COVID interrupted my progress for about a year. (Don't get me wrong – I was still working to make learning visible in Zoomland, but, as you all know, there were additional issues and dynamics there that made it more complicated.) But starting in the Spring 2022 semester, I've devoted significant time in class for students to work on problems. I use the VNPS approach whenever possible in all my STEM math courses (Trigonometry, Precalculus, Calculus, etc.).

My typical lesson cycle in STEM courses involves some relatively short introduction to a topic – between five and twenty minutes – usually in the context of a concrete example that students can relate to. This is followed by thirty or more minutes of working on problems in randomly-generated small groups[1]. During this time, I'm circulating around the room, giving hints, answering questions, and promoting good use of math notation on the board. Often my answer to students looking for help is to direct them toward other groups to engage in conversations about what approach they are taking. Groups that finish early are expected to circulate and help others. Sometimes I direct students who are finished to work with a particular group that needs help. Toward the end of class, I lead a whole group discussion, comparing methods and tech-

niques on the board and drawing connections between things we've talked about in the past and things that we will do in the future. Often, we discuss a theorem in this phase of the class. In longer class sessions (two hours or more) I usually do two iterations of this cycle.

When I discuss my lesson cycle with colleagues, I often get the response that they don't have time to let students work on problems in class, especially not for half or more of the time. They say something like, "But if I only cover two of the cases for partial fraction expansion, and they come upon a homework problem that asks them to do one of the cases I haven't covered, they'll come back and complain."

My response to that is that this is a problem I want to have. I am delighted when a student comes back after working on their homework with questions about how to do something that we didn't talk about in class. Students then have context for what we are talking about and can relate the new approach to work they have already done. These connections help them learn it better and retain it longer.

If that means we spend fifteen minutes learning how to do that kind of problem at the beginning of class, then all the better. The moment they realized they didn't know how to do the problem was the moment of learning. If they, instead of returning to class with their question, turn to YouTube or their textbook to find out how to do the problem, that is also a win. What could be better than having students study math outside of class?

Another comment I get from colleagues when I talk about this approach to the classroom is something like, "But how will I know that they learned it if I don't show them?" My response is, "How do you know, now, that they learned the material you are showing them?" I argue that by making the learning visible in class, I know more about what the students have learned and what they don't, because I see it in class every day, not just at test or quiz time.

Furthermore, it's my experience that by helping students learn less material in class, but more deeply, they establish a firmer foundation for learning and problem solving. Based on that foundation, they are more prepared to problem solve and figure out how to solve the new problems that we didn't talk about in class. And the new information will connect to the base they started to build in class.

Finally, by making learning visible in class, I can more effectively see which students need additional help and which are doing fine. I can focus my energies on those that are struggling in that moment and help them catch up.

My approach to making learning visible is not the only one. But no matter the method, the benefits are clear. I'd love to hear from you about the ways that you see what students are learning in your classes.

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

[1]I like groups of three students the best, because two students are more easily "stuck" on a problem and in groups of four, there is more likely to be one student who "hides" or is even excluded from the group. I've found three students to be the balance point of engagement and support.

Mentality, Mindset, and Math

Joshua Rhodes, College of San Mateo

Summer is arriving and that means its that time of the year where I get to think about what worked and didn't work in my courses.

This semester, something that has stood out to me and my colleagues, including CMC[3]'s previous editor Jay Lehmann, is the fundamental importance of having a cohort-like structure for students. Many of us believe, as I am sure many of you might agree, that having students form groups can be immensely beneficial.

Some of the benefits are obvious: Students are more comfortable to discuss topics, there is more likelihood that they actively participate in the class if they are around friendly people, class structure can feel more inviting, and students develop a camaraderie in the mutual learning journey they are on. However, I think that there are more in-depth and secondary aspects that cohorts can have to benefit our classes. I would like to use this time to reflect on what benefits I have seen, some of my own possibly unique experiences with different degrees of forced cohort structure, as well as ways to help foster and develop such cohort structures.

First, the benefits of having a cohort in class needs to be emphasized. I do not think that this aspect of a learning experience should be understated – it is important that students build a community of peers when learning material. In mathematics especially, having someone to be able to try and explain your ideas to is critically important. Just encouraging discussion during class may not be enough as some students will, when prompted to tell someone else what an answer is or why they think an answer is correct, simply state the reasons that justify the correctness of their answer instead of explain *how* they arrived or even knew how to navigate towards such an answer. If you are being forced to be a part of discussion that you are not voluntarily participating in, then both parties are content to leave it at that, whether both students leave that discussion with more understanding or not. However, with the longer, more ingrained community structure that some cohorts can bring, if the listening student believes that "floor" level of discussion is not sufficient or helpful to their understanding, they are more likely to ask for a better explanation. That is to say, they are more likely to try and learn more. This can stem from feeling more comfortable with the speaker, some collective responsibility, or just a shared caring that they are both in the same class(es) and want to be

on the same level of understanding.

Two examples I have in mind both occurred this semester where, in one of my lower enrollment courses, students were rather reticent to speak to each other and the format was not comfortable for students. I partially believe that this was because of smaller than usual class size, which leads more shy students to feel more intimidated to speak up because there are less other people to speak up. That is, they may not want to take up so much vocal space, proportionally. My other class was teaching the same material and had almost a full room (at least at the start of the semester) and they were much more comfortable speaking to each other. This difference showed itself when I would assign conceptual problems: The low-speaking group would struggle to portray their ideas, whether through speech or writing on exams, while the speaking group were rather clear and concise in what parts of the problem were relevant to their answers and why. This is surely not news to anyone, but it is worth reporting anyways.

I also had a class with a forced cohort of middle-college students mixed with standard students. Even if there was a small cohort group and non-cohort group within the same class, the benefits of the cohort appeared. At first, only the middle college students were comfortable to speak, but mostly to themselves. Most of my non-cohort students were reluctant and gave "floor" level responses when prompted or pressured to speak to their peers. However, when mixing students around both groups of students were now next to each other, the fact that there were already students speaking lead the non-cohort students to engage with the cohort students, resulting in a larger discussion and more beneficial results. This type of dynamic is already known and many teachers try to plan around such group structures by moving personalities around to optimize such interactions, but having even a subset of a class be a cohort acts a catalyst to build the sense of community within the classroom, even to those outside the cohort. Just make sure you mix the two subsets of the class!

I also have a unique privilege of having an athletics cohort where the structure of students interacting is not only assumed, but guaranteed. I have taught many classes of all sports players and seen the benefits of having an almost forced cohort. All of these students will see each other in my class, again at practice, again at a game, and again during study hours. One unique benefit of these types of cohorts is the opportunity to coordinate with coaches as they are incredibly invested in making sure their players are doing the best they can and remain eligible to play. A coach and professor is a powerful and unique pairing as you can relate content to their athletics as well as relate the athletics to the process of learning. You can also inform the coaches of at-risk students and find additional support there – I have a lot to add to this idea, but it may be a bit off of the cohort structure so I will just say that I have enjoyed my experience with student athletes and I know that the ease with which they engage each other in a classroom has lead to have better than typical athlete-results in my classes without such cohorts. Much better.

So how do we build such a cohort or community in our classrooms? I have no guarantees – I know that my own tools and tactics did not work in all of my classes this semester and I am sure that there will always be more to try and learn. However, I am reminded of the talk at our CMC^3 Fall 2022 conference, where I was able to listen to Jeff O'Connell from Ohlone College discuss community building and "off-topic" conversation. I think that presentation put to a science more of what I think helps build community and allow cohorts to be a catalyst for others. There, I saw Jeff demonstrate some examples of building up trust and demonstrate caring (bringing snack bars in for those who might be hungry, asking students about their goals, interests, and just having good small-talk, among other things) and those are what makes a class feel comfortable. That, paired with either institutional cohort requirements or friendly cohort-like groups that form from the start of the semester, can be a jumping board to the idealized community of learning we all strive to craft.

Lastly, I feel that it would be natural to have a gap in effort to acquire knowledge when a student feels like they are there to perform up to standards that are being forced on them by a classroom setting versus those that are expected of them by their peers and themselves. And in my mind that is what cohorts, hopefully developing into communities, provide: a new outlook on what it means to be a successful student who is learning and helps reduce the tendency to give "floor"-level effort.

I would love to hear about any ideas or questions you might have in incorporating groups or cohorts in 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

As a side note, I would like to recognize the hard work and dedication from Jay Lehmann and wish him well in his retirement! Congratulations!

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