

Later in life, one gets to have students working on more distant projects. For a nontenured faculty member I would suggest doing this only in a shared advising scheme (see below).

**(4) Be patient with your ideas.** Say you have a meeting with a student and you suggest a way to solve a problem. Possibly you know that this, or something like it, works. But your student seems not to get it. What should one do? I suggest that you persist. Suggest the same or similar idea, possibly from a slightly different angle. Repeat during your next meeting. And be patient.

At some point your student will take your idea and build a result on it. A good student will take it further than you thought, and you'll be quite pleased. But be careful—never say, "I told you so." It might so happen that after a month your student comes back with a great idea, which you happen to recognize...please don't mention it! Realizing at any point of your career that an idea you thought was yours actually came from somewhere else can be quite humbling. I know—it continues to happen to me all the time.

**(5) Shared advising.** Sharing a student with an experienced advisor is a great way to start. With shared advising you can start before you have a tenure-track appointment. You will get to learn things from your colleague while advising (and not just from your student). It allows your single student to be part of a possibly larger group. It is also a great way to continue—after a student gets a result, why not explore a wider range of ideas and tools? After all, it is harder to pick those up later in one's career.

**(6) Good practice.** Have a weekly meeting. Send students to workshops and conferences. Suggest that your student subscribe to the relevant preprint archive...in short, read the edition of this section of the *Notices* advising students how to choose a good advisor, and how to be a good advisee, and turn the mirror to yourself.

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## Casual Mentorship and the Strength of Weak Ties

*Natalia M. Pacheco-Tallaj*

Let me start by sharing some anecdotes, from me and other students, of meaningful mentorship experiences that we feel have particularly impacted our mathematical lives in one way or another:

- "I sent a professor an email asking a question about hyperbolic 3-manifolds. He told me to drop by his office hours and we talked about hyperbolic geometry. He posed interesting questions, helped me understand the development of the discipline, and gave me some direction on what to read. I came to his office one more time, and we did not meet again. But after those two days, I had a clear plan on how to work up to the papers I wanted to read in hyperbolic knot theory."
- "A professor reached out to me and other womxn in the department via email to have a conversation about department culture. We all got lunch together and brainstormed ways those of us at each level (student, postdoc, faculty) could contribute to making the department more welcoming for people at our stage. We each went off and put some things into practice, and we know our doors remain open to each other whenever we need to brainstorm in the future."
- "At department teatime, a postdoc asked me what I was doing in the summer, and based on my interests, recommended I attend the PCMI Summer School, which I had not previously heard about, and gave me advice on applying. I have not talked to this postdoc since, but I did go to PCMI, where I found both research advisors and the area of research I want to pursue in grad school."
- "I went to a professor's talk with plans to meet with him after. What I thought was going to be a one-hour post-talk conversation turned into several hours of excited math chat over two dinners on two different days. It's been a while but this remains one of my best mathematical memories."

All of these interactions have had an impact on students' mathematical lives: a fond mathematical memory formed, a new discipline learned, a plan of action formed, or new opportunities discovered. Yet they each required less than a few hours of commitment from the mentor.

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When I was asked to write an article about mentorship from the point of view of a student, I felt, at first, very stumped. Who was I to tell professors how to be advisors? Was I supposed to tell them we want them to listen to our feelings, our uncertainties about our careers (sometimes we do), or to understand our life's stresses (we have many, especially during the pandemic), or to have us stand on a table and chant along to Walt Whitman "O Captain! My Captain"? But after thinking carefully about my own path—and about who I have to thank for it—I realized not every valuable mentor has been a Robin Williams character in my life. Yes, every student wants to have one or two prolonged, profound mentor relationships. But a large part of our knowledge, opportunities, and decision making comes from a collection of very casual mentorship interactions, like the ones above.

A paper by sociologist Mark Granovetter, entitled "The Strength of Weak Ties," underscores the value of these casual interactions. According to Granovetter, our social panoramas are composed of a combination of strong and weak ties that serve different purposes [1]. While strong ties provide sustained personal support, weak ties play a strong role in social mobility and professional development. In the context of mentorship, a mentor with whom I share strong ties might spend several hours a month teaching me homotopy theory, listen to me practice a conference talk, or help me address career uncertainties. On the other hand, a casual mentor might put in a good word for me at a program, send my paper to other researchers in my field, or give me some guidance on how to read in a new area of mathematics.

So, what can we make of mentorship opportunities during quarantine? The bad news is that we've all been feeling a dearth in our relationships with our regular advisors. Strong mentorship relies on frequent presence and some amount of personal or emotional connection that is hard to recreate virtually. The good news is that casual mentorship is at a moment of perhaps unparalleled opportunity. Look at the four examples above. In three-quarters of them, initial contact happened online. The subsequent contact could have just as well happened online. Most of the examples happened with professors and students from the same department—there was some a priori mutual recognition or logical point of access due to physical proximity. But if everyone in my field is now attending the same California-based talk on Zoom, then suddenly my number of access points has greatly multiplied. The best we can do for students right now is ensure our virtual spaces are places where casual mentorship interactions can flourish.

To attempt to provide some evidence of the aptitude of online spaces for fostering casual mentorship, let me tell a brief story about the Algebraic Geometry Syndicate (AGS). AGS is a server that several professors and students, including me, have been running on a messaging platform. The server has multiple channels people can speak in, such

as "Math Chat," "Student Discuss," "Women and Gender Minorities Discuss," "Career Advice," etc. Participating students have consistently expressed gratitude for the Career Advice section—they can raise career-related questions in a casual, conversational setting, and faculty in algebraic geometry that they would not otherwise have access to give thoughtful, informative responses, which are accessible to the whole community.

Let me now turn from observation to action. To virtual event organizers: I encourage you to set aside spaces in your events specifically designed for those earlier in their careers to be able to interact with new faculty at the event. This may mean a social "teatime" after the talk where you sort people into various Zoom breakout rooms for smaller conversations, or it might mean a chatting platform that lingers for some days after the event for postmortem questions and discussion. In engaging younger mathematicians, a respectful yet casual mode of interaction—small groups, chats instead of forums—goes a long way in terms of mitigating intimidation. Take into account that people feel most comfortable talking to others near their level of seniority. Encourage the participation of younger grad students through the facilitation of older ones, and encourage the participation of older grad students through the participation of postdocs, etc.

To professional mathematicians at every stage: students really appreciate even small bits of your time. Some words of wisdom, mentioning a good paper, telling us about your work, introducing us to a colleague after a talk, even congratulating us on something we did, or just saying hi at an event—something that may seem mindless to you could mean a lot to us. Now, and once we are again physically together, you can increase connectivity by having casual mentorship interactions with people who don't usually have contact with you, or who might not feel confident enough to reach out.

To students: If anyone has ever done you a small act of mentorship that shaped you in some way, write them an email or message to thank them! Everyone appreciates being thanked, and the more we can make it heard what types of support are valuable to us through our thanks, the more we will receive that support. Mentorship is often regarded as exclusively referring to a lifelong, time-intensive, emotionally intensive commitment between a teacher and a student. I hope that I have convinced you that there is a second, often overlooked type of mentorship that is also important in students' professional lives, and we have a chance to develop it. If we choose to create spaces around this goal, we can ultimately come out of quarantine with a more highly connected graph in the world of mathematics, even if the weights on some of the new edges aren't as big—and this, too, has value.

## References

- [1] Mark S. Granovetter, *The strength of weak ties*, *American Journal of Sociology* 78 (1973), 1360–1380.



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## Creating Your Own Teaching Community

*Robin Pemantle*

### Teaching Communities

A teaching community is a group of peers with shared interests in teaching, available for advice, collaboration, venting, and other social support for the enterprise of teaching. Peers could be more senior or more junior than you—the term is meant to encompass permanent or temporary faculty or staff, on whose doors you can knock and to whom you can easily talk.

There are a lot of reasons you might want to be part of a teaching community. The reasons I give below will not include evidence from studies. I don't know any studies scientific enough to be credible. Instead, I will compare the situation in college teaching with goals and practices in precollege teaching, where many of the issues and solutions translate in recognizable forms.

### Teachers, K–16

We in higher ed have a lot to learn from the K–12 teaching profession. Granted, faculty at research universities devote a much smaller fraction of their effort to teaching. However, when we do teach, the principles of good teaching are not so different, nor are the steps needed to arrive there.

Primary and secondary school teachers earn certificates before they can be placed in a teaching job. In addition to content knowledge and child psychology, they learn many aspects of teaching that would be highly relevant to college teaching, such as

- learning to construct a lesson,
- acquiring classroom skills,
- learning to pose problems and set exams,

- choosing course goals and a useful relationship to the students,
- constructing a curriculum.

In higher education, teacher training is in a far more primitive state. There is no preservice teacher training, other than what someone might have picked up in graduate school. Absent an increase in coordination of the graduate school teaching experience, it falls on the employing institution to provide all the relevant training. At many institutions, this ranges from a few workshops at the start of the first year to none at all.

There are reasons, beyond mere historical accident, for this neglect. It would be hard to make time for a formal program of teaching improvement for young faculty at colleges and universities. It may not be very efficient either. The minutiae of college teaching vary greatly by discipline and level of student. The strong tradition of academic freedom may also put a damper on large-scale organization of teacher training. Instead, college teachers are often asked to self-organize into subcommunities where there is greater commonality.

### The Role of Community

Because teaching is the sole job of most primary and secondary educators, a good measure of community is built in. However, even in these jobs, the professional organization for teachers of mathematics believes there to be too little focus on community [1, p. 100]. For college teachers, the self-organized teaching community is the main avenue, beyond experience, for continued development of teaching skills.

In a sense, communities are organic. If you take the initiative to talk to those around you about teaching, you will have a teaching community. In my experience, however, the initiative is appreciated but often not reciprocated. The presence of community is like a bonfire on a rainy day, requiring constant stoking or it will tend to wane. Fortunately, there are venues that will keep the fire alive longer and with less effort. Further, these communities can be directed toward the points (classroom skills, lesson construction, etc.) most notably missing from the training of early-career instructors.

The remaining three sections of this article provide ideas for harnessing the power of teaching communities for maximal gain, often with minimal effort. The ideas are drawn from my experiences in several multiyear projects: calculus reform and active learning projects at Penn during the last ten years; preservice teacher curriculum development at Wisconsin and Ohio State from 1994 to 2003; and workshops in the 1980s given by personnel from Project SEED and various NSF-sponsored teaching initiatives.

### Lesson Study

Stigler and Hiebert, in their 1999 book *The Teaching Gap*, give a compelling account of a practice originating in Japan.

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