



**TPSE**Math

Transforming Post-Secondary Education in Mathematics

# PREPARING MATH MAJORS FOR CAREERS: WORKING WITH ALUMNI

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**RUTGERS**

School of Management  
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EDUCATION AND EMPLOYMENT  
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## RUTGERS EDUCATION AND EMPLOYMENT RESEARCH CENTER

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# TPSE Math

Transforming Post-Secondary Education in Mathematics

Transforming Post-Secondary Education in Mathematics (TPSE Math) aims to effect constructive change in math education at U.S. community colleges, 4-year colleges and research universities by working closely with faculty leaders, university administrations, membership associations, and disciplinary societies. TPSE Math identifies innovative practices where they exist, advocates for innovation where they do not, and works with and through partners to implement and scale effective practices in the pursuit of mathematically rich and relevant education for all students, whatever their chosen field of study. TPSE Math is funded by a grant from the Carnegie Corporation of New York.



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Rutgers' Education and Employment Research Center (EERC) is housed within the School of Management and Labor Relations. EERC conducts research and evaluation on programs and policies at the intersection of education and employment. Our work strives to improve policy and practice so that institutions may provide educational programs and pathways that ensure individuals obtain the education needed for success in the workplace, and employers have a skilled workforce to meet their human resource needs. For more information on our mission and current research, visit [smlr.rutgers.edu/eerc](http://smlr.rutgers.edu/eerc).

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## INTRODUCTION

Transforming Post-Secondary Education in Mathematics (TPSE Math), a project funded by the Carnegie Corporation, the Alfred P. Sloan Foundation and the National Science Foundation, is dedicated to enhancing math education in two- and four-year colleges to prepare students with the “*mathematical knowledge and skills necessary for productive engagement in society and in the workplace*” (<https://www.tpsemath.org/>). In 2019, TPSE contracted with the Rutgers' Education and Employment Research Center (EERC) to study career readiness programs for math students and to identify and study promising practices in math departments across the country.

EERC, housed within the School of Management and Labor Relations, engages in multi-site, multi-method qualitative and quantitative evaluation, and conducts research to inform curricula and programs at the intersection of education and workforce development. With input from members of TPSE's Mathematics Advisory Group (MAG), EERC developed and administered an online survey to faculty, department chairs and senior administrators at 143 public and private two- and four-year colleges across the nation as well as five non-profit organizations (survey respondents N=219). The survey asked questions about career preparation, career pathways, advising, research and internship opportunities, alumni networks, interdisciplinary collaborations, and partnerships with employers.

In addition, the EERC team conducted 26 in-depth phone interviews with faculty, staff, and students at seven colleges<sup>1</sup> identified through the survey as having innovative programs. We also viewed a TPSE webinar with a presentation from the Dana Center at the University of Texas – Austin. The webinar and interviews provided a more detailed cross-institutional perspective on career readiness activities and programs.

This brief on alumni is one of six briefs and an executive summary in the Preparing Math Majors for Careers series prepared by EERC that discusses the findings and recommendations that emerged from this qualitative research study.<sup>2</sup>

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<sup>1</sup>Babson College; Villanova University; Brigham Young University - Idaho; Harvey Mudd College; University of Nebraska – Lincoln; University of Arizona; and the University of Wisconsin

<sup>2</sup>All the briefs in this series are available from the EERC website at:

<https://smlr.rutgers.edu/content/transforming-post-secondary-education-mathematics-research>

## BUILDING ALUMNI RELATIONSHIPS

Building alumni networks and hosting alumni events can be a daunting task, and many department representatives reported they either did not conduct systematic outreach to alumni or did not reach out to them at all. However, respondents who reported that their departments had made such connections, described alumni as invaluable resources for current students, conduits to industry, a resource for feedback about majors and courses, and potential scholarship/department donors. In fact, an active alumni network was referenced across EERC's interviews and TPSE-M survey responses as a huge, often untapped, resource for both current math students and departments. Alumni can help students understand how to apply what they are learning in their math courses and provide information about different career pathways and specific jobs that use math skills. They can also provide helpful feedback to departments about majors and coursework. A faculty member at Harvey Mudd University noted,

*Tracking alumni can have huge payoffs. Bringing alumni back to campus and having them talk to students can yield job referrals. They can tell you what helped them succeed and what didn't work in their education. Someone that is three to five years out of school can have more perspective on the job market and trends in industry than prominent faculty at a research one university. Making those connections and keeping them strong can have enormous benefits for your department.*

He also noted that alumni *"are the connection between us [math faculty] and industry."* A faculty member from Wisconsin University said alumni offer *"a wealth of knowledge, and they want to help students."*

While the benefits of alumni networks remained a constant across EERCs interviews and TPSE-M survey responses, their creation, location, and maintenance varied across institutions. Maintenance of an active alumni network takes time. Some math departments build strong relationships with their campus career services center to maintain a current and strong alumni network. At some institutions, surveys and maintenance of alumni networks are handled by a central institutional department, and other schools do this work within each department. This work can also be done by alumni relations directors, internship coordinators, and even faculty.

There are many ways departments keep in touch with alumni and tap them as a resource. This brief examines the ways some math departments and colleges have approached alumni relations, and the benefits that have accrued from these efforts. This examination is followed by a discussion of some of the challenges these colleges have faced as well as recommendations to enhance and build alumni and departmental relationships.

## SURVEYS

Surveys are a common strategy that institutions, and some math departments, use to track graduates. Surveys can provide a wealth of information, including contact and employment information. Surveys can also help departments get feedback about classes and majors and provide information about how many students are entering the workforce versus pursuing further education after graduation. One faculty member said, *“this information can help guide what courses we offer.”* Some departments have mentoring networks that allow current students to get in touch with alumni working in fields that interest them. In these cases, surveys are used as a way for the department to collect information from alumni interested in becoming a mentor. Other departments that do not have an official mentorship program may look to their alumni network to connect alumni with current students interested in their career field. One faculty member discussed how alumni have become *“excellent resources to set students up with”* in his department. He said, *“if a current student is interested in the Peace Corps, Google, high-speed trading . . . I can easily connect them to an alum who has been there and done that.”*

How often an institution or department conducts alumni surveys varies by institution. Some send out surveys every few years, but many send out surveys annually. For example, Wellesley College’s math department sends out a *“questionnaire to students after graduation”* asking them to share their current positions. This alumni survey becomes a virtual career panel for the college’s current students and lays the foundation for the alumni network of each graduating class.

## FACULTY CONNECTIONS

Many faculty members and department chairs commented that they regularly reach out to alumni through personal connections. One said, *“I try to meet with alumni who live in the metro area for lunch at least three times a year. These are often one-on-one meetings, although occasionally I have met two alumni for lunch.”* Other faculty members maintain contact with alumni they know through email or social media outlets, a practice one faculty member described as *“massively beneficial for connections for current students.”*

## SOCIAL MEDIA

Many departments use social media for maintaining contact with alumni, either at the departmental level or individual faculty level. Social media accounts help departments remain visible to alumni and keep those alumni engaged. LinkedIn and Facebook are the two platforms most often used for alumni outreach. One faculty member said, *“we have an alumni office that does some of this work, but social media—Facebook—seems to work just as well.”* One department runs a separate Facebook group for each of its cohorts. LinkedIn groups for math majors have also been useful for some departments.

In an interview, one faculty member reported that LinkedIn tends to work well for alumni already in touch with the department. To facilitate the engagement of other alumni, he suggests identifying companies within a 100-mile radius of the school who are hiring, and then using LinkedIn to identify and reach out to alumni who are employed by these companies.

## PANELS/PRESENTATIONS/EVENTS

Alumni can be ideal mentors for students because they *“understand the local culture of a school, and they’re less intimidating than an outsider.”* Many colleges involve alumni in activities that allow them to interact with students, such as class discussions, events, and competitions. (For more on this see the EERC brief: *Preparing Math Majors for Careers: Practices and Policies for Career Readiness*).

Harvey Mudd College brings alumni back for pizza lunches with current students. Alumni attend the lunches to talk about their jobs: *“they’re talking about what’s it like to have a job at Facebook, a government lab, Google, Cal State, as a high school teacher, etc.”* Students can ask questions and receive direction about how to pursue different types of jobs and where to look for them, which can lead to a better understanding of various jobs and possible career pathways. One faculty member described these conversations with alum from the workforce as opportunities for students to *“get to see what it’s like—to ‘try on’ that different identity.”*

The event at Harvey Mudd *“connects students to role models, individuals.”* In addition, Harvey Mudd faculty members teaching elective math courses often invite alumni into the classroom to speak to students or to be a judge or reader of final projects. For example, the Math of Sports class recently brought in an alumnus who runs analytics for a college baseball team to talk about his job.

Departments at other institutions also routinely host alumni panels and networking events, where multiple alumni gather to discuss their careers and the paths they took to get there. Speaking of alumni events at their institution, one faculty respondent said, *“the panels and networking are fruitful.”* Another said their department holds an alumni networking event every semester because the jobs alumni discuss *“become real”* to current students. Some colleges maintain contact with alumni who return regularly to participate in career focused fairs, vocational seminars, annual awards dinners, and *“career night”* events, in addition to alumni panels. One faculty member said, *“bringing alumni in to talk about their career paths is a powerful way to exhibit options”* to current students. It can also lead to alumni donations and a potential pipeline of adjunct faculty. One faculty member said, *“we sometimes hire alums as part-time faculty.”*

Faculty also encourage students to seek opportunities to learn about math-related careers off campus. One faculty member spoke of a course assignment that requires students to attend at least one or two alumni-related “*outside events*.” Listening to others’ stories, she said, helps students relate to life beyond the college campus and helps them envision their own career paths.

One Villanova student said he “*went to an off-campus talk from this lady who had a non-traditional upbringing, and [she talked] about her math education and how she is successful now, and that was helpful too.*” He noted that attending events like the one he described “*gets you out there to hear all this stuff, and I have heard so much about things I never thought of in math.*”

At many colleges, math faculty encourage their current students to attend math club meetings or participate in a campus event sponsored by a club, especially when alumni have been invited. At Villanova University, several clubs on campus focus on mathematics. The Association for Women in Mathematics hosts alumni career panels and invites guest speakers. A student discussed her experience attending an event sponsored by the Society of Actuaries to “*discuss the test and becoming an actuary.*” She said attending that event and others has helped her understand the variety of career paths available to her: “*I have so many options I didn’t know about.*”

At Babson College, the math department is working to strengthen its alumni network. Recently, faculty worked with career office staff to locate alumni. Once the list was complete, the department organized an “*after work*” catered alumni event in Boston with university speakers and entertainment. The purpose of the event was to create a list of alumni willing to come to the university to speak to students and take part in student-centered events. Math department faculty hope these efforts will create a strong base of alumni they can build upon moving forward.

## “CAREER PERSPECTIVES”

### LECTURE SERIES

At the University of Nebraska, Lincoln, the math department hosts a special “Career Perspectives” lecture event once or twice per semester. The lecture highlights a visiting alumnus and their career path. The lecture series originated because an alumnus was interested in sponsoring something that would help undergraduate students think about their career options.

Usually the department invites an alumnus they know is going to be in town for other reasons, such as to attend an alumni board meeting. Generally, the speakers are people who have been successful at non-academic careers, to highlight that “*math alums can be successful at anything.*”



Further, some colleges, like the University of Wisconsin, have established partnerships with local employers, who encourage students to attend career-related events held at local company's worksite. At these events, alumni discuss their career paths and their experience as an undergrad. Company-based events give students the opportunity to both visit a local employer and hear from alumni working there.

## JOBS/INTERNSHIPS FOR CURRENT STUDENTS

Alumni are an excellent source of employment and internship opportunities for current students. (For more on this see the EERC brief: *Preparing Math Majors for Careers: Practices and Policies for Career Readiness*). Some departments that use this network of potential employers have found alumni who *"have been providing internships for math sciences majors for over a decade."* One math faculty member said alumni *"are our biggest asset when placing students in internships and permanent employment."* Many faculty members have found *"alumni are enthusiastic to share their career experiences with undergraduates."* Another said, *"alumni connections are valuable for students to have connections in industry."* One faculty member discussed the relationship with alumni as being part of a process of support: *"We start by asking our alumni for help with internships. Then jobs. Then scholarships."* That relationship is something departments can build upon for ongoing support.

## NEWSLETTERS AND REUNIONS

Most survey respondents indicated that departmental newsletters are a primary mechanism to connect with alumni. Through their newsletters, departments invite alumni to participate in career-related panels and events, engage in mentor networks, donate funds for scholarships, and support other departmental fundraisers. In addition, they are used to highlight the careers of departmental alumni and recognize donors. One faculty member described the benefits of the newsletter as *"essential for job placement and for building financial donations to the department."* Newsletters are also used to announce alumni events, such as Wake Technical Community College's *"Alumni-in-Residence Day"*: a full-day campus event during which math department alumni interact with students and other alumni.

Alumni reunions were also cited as a means to keep alumni active with departments and to kindle or rekindle donor relationships. Several colleges noted that they hold 10-year alumni reunions expressly to build their alumni networks.

## FUNDRAISING

Benefits of alumni donations can be significant. At some colleges, alumni have helped to fund internship stipend scholarships, and the purchase of special materials and equipment. For example, one respondent reported their department had *"built up accounts in the university [alumni] foundation large enough for us to award around \$180,000 in department scholarships to our majors every year."*



## CHALLENGES

Although some colleges have made significant use of their alumni connections, many respondents report that their departments lack a systematic approach to creating and maintaining an alumni network or do not fully realize the potential of those alumni with whom they are already connected. Staffing and time were cited as two major issues affecting initial outreach. As one faculty respondent observed, however, *“once you start getting alumni contacts, they start falling out of the woodwork.”* A faculty respondent with a large and sustained alumni network noted that building such a network requires *“a lot of bandwidth”* and that further effort is required to ensure the network is properly maintained: *“Our alumni are enthusiastic. That being said, you need to curate the enthusiasm appropriately.”*

Locating alumni can be a challenge for some departments. Faculty can help locate alumni that may not be easy to find. When faculty at Babson College were compiling their list of alumni to invite to their networking event in Boston, they discovered an unanticipated challenge: Because many math alumni were employed in fields that did not appear to relate to mathematics, they were harder to track and locate using typical search mechanisms. For example, a student with a degree in analytics may be employed by Blue Cross. Therefore, they are recorded as working in healthcare. When math faculty wish to reach out to alumni in math-related jobs, alumni employed in *“healthcare”* would likely be excluded from their contact list. As a result, math faculty and career department staff spent considerable time tracking down students that may have been missed in general searches.

Finding the best timing for an event can also be challenging, from what time of day (i.e., mornings, midday, evenings, weekends) to what time of year. A Harvey Mudd faculty member said although they have been holding the alumni event that became their *“pizza lunch”* for years, they had some challenges with it starting out. They had initially scheduled the events in the evening, and they were lightly attended. When one alumnus could not make the scheduled time, they changed it to lunchtime to accommodate him. The attendance was much higher than it had been when the events were scheduled later in the day. The department has offered the events at lunchtime ever since, and they have yielded consistently high attendance. The faculty member added: *“It sounds ridiculous, but offering pizza makes a big difference. They [students] come for the pizza. He noted that departments must try different things until they find the method that works best for them.”*

## RECOMMENDATIONS

Although the process of developing an alumni network can be daunting, the results can be tremendous. Alumni networks bridge the gap between academia and industry and offer a wealth of opportunities for undergraduate career education, student mentorship opportunities, student employment and internships, scholarships, and departmental donations. From simple outreach to more time-intensive, full-scale events, departments can draw on their alumni network a variety of ways.

Creating a systematic approach to developing alumni relationships is key to maintaining a strong alumni network. Following are suggestions to build and expand alumni networks:

**Use faculty connections and networks.** Faculty members develop relationships with students as they move through their education, taking classes, participating in research opportunities, and creating capstone-type presentations and portfolios. Encourage faculty members to maintain these relationships, keep current contact information, and personally invite former students to both attend alumni events and participate in fundraising campaigns.

**Use data from institutional surveys or conduct department-level surveys.** If your institution conducts regular alumni surveys, reach out to the institutional department that sends the survey to find out whether and how the math department can play a role in defining questions. Suggest ways the survey data might be shared with departments to develop strong alumni networks. Math departments might also consider creating their own surveys in place of or to complement institutional surveys. Surveys may be sent out annually or every few years to create a portfolio of alumni.

**Use social media.** Social media such as LinkedIn can be used to find local alumni. LinkedIn and other social media outlets, such as Facebook, can also be used to maintain alumni networks and send departmental invitations.

**Host events.** Once an alumni network has been established, host events such as alumni lunches, panel presentations, lecture series, and networking socials. These events can be leveraged to keep in touch with alumni, introduce them to current students, highlight the variety of career path options available to current students, and introduce alumni to potential future employees. An alumni network can also be drawn upon to organize social events where alumni can connect with one another; these can be good opportunities to recruit them for undergraduate-focused future events.

**Send a newsletter.** Send a regular department newsletter to your established alumni network to keep them engaged and up to date on departmental events. The newsletter can also be used to spotlight alumni accomplishments as well as those of current students, announce scholarship recipients, and showcase donors.

**Use your alumni network as industry connections.** Draw on your alumni network to supply current students with jobs, internships, and mentors. Industry alumni can also provide feedback to faculty to ensure they remain current in fast-changing fields as well as identify real-world problems that can be modeled as class assignments and research projects.

## CONCLUSION

A misconception among some math department staff and faculty is that integrating career readiness and career pathway content takes a tremendous amount of faculty time and departmental resources. The results of the TPSE-M survey and data collected from EERC's interviews demonstrate the existence of multiple strategies departments and faculty can employ to add or enhance career readiness content without using extensive resources. Rather than a major commitment of time and financial support, these strategies require a shift of focus, some creativity, and a commitment to help students prepare for the future. While a systemic and integrated program is ideal, EERC's analysis suggests that minor changes can have a big impact.

Each of the six briefs in this series prepared by the EERC showcase different strategies that have proven successful and that, with a minimum of resources, can be replicated and scaled to fit diverse institutions, e.g., offering elective career exploration/preparation courses, adding assignments that involve real-world problems, integrating course content on different career pathways, using online modules, inviting guest speakers, engaging with local employers, identifying research opportunities, offering internships, and engaging alumni in departmental activities. In addition, at colleges where there is an established career center, it is important that the math department and individual faculty make use of its resources including center staffs connections with industry employers. Active department-center collaborations can also reduce duplication of efforts, especially around the development of industry partners, leverage expertise, and facilitate student referrals.

Some of the strategies identified in EERC's briefs are more resource dependent, including departmental curriculum reviews and restructuring or adding new degree programs (e.g., applied mathematics, data science). Given the dynamics of the Covid19 pandemic, including decreased college funding, shifts in student enrollment, and changes in how students perceive majors and career pathways, it is important for each college to fully assess which career readiness strategies are most relevant and feasible. However, regardless of how it is done, incorporating career knowledge and skills into higher education pathways is key to preparing students for careers in mathematics.

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