

OVERVIEW

The **Training Research Educators in Minnesota (TREM)** program is an NIH funded Institutional Research and Academic Career Development Award (IRACDA). The IRACDA mechanism recognizes that current training of future faculty is inadequate, and understands the considerable benefits and need for diversity throughout academia and the biomedical workforce. The goals of IRACDA are two-fold: (1) Train the next-generation of higher education faculty through a strongly mentored research program (75% effort), coupled to substantive training and experience in teaching (25% effort). (2) Increase the number of underrepresented minority (URM) students who ultimately become leaders in the biomedical research enterprises of Minnesota and beyond. TREM will enable our brightest postdocs in the biomedical sciences to have a balanced training in research and teaching.

TREM scholars will devote 75% effort to their own research program, and will be mentored by one of 32 University of Minnesota faculty across a broad spectrum of biomedical disciplines. As well as research, TREM scholars will devote 25% effort to development of teaching skills. In combination, this will enable the scholars to become skilled research educators. TREM is a three year, full-time program with a 3:1 effort balance each year between research and teaching, respectively. Annually, three new scholars will be admitted to TREM, leading to a steady state of nine scholars when fully populated. The University of Minnesota is partnering with three Minneapolis-St Paul community colleges (Minneapolis Community & Technical College, North Hennepin Community College, Normandale Community College). Student composition in these colleges is 28-46% NSF-defined racial and ethnic minority, and approximately 50% economically disadvantaged. In year 1, the scholars will take the Preparing Future Faculty program at the U of M, and during the summer will each host a community college URM student in a ten week, full-time research internship. In years 2 and 3, the scholars will work with an experienced teaching mentor for one semester to update and develop 1.5-2 credits of course material at the partner institutions, and gain substantive teaching experience in both classroom and laboratory environments. TREM's immediate goal is to tap into the diversity currently in our community colleges, whilst preparing superlative future faculty. In the long-term, we envisage TREM scholars become successful tenured faculty who inspire their students, whilst the TREM program as a whole will increase the number of Minnesota URM students who pursue postgraduate education and become leaders within the biomedical workforce.

TREM Program Pipeline (Research, Teaching, Courses / Workshops)



TRAINING

Duration of TREM training: Scholars will be fully supported for three years whilst formally in the TREM program.

Number of Scholars: We will appoint three new scholars each year (September 1st).

RESEARCH PROGRAM (75% effort)

The primary goal of the TREM program is to prepare scholars for productive careers as independent research educators in higher education (tenure-track faculty). All our research mentors have vibrant, well-funded labs, and are internationally recognized leaders in their scientific fields. All our research mentors have substantial bodies of peer-reviewed research publications, as do their past mentees. All our research mentors are highly experienced in mentoring postdoctoral scientists. As such, the TREM mentors have collectively demonstrated their commitment to all aspects of mentoring young scientists.

Throughout, the emphasis of the TREM research program is career development and progression of the scholars. Broadly, this includes carrying out high-quality research, publishing high-impact manuscripts, attending scientific meetings, and ultimately applying for faculty positions. To ensure scholars gain the most from the research program of TREM, there will be a number of specific components required of scholars and their mentors.

1. **Scholar Advising Committee (SAC).** The scholar will assemble an advising committee consisting of three faculty members including the mentor. Due to the broad diversity of research, members of the SAC do not have to be TREM mentors. The scholar will be required to meet with this committee formally once per year to discuss progress and receive feedback, and will be encouraged to interact informally with committee members (and other faculty) on a regular basis.
2. **Individual Development Plans (IDP).** The scholars will create an IDP at the beginning of the TREM program. They will review this with their mentor, will update it minimally once a year and discuss it with their mentor at the time of the annual review. They will be encouraged to also share the IDP with their Scholar Advising Committee.
3. **Training in effective lab management.** After spring break of year 1, the scholars will take a 7-session in-person interactive course entitled "Research Group Management in the Biological Sciences". The class covers creating a lab culture, best experimental and data tracking practices, mentor-mentee relationships, and scientific collaborations.
4. **Grant writing.** At the start of the summer of year 2, the scholars will take an introductory full-day workshop on early career grants, such as the NIH K-series awards. The workshop will provide an overview of funding sources, interpreting RFP or program announcements, peer review, developing specific aims, crafting the research proposal, and additional components of the submission. The TREM workshop will focus on funding agencies relevant to the scientific field of the participating scholars, including insider tips from their research mentors. During the afternoon the scholars will draft a specific aims page based on their own research. This will go through rounds of critique and revision by each other, the research mentors, and the year 3 TREM scholars. Regular, mentored, peer-review sessions during the summer will critique different sections of scholars' proposals. By the end of year 2, the scholars will have developed a grant application for submission in year 3, such as the NIH K99/R00 Pathway to Independence Award, or a fellowship from a funding body within their scientific field.
5. **GRAD 8200: The Academic Job Search.** In year 2, scholars will take this 1-credit class, which is an adjunct class to the Preparing Future Faculty series that the scholars take in year 1. Participants analyze faculty roles at various institutions, discover resources related to academic career planning, develop an individual, tailored job search portfolio to support an academic career plan, and rehearse speaking components of the job interview process.
6. **Participate in a regular multi-lab meeting,** such as a journal club or colloquium, at which scholars make regular oral presentations. Scholars are expected to take advantage of the vibrant scientific communities at the U of M, and these meetings also provide them with additional forums for honing oral presentation skills.

The TREM scholars will attend the annual IRACDA Conference, and will be expected to attend at least one national/international scientific conference a year appropriate to their scientific field, presenting their work either as a poster or oral presentation. Mentors and scholars will be encouraged to co-author at least one literature review or opinion piece for publication. As part of TREM training, mentors and scholars are

encouraged to co-peer-review several manuscripts that have been submitted to research journals. However, the primary research program goal for the scholars is to build a portfolio of achievement in their scientific field through high-quality research leading to high-impact publications.

TEACHING PROGRAM (25% effort)

The teaching mentors at the community colleges are award-winning, full-time faculty with extensive teaching experience. The teaching mentors will work with the scholars on teaching techniques in both lecture and laboratory formats. Examples include: designing courses and syllabi, preparing lesson plans, implementing active learning activities, understanding the learning challenges of adult students and implementing pedagogies to meet their needs, effectively utilizing technology and course management systems, developing and teaching online courses, developing materials for assessment of student learning, developing lab experiments, training on lab equipment not familiar to the scholars, addressing classroom management issues, arranging classroom assessments and observations, effectively interacting with students during office hours and review sessions. In addition, scholars will be invited to participate/present in science division and department meetings and institutional faculty professional development sessions, as well as student clubs related to STEM.

We have identified more than two teaching mentors at each of the partner institutions to cover the broad range of scientific interests of the research mentors (and therefore the scholars). The ultimate goal is to effect change across a wide spectrum of STEM courses, including biology, microbiology, biochemistry, biotechnology, physiology and chemistry, and promote interdisciplinary content that reflects the nature of current biomedical research.

NOTE: If any of the required courses below have been recently taken, the scholar can request a substitute course, or propose another teaching activity.

YEAR 1:

In year 1, the scholars will:

1. Undertake courses run by the U of M to prepare for the practicum in years 2 and 3 at the partner institutions;
2. Be matched with a partner institution teaching mentor and teach during three class periods;
3. Mentor an underrepresented minority student from one of the partner institutions undertaking a 10-week research project in their home lab during the summer.

GRAD 8101: Teaching in Higher Education (fall semester, 3 hour block per week)

GRAD 8101 is designed and conducted with the intent of creating a "transformational" learning environment. This 3-credit course teaches postdoctoral fellows to become responsive and reflective teachers. The instructor, along with course participants, will model a variety of active learning strategies, and facilitate discussions addressing educational theory and practice. By combining action and analysis, participants will explore and develop teaching skills that promote learning within a diverse student body across a variety of settings.

As a result of taking this course, participants will be able to:

- Begin to articulate a philosophy of teaching;
- Synthesize their academic and professional experience in a curriculum vitae;
- Construct, apply, and interpret the results of assessment tools measuring student learning and teaching effectiveness;
- Design a syllabus demonstrating the relationship between course objectives, content, and methodology;
- Demonstrate knowledge of active learning theory and practice;
- Analyze and manage classroom environments;
- Gain comfort and confidence with regard to teaching.

GRAD 8200: Practicum for Future Faculty (spring semester, 1-credit)

GRAD 8200 is designed to give participants opportunities to apply the theories and methods learned in GRAD 8101, and to further enhance understandings of the faculty role in higher education. **As part of this course, the scholars will teach three class sessions under the guidance of their year 2 teaching mentor at the partner institution.** The mechanism for partnering scholars and mentors is detailed below (**section B.c.2.2**). This will enable the scholars to visit the partner institution, meet students and have an initial mentored teaching experience. The class will not necessarily be the same class that the scholar will teach in the subsequent year. MCTC, NHCC and NCC have all participated in GRAD 8200 in past years and are approved partners of the U of M Preparing Future Faculty program. Although not preferred, scholars can complete the practicum of GRAD

8200 at any of the partner institutions or U of M, if there is a good reason for doing so. Course participants meet face-to-face four times during the semester; participants should expect online course work between face-to-face sessions.

Upon completion of this course, participants will have:

- Familiarity with a broad range of educational issues (e.g., promotion and tenure, the emergence of non-tenure hiring lines and their impact on the academy, the changing nature of academic institutions, and faculty roles within them) and how those issues impact their career planning;
- An increased understanding of institutional cultures and the responsibilities of faculty members at community colleges, baccalaureate colleges, master's colleges/universities, and doctoral research universities;
- An increased understanding of what it means to be an academic professional and a colleague in a variety of institutional contexts;
- An appreciation for the full range of faculty role and service activities at particular kinds of institutions by establishing a relationship with a faculty mentor at an area institution.

Quality Matters (QM): Teaching Online: An Introduction to Online Delivery (year 1)

The U of M is a subscriber to the QM online courses. This workshop explores basic components of online course delivery. Participants will be introduced to differences between traditional face-to-face learning and online learning, the instructor's role in the online classroom, the importance of getting (and keeping) students engaged, and methods of facilitating online discussions using the discussion board. The workshop occurs over a two week period and requires 16-20 hours of time to successfully complete the workshop. The workshop is run multiple times a year, and the scholars must have completed the workshop by the end of year 1. Further in-person training will occur with the teaching mentors during years 2 and 3, and through resources and training available at the partner institutions, as required.

Mentoring an underrepresented minority student from the partner institutions for laboratory research (summer)

The summer of year 1 will also include scholar training in one-on-one research mentoring of a partner institution URM student chosen through a competitive process organized by the college TREM program coordinators. Through discussion with the research mentor, the scholar will design a 10-week research project for the student, including a defined goal and the experimental design. The student will work alongside the scholar in the research lab learning critical lab skills and understanding what it is like to conduct cutting-edge research. The U of M research mentor will provide guidance and oversight in the mentoring and research experience of the student, and feedback to the scholar. The students will be part of the Life Sciences Summer Undergraduate Research Program (LSSURP) at the U of M College of Biological Sciences (<http://cbs.umn.edu/academics/departments/btl/outreach/lssurp>).

YEARS 2 and 3:

Although the program will be tailored both for individual scholars and for maximizing the impact on partner institution students, we envision some basic, common components:

1. The scholar will co-teach a course with a teaching mentor in either the fall or spring semester.
2. The scholar will gain substantive teaching experience in both classroom and laboratory formats.
3. Scholars will teach 1.5-2 credits per year (half a 3-4 credit semester course or 1 credit course+2 credit lab)

Partnering TREM scholars with teaching mentors

In the late fall of the year **prior** to teaching, there will be a social get-together of the Program Director (PD), college Program Co-ordinators (PCs), teaching mentors and TREM scholars, during which informal presentations will be made by the teaching mentors about the courses they teach, and the year 1 and 2 scholars about their scientific backgrounds and interests. Following this, and by mutual agreement, year 1 and 2 scholars will be partnered with appropriate teaching mentors for year 2 and 3 teaching (facilitated by the PCs and PD), and the courses that will be co-taught/updated in the coming year identified during the spring semester. The year 1 scholars will teach three classes with the mentor in the spring as part of the Preparing Future Faculty series course "GRAD 8200: Practicum for Future Faculty".

Scheduling will be flexible to create the best mentoring experience for the scholar, to enable the partner institutions to gain the broadest impact across their courses, and for TREM to reach the most URM students. For example, in one year all the mentoring may occur in a single semester at a partner institution. In year 3,

scholars will be matched to a different mentor to expose them to different teaching styles and skills. Scholars do not need to stay at the same partner institutions from year 2 to year 3, but there are benefits to staying. The scholar will be familiar with the environment and institutional workings, therefore allowing more focus on course content and teaching pedagogies, as well as fostering a feeling of “belonging to a community”.

Teaching in the classroom

The mentor and scholar will meet ahead of time to plan the class, focusing on the content and knowledge level of the class. The scholar will be encouraged to develop new content, particularly with regard to introducing the latest research and active learning strategies appropriate to the size of class and structure of the lecture space. Both the mentor and scholar will attend all classes, with the mentor and scholar teaching alternating lecture blocks where possible (delineated by changes in topic) throughout the semester. This will give the scholar time to incorporate mentor feedback and make adjustments for the upcoming lecture topic. Under the mentor’s guidance, the scholar will hold office hours, as well as prepare and grade homework, quizzes, and exam questions. Towards the end of the lecture course, the scholar will develop new material in consultation with the mentor. In total, the scholar will formally teach ~ 50% of the class (assuming 3-4 credits). The scholar will receive formal student feedback, which can be added to their teaching portfolio. This is only one scenario. Other scenarios include teaching a 1-credit course and combining with a 2-credit lab, developing a new 2-credit course with a mentor, or two scholars pooling their 25% effort to create a new 3-4 credit course with a mentor.

Teaching in the laboratory

The scholar will work with a teaching mentor to teach/develop a lab-based course. As appropriate, the scholar will be encouraged to work with the mentor to update lab coursework using instrumentation and materials available to the students, as well as exposure to additional techniques used at the U of M. In particular, the possible inclusion of 1 or 2 field trips to the U of M will be explored to expand the lab class beyond what is available at the partner institutions. In addition, there may be opportunities of involving students in ongoing research and citizen science.