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Developing a Training Program to Diversify the Biomedical Research Workforce

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Abstract

The National Institutes of Health has made considerable investments to diversify the biomedical research workforce. Towards this goal, the authors partnered with representatives from several minority serving institutions (MSIs) to develop training for the next generation of researchers. To ensure the most effective training program, the authors conducted a needs assessment with junior and senior investigators from the partnering MSIs. In 2016, the authors conducted focus groups and interviews with 23 junior investigators as well as in-depth interviews with 6 senior investigators from the partnering institutions with the goal of identifying specific areas of training and support that would help junior investigators at MSIs develop and sustain research careers. The data were transcribed and coded and thematic analysis was conducted. The authors determined four areas in which training and support were needed: training in the "informal curriculum" (skills not covered in traditional clinical research courses), protected time for research training, opportunities to create career-advancing work products, and networking opportunities. The themes that were identified informed the development of the LEADS (Leading Emerging and Diverse Scientists to Success) program. The program consists of ten instructor-led online modules each lasting approximately one month in duration with weekly synchronous sessions. Scholars are expected to be able to devote at least 20% of their time to the program.

In its 2011 Strategic Plan, the National Institutes of Health identified diversity as "an indispensable component of research training excellence" that "must be advanced across the entire research enterprise."[1] Yet despite significant investment of effort and funding by major academic medical centers, foundations, and federal agencies including the National Institutes of Health (NIH), Department of Health and Human Services (DHHS), National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), and Agency for Healthcare Research and Quality (AHRQ), the number of underrepresented minority (URM) researchers in medicine remains alarmingly low.[2,3] Although many URM students start college majoring or intending to major in a science field, they leave science and research in disproportionately high numbers,[4] contributing to the oft-mentioned leaky pipeline.[2–4] The lack of diversity is especially severe with respect to African Americans, Hispanics, and Native Americans. Despite together comprising over 30% of the U.S. population, African Americans, Hispanics, and Native Americans only accounted for 9% of the PhDs earned in science, technology, engineering, and mathematics (STEM) fields.[2] The picture gets even bleaker continuing down the pipeline. According to a 2017 report from the NSF, of faculty positions in scientific research in 2015, only 4% were held by African American researchers, 4% by Hispanic researchers, and .2% by Native American researchers.[5]

These disappointing numbers point to the importance of finding new and better ways not only to attract more people from URM groups to biomedical research, but to ensure that they flourish while in this field. Productive scientists are made, not born[6]; thus, as McGee suggests, the focus should be on understanding what is happening *within* the pipeline, rather

than simply measuring flow *through* the pipeline.[2,4] Yin and colleagues have called for the development of new mechanisms to increase the success of women and members of URM groups to "ensure a diverse and vibrant [clinical and translational research] workforce."[7] This emphasis on talent development calls for new approaches to science training.[7]

There have been efforts at several institutions to ensure that URM researchers within the pipeline flourish, but they are far from common. A 2012 environmental scan of faculty diversity programs at U.S. medical schools found that less than one third had programs targeting underrepresented minority faculty—and only one of these was at a historically Black medical school.[8] Beech and colleagues' 2013 systematic review identified mentoring programs for URM faculty at only 13 academic medical centers.[9] Few programs cast a broad net along the length of the pipeline. One exception is the Research Education Program to Increase Diversity in Health Researchers (REPID) at the College of Human Medicine at Michigan State University, whose trainees include undergraduate, graduate, and medical health professions students and lifelong learners from underrepresented, minority, and diverse backgrounds.[10] These programs commonly consist of some combination of standard basics of research training; career development classes or workshops; and mentorship, networking, and/or peer support, and are offered by individual institutions to their own audiences. While some institutions with clinical and translational science awards (CTSAs) (such as Vanderbilt University and University of California, Los Angeles) have partnered with minority serving institutions (MSIs) before, most of those partnerships have involved the provision of clinical and translational research degree programs, and did not address training needs outside the traditional curriculum.

Our own CTSA institution at the University of Pittsburgh established a partnership with 5 MSIs (Charles R. Drew University, Howard University, Morehouse University, University of Hawaii Manoa, and Universidad De Puerto Rico Medical Sciences Campus) to create an intensive, one-year online training program called Leading Emerging and Diverse Scientists to Success (LEADS) for junior faculty and post-doctoral trainees (junior investigators) at the partnering institutions. The goal of LEADS is to help early-career scientists at MSIs launch successful biomedical research careers, thus expanding research capacity at their home institutions. However, before designing the program, we wanted to make sure we fully understood the needs and wants of prospective trainees, and to develop our training in close collaboration with, and with ample input from, our MSI partners. To this end, we conducted a needs assessment with junior and senior researchers from each of the partnering MSIs. Our goal was to identify specific areas of training and support that would help junior investigators at MSIs develop and sustain research careers. We present the methodology and results of the needs assessment below.

Needs Assessment

Our approach

We began the needs assessment process by forming a leadership team with a senior researcher from each of the participating MSIs. Before conducting the focus groups and interviews, we conducted a series of virtual meetings with the leadership team in which we discussed the skills and abilities junior investigators need to launch successful research

careers and identified specific areas of training that were not taught at the participating institutions, or required further reinforcement. A list of competencies began to emerge from these meetings that was consistent with two other needs assessments conducted at MSIs.[11,12]

To determine whether the competencies we identified aligned with the perceived training needs, motivations, and constraints of potential trainees, we collected data from junior investigators via focus groups and interviews. Moreover, on the assumption that junior investigators "don't always know what they don't know," we also consulted additional senior investigators from the partnering institutions via in-depth interviews.

Junior investigators.—We conducted focus groups and interviews with 23 junior investigators from 4 of the 5 participating MSIs (we were unable to coordinate times with the remaining institution), between March and August of 2016. Our intention and preference would have been to conduct focus groups at each institution, guided by the thinking that the social interaction of a focus group would provide a good opportunity for junior scholars to compare and contrast their experiences. However, at one of the participating institutions, we opted for individual interviews instead of a focus group as participants' schedules proved impossible to coordinate. Additionally, one focus group had too few participants to accurately be described as a focus group, and hence was technically a group discussion. Although unintended at the outset, the use of multiple data collection methods allowed for us to compare what scholars shared across institutions, but also what they said in larger groups, smaller groups, or when interviewed individually.[13,14] As can be seen from the wide range of dates during which data was collected, recruitment was difficult, perhaps due to the sensitive nature of the topics to be discussed. Discussions were moderated and interviews conducted by experienced moderators from Qualitative, Evaluation, and Stakeholder Engagement Research Services (Qual EASE) at the University of Pittsburgh (M.H. and research assistants). Both focus groups and interviews were conducted remotely, via video conferencing for the focus groups so that participants could pick up on each other's cues in the group discussion, and via telephone for the interviews. Participants were postdocs and early career faculty at MSIs. Our goals were to identify training areas with the highest potential impact, to gauge the interest of potential participants in the program, and to identify a manageable workload. Participants were asked about the importance of research to them personally, their perception of the importance of research at their institution, institutional resources supporting their research, barriers to their launching or sustaining a research career, and their current training needs with respect to research. They were also asked about gaps in their training and how these gaps could be filled. No demographic data were collected, to ensure the anonymity of individual comments**.** They were then presented with a summary of what we were envisioning for the program, and asked what might encourage them or discourage them from participating in such a program, as well as any specific topics they would like to see covered in the program. For the focus group guide, see Supplemental Digital Appendix 1; for the scholars with whom we did interviews, the same guide was used. From these data sources, we collaboratively distilled a set of skill areas that informed the design of the curriculum.

Senior investigators.—To supplement data from junior investigators, we interviewed six senior investigators from four participating institutions, from March to August of 2016, to gather their perspectives on the role of research in the careers of junior investigators at their institution, and to get their feedback on preliminary plans for the structure and content of the program. As with junior investigators, it was difficult to find senior investigators willing to be interviewed, perhaps due to the sensitive nature of the topic. Demographic information was not collected to ensure preservation of anonymity. Senior investigators were asked about the research environment at their institution, barriers to junior investigators launching and sustaining research careers, and the training needs of junior investigators at their institution. For the interview script used with senior investigators, see Supplemental Digital Appendix 2. Interviews were conducted telephonically by experienced moderators from Qual EASE.

Data analysis.—Focus group discussions and in-depth interviews were transcribed verbatim. The “editing” organizing style was used to inductively develop a codebook representing the range of topics found in the transcripts.[15] Two independent coders (M.H. and an experienced coder from Qual EASE) then applied the codebook to all transcripts using the qualitative analysis software ATLAS.ti (Scientific Software Development GmbH, Berlin, Germany), and all differences in coding were adjudicated by the coders to full agreement to ensure consistency in coding. The primary coder (M.H.) then developed themes and sub-themes from the data, using a combination of thematic analysis[16,17] and the constant comparative method.[18] Analytic results were discussed with the broader study team, including the leadership team of senior scholars from partnering MSIs, as a form of analyst triangulation.[19]

The University of Pittsburgh’s Institutional Review Board deemed that this was not research, but rather information gathering for program development.

Findings

Results from virtual meetings, focus groups, and interviews are discussed below. Study subjects from each institution are summarized in Table 1, where institutions are identified by a letter only in order to preserve anonymity of the participants. When direct quotes are presented, the institution and scholar type that they came from are provided in parenthesis. Although we made an effort to quote widely from the different institutions and scholars, some participants were more loquacious than others, and hence are represented more frequently in direct quotations. Results applied broadly across the institutions.

The virtual meetings we conducted with institutional leaders at the MSIs uncovered a need to teach specific skills not typically taught in a Master of Science in Clinical Research or a Master of Public Health degree program. These leaders expressed an interest in teaching the mentees skills that mentees frequently learn from their mentors, such as how to identify an area of research and formulate a hypothesis. They unanimously agreed that students did not need training in areas such as biostatistics that were well represented in the formal curricula; rather, they needed more systematic training in skills that are not formally taught but are essential for successful research careers (e.g., critical and creative thinking, problem formulation, collaboration, and communication).

Junior investigators with whom we spoke were overwhelmingly interested in engaging in research. Both senior and junior investigators described widely varying degrees of support and access to resources for research at their institutions. However, regardless of the resources available, they identified a common set of barriers that educational programming could help them address, as well as a core set of features that they would like such programming to have. These barriers and programmatic features clustered around the following themes: informal curriculum, protected time, work product, and networking opportunities.

Informal curriculum.—Both junior and senior investigators described a lack of systematic training in the "informal curriculum," particularly in topics such as grantsmanship, the successful administration of funded grants, management of a laboratory or research team, time management, developing research questions, and writing papers. This lack of systematic training was linked to greater mentorship needs than the institutions could sometimes support. Junior investigators noted that these issues were frequently related, and expressed interest in a curriculum that might cover these topics holistically. As one junior investigator (institution B) described the link between publishing and successful grantsmanship, "I think the major reason [for us] not getting funded is that we're not able to tell our story properly [and are] not getting published in good impact journals that improve your grants." Similarly, a junior investigator (institution C) highlighted the relationship between administering grants and launching a research career, and expressed a desire to have more training in financial management of research.

Senior investigators additionally identified the need for training in what might be termed the "politics of science." One senior investigator (institution A) described the conundrum in which "it's becoming more and more difficult to secure NIH funding," and yet "our students don't have those opportunities, to develop those … networks and partnerships" that allow you to "[get] your name out there" and have a better chance at getting a foothold.

Additionally, senior investigators noted that mentoring within their institutions is a challenge, owing to the dearth of mentors who can teach young investigators the skills and knowledge that constitute the informal curriculum. Moreover, those mentors who are available, particularly those from underrepresented backgrounds, face a greater demand for their mentorship than they can meet. One such senior investigator (institution A) described how "it's less than a handful of people that [are] carrying the load to really provide mentorship and training to a number of minority investigators interested in health disparities." The dearth of mentors creates a heavy mentorship load for senior investigators, while also depriving junior investigators of adequate mentorship.

Protected time.—Both junior and senior investigators described their institutions as supportive of research in spirit, but noted that, for a variety of reasons, their institutions did not provide the protected time that junior investigators need to launch a research career. One junior investigator (institution A) described the difficulty of juggling so many competing demands—working with residents and medical students, as they are encouraged to do as a faculty member, while at the same time "seeing patients … and … trying to find the time to actually do research." Other institutions were described as facing severe financial shortfalls

and lacking resources to provide even minimal research support, as in the case of a junior faculty member who had to purchase her own computer to use in her research. Similarly, while some institutions provided programmatic support for grant writing through formal channels for proposal critique, others had no such supports in place. Without resources, devoted research time, and grant writing support, junior scholars felt that they were fighting an uphill battle to launch their research careers.

This combination of the lack of institutional support and the increasing challenge of securing research funding was described as a vicious cycle, in which failure to secure grants decreased the likelihood that the institution would invest the resources to ensure that faculty had time and administrative support to write a successful grant, which further decreased the likelihood of success. In addition to their concern about the lack of protected time to launch their research careers, junior investigators were uncertain whether they would be able to devote the time needed to participate in additional training—even just eight hours per week. While some felt that they could accommodate such time demands, others thought that it would not be feasible without protected time from their institution. Additionally, they felt the time demands would be more manageable if scheduled time could be limited and they could complete as much of the training on their own time as possible.

Work product.—Some junior investigators voiced the opinion that the program would be of maximal impact if, as one individual (institution D) explained, there were “a clear outcome at the end … a finalized proposal that is ready, [and] has been revised by various individuals.” Junior investigators were not interested in a program that would focus solely on abstract principles; rather they were only interested in investing their time if, upon completion of the program, they had generated a product that would advance their research.

Networking opportunities.—Several of the senior investigators with whom we spoke felt that networking was key to launching a successful research career. One senior investigator (institution A) stated, “In science, you are as good as your network,” and noted that creating opportunities for networking and collaboration was vital to improving their students’ and mentees’ chances of securing research funding. Another senior investigator noted that the better networked scholars are, the more likely other scholars are to be aware of and cite their work. In one individual’s view (institution A), the increased awareness of a scholar’s research that could come from networking might also lead to better chances of securing funding, in that the more they can “generalize and transfer what we’re learning here out to other communities across the U.S., the more favorable our applications will look to reviewers.” The potential for networking, particularly multi-institutional, was a facet of the program that the senior investigators thought held great potential. This would enable the scholars to tap into expertise that their home institution may not have.

Program Design

The focus group and interview data we collected in the needs assessment was pivotal to informing key aspects of the LEADS program. We structured LEADS to include topics derived from the informal curriculum (see Table 2), which were offered online to make the training available to participating scholars in different geographical regions and time zones

and to provide flexibility in where and when they could complete the work. We required protected time for participation and structured the work to focus on deliverables that would help build LEADS scholars' research careers. We decided on a one-year program because, as our partners from the MSIs noted, it would be difficult for the junior investigators to get protected time to engage in the program beyond one year. However, to ensure success of the program, after completion LEADS scholars continue to complete an individualized development plan and an annual report noting their progress.

We addressed the four themes identified in the needs assessment in the following ways.

Modules that target key skills in the "informal" curriculum

Historically, in academic medicine, budding researchers are most often trained using a variant of an apprenticeship model—the famous "see one, do one, teach one." Success when using this model is heavily dependent on the research experience, availability, and willingness of individual mentors, as well as research opportunities that may or may not be available at a given institution. When the expertise does not exist at a particular institution, this model fails the mentee. Also, this model does not ensure that the skills that fall within the informal curriculum are taught in a systematic, consistent, or efficient way—a deficit identified by the junior and senior investigators. Therefore, we decided to include modules (listed in Table 2) that would provide formal instruction in some of the elements of the informal curriculum. Examples include a module that guides scholars through thinking creatively and critically to help them approach their research in innovative ways, and another module in which scholars learn to identify a significant research problem and a theoretical and conceptual model. In the Asking the Right Question module, scholars take the problem they identified in earlier modules and formulate it into testable hypotheses. The Launching Your Research Career module focuses on personal and professional development by helping scholars develop a strategic plan for their careers, and covers topics such as mentoring, time management, and negotiation.

Departments that guarantee protected time

As one of our focus group participants said, "Research takes time … freedom to think, and peace to think." To ensure our LEADS scholars would have the necessary freedom and peace to think, we required LEADS applicants to include a letter of support from their department chair in their application packet. In this letter, the department chair committed to providing 20% protected time for the applicant during the program. This equates to approximately 8 to 10 hours per week, the time we anticipated was needed to fully participate in the program, complete the online modules, and generate meaningful products.

Module assignments that yield concrete work products

Junior investigators told us they wanted to complete the training with a practical work product, such as a draft of a grant or manuscript. To this end, we included Grant Writing and Medical Writing modules to reinforce these high-value skills through additional practice and feedback. Moreover, we designed assignments to focus on specific deliverables that built over a series of modules into a significant work product. LEADS scholars begin to identify and develop a significant research problem in the Identifying the Problem module, articulate

a research question and hypothesis in the module Asking the Right Question, write specific aims and draft an innovation and approach section in the Grant Writing module, and craft abstracts and outline the sections of a manuscript in the module Medical Writing. Our goal was to ensure that the work scholars did in their LEADS modules provided a structure and incentive to bring a grant proposal and manuscript closer to fruition.

Asynchronous and synchronous activities that encourage networking across institutions

The senior investigators we interviewed believed that opportunities to connect with a national network of scientists would increase the program's impact and improve junior investigators' funding prospects. We took this feedback to heart when designing LEADS and included opportunities for LEADS scholars to interact and network with other participating scholars from the partnering MSIs as well as with senior researchers from the University of Pittsburgh and other institutions. We did this in part by recruiting a diverse group of successful biomedical researchers to design and teach LEADS modules, which immediately expanded the network available to LEADS scholars and gave them the opportunity to hear strategies, advice, and stories from a range of experienced senior investigators. To give scholars the opportunity to interact with peers across institutions, we incorporated weekly, 2-hour synchronous sessions and asynchronous discussions, where scholars could discuss problems, ask questions, share concerns, and develop strategies within the group. Our goal was to foster stronger professional networks by encouraging as much interaction as possible among researchers at the participating institutions.

Insights

The goal of LEADS is to provide junior investigators at MSIs with the resources and training they need to flourish in biomedical research. Following McGee's suggestion, we focused on what is happening *within* the pipeline rather than simply measuring flow *through* the pipeline.[2,4] LEADS provides a new approach to developing the URM talent that already exists within the pipeline by teaching an "informal curriculum" identified in part through our needs assessment. In addition, our goal is that LEADS will help to redress the "leaky pipeline" problem by providing participants with systematic training, protected time, networking opportunities, and the creation of a concrete work product.

The MSI leadership's conclusions dovetailed in large part with a needs assessment conducted by Estape-Garrastazu and colleagues[11] with faculty and students at the three minority medical and health science institutions comprising the Puerto Rico Clinical and Translational Research Consortium (PRCTRC). This study identified a strong desire to develop better translational teamwork and communication skills among associate and assistant professors. A second, informal needs assessment conducted at Howard University's Department of Medicine[12] identified the need for training in areas such as research design, grant writing, research administration and leadership, data management and analysis, and disseminating research findings. These needs assessments, in combination with our interviews and focus groups, helped us craft an initial set of topic areas to address in our online training.

At the same time, it is important to note that LEADS does not address *all* the impediments to a successful research career that were revealed by the needs assessment; for example, junior investigators sometimes cited financial shortfalls and lack of institutional resources, which suggests the need for interventions that go beyond training. Moreover, both senior and junior investigators whom we interviewed indicated the need for more mentors and more formal recognition of mentors. We constrained the LEADS program to *mentee* development, leaving the task of *mentor* development to the National Research Mentoring Network, which is charged with developing and training mentors committed to mentoring people from diverse backgrounds. However, we recognize that more consideration is needed as to how to improve the mentorship for junior investigators at MSIs.

Limitations

Our conclusions were drawn from conversations, interviews, and focus groups with stakeholders at five MSIs. While we feel these comprise a representative sample, it is possible that leaders and senior and junior investigators from other MSIs would identify different concerns. Also, we only conducted a limited number of focus groups and interviews, so it is possible that the data are not sufficient to inform the development of the program. However, we did reach thematic saturation with the interviews and focus groups, which gives us confidence that we identified the most pressing areas where junior investigators need training.

Concluding Remarks

Conventional training is not, by itself, sufficient to overcome the lack of diversity in the biomedical workforce, even though it is an important component. For a diversity-focused program to be effective, it must be grounded solidly in an understanding of the training deficits identified or experienced by junior investigators. The needs assessment described here generated insights that helped us design a program specifically targeted to overcome identified deficits, develop talented individuals already in the pipeline, retain them in biomedical research careers, and improve the diversity of the clinical and translational research workforce.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Participating Investigators From Each Institution Whose Insights Informed Development of a Junior Investigator Training Program to Diversify the Biomedical Research Workforce, 2016

Institution	Junior investigator participation	Senior investigator participation
A	12 scholars in 1 focus group	2 mentors interviewed
B	4 scholars in 1 group discussion	1 mentor interviewed
C	3 scholars interviewed	1 mentor interviewed
D	6 scholars in 1 focus group	2 mentors interviewed

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Table 2

Title, Learning Objectives, and Expected Time Commitment of LEADS Online Modules, From a Junior Investigator Training Program Developed to Diversify the Biomedical Research Workforce, 2016[a]

Module title	Learning objectives	Cumulative time commitment (hours)
Introduction to Team Science	• Identify one's orientation to and readiness for team science. • Recognize the importance of team composition and one's leadership style in building an effective research team. • Lay the foundation for effective teamwork, including developing a shared vision, fostering trust, and creating collaborative agreements. • Apply best practices for maintaining positive team dynamics through effective communication and conflict management.	40
Critical and Creative Thinking	• Differentiate between critical and creative thinking. • Identify and apply the key elements of thought. • Apply creative problem solving and innovative thinking. • Articulate reasoned arguments and evaluate the credibility of sources. • Think imaginatively, actively seeking out new points of view.	40
Identifying the Problem	• Define a research problem, identify sources of research problems, and evaluate the problem. • Develop and use conceptual and theoretical frameworks to study a problem.	20
Asking the Right Question	• Defining different approaches to formulate research questions. • Listing characteristics of a researchable question. • Explaining how your research question affects your study design.	30
Grant Writing	• Identify types of career development (K) and early career grant programs from the NIH and other funding agencies and use web-based and other resources to identify appropriate agencies for your research idea. • Describe the process of grant preparation, writing, submission, and review. • Develop several components of an NIH grant application, including specific aims for your research project idea; an extended outline of significance, innovation, and approach sections for your research project idea; and a practical work plan and timetable for grant application submission. • Provide effective, constructive critiques of peers' specific aims page and significance, innovation, and approach outlines.	80
Starting Your Research	• Describe all the major components involved in the operation of a research study. • List the tasks needed to achieve the research goals with sufficient detail so that the timeline is realistic. • Create an effective operations manual. • Identify and manage talented research staff who will be involved in the day-to-day operation of the study.	40
Medical Writing and Communication	• Describe the ways clear writing supports career advancement as a biomedical scientist, and identify how errors in medical writing inhibit effective communication, and explain how adhering to specific elements of writing style promote effective communication. • Distinguish "good" from "bad" scientific abstracts and write a clear, concise, well-organized abstract for a scientific meeting or manuscript. • Identify the forms and functions of the four key sections of a scientific manuscript (i.e., introduction, methods, results, and discussion). • Create a well-designed table and figure from empirically derived data that effectively communicates important research findings.	40
Effective Peer Reviewing	• Trace the history of the peer review process and describe how it is likely to evolve over the next decade. • Identify the multiple forms of scholarship subject to peer review and the steps involved in the peer review process for each type. • Identify the ways in which effective participation in the peer review process can enhance the likelihood of academic success and promotion. • Characterize the "golden rules" for being a good peer reviewer of scientific manuscripts and the steps involved in the process. • Distinguish "good" from "bad" peer reviews of scientific manuscripts. • Perform a peer review of a scientific manuscript that adheres to reviewers' golden rules. • Create a letter of response to a journal editor that addresses peer reviewer comments on a scientific manuscript.	
Launching Your Research Career	• Develop a vision and strategic plan for your career.	40

Module title	Learning objectives	Cumulative time commitment (hours)
	• Create a five-year plan.	

Abbreviation: LEADS indicates Leading Emerging Diverse Scientists to Success program; NIH; National Institutes of Health.

[a]Each module is administered online through Moodle, an open-source learning management platform. The modules listed above last between 3 and 8 weeks. Every week of a module corresponds to one unit. For each unit, scholars have videos to watch, readings to complete, asynchronous discussion(s) to join, a synchronous session to attend via videoconferencing, and a challenge assignment to complete. Scholars may earn a badge for each module if they complete all the weekly videos and readings; join at least three of the weekly discussion forums; attend at least three of the weekly synchronous sessions; and complete at least three of the weekly challenge assignments.