


A Pipeline to Increase Public Health Diversity: Describing the Academic Enrichment Components of the Summer Public Health Scholars Program

Danielle M. Joyner, MPH¹ , Eman Faris, MPH¹, Diana Hernández, PhD¹,
Joyce Moon Howard, DrPH, MPH², Robert E. Fullilove, EdD¹,
Elizabeth G. Cohn, PhD, RN, NP, FAAN³, Michelle Odlum, EdD, MPH¹,
Dennis Mitchell, DDS, MPH¹, and Hilda Hutcherson, MD, MS¹

Abstract

A public health workforce that reflects the increasing diversity of the U.S. population is critical for health promotion and to eliminate persistent health disparities. Academic institutions must provide appropriate education and training to increase diversity in public health professions to improve efforts to provide culturally competent care and programs in the most vulnerable communities. Reaching into the existing talent pool of diverse candidates at the undergraduate level is a promising avenue for building a pipeline to advanced training and professional careers in the field of public health. The Summer Public Health Scholars Program (SPHSP) at the Columbia University Irving Medical Center (CUIMC) is a 10-week summer internship program with a mission to increase knowledge and interest in public health and biomedical sciences. Funded by the Centers for Disease Control and Prevention's (CDC) Undergraduate Public Health Summer Programs, sponsored by the CDC's Office of Minority Health and Health Equity, SPHSP aims to pipeline underrepresented students into public health graduate programs and careers by providing mentorship, academic enrichment, professional development, and field-based placements. The SPHSP is uniquely positioned to offer scholars a program that exposes them to core public health training components through the joint effort of all four CUIMC schools: public health, dentistry, nursing, and medicine. Here, we describe the program's academic enrichment components, which provide advanced and multifaceted public health training opportunities. We discuss the impacts of the program on student outcomes and lessons learned in developing and refining the program model.

Keywords

diversity, public health, health professionals, workforce training

The Summer Public Health Scholars Program (SPHSP) at the Columbia University Irving Medical Center (CUIMC) is a 10-week summer internship program. The SPHSP is uniquely positioned to offer scholars a program that exposes them to all aspects of public health through the joint effort of all four CUIMC schools: the Mailman School of Public Health, Vagelos College of Physicians and Surgeons, School of Nursing, and College of Dental Medicine. Based on successful diversity pipeline programs at CUIMC, Diversity Deans at the Columbia Health schools modeled what they envisioned would be needed for the next generation of public health leadership. The SPHSP equips scholars with knowledge and skills that enable them to pursue public health as a career by providing mentorship, academic enrichment, professional

development, and field-based placements (Centers for Disease Control and Prevention [CDC], 2018). Students accepted into this competitive program receive instruction in graduate-level public health courses and practical experiences in research, government, and community-based settings. Through this enriching academic and

¹Columbia University, New York, NY, USA

²New York University, New York, NY, USA

³City University of New York, New York, NY, USA

Corresponding Author:

Danielle M. Joyner, Vagelos College of Physicians and Surgeons,
Columbia University, 104 Haven Avenue, Suite 1003, New York, NY
10032, USA.

Email: dj2331@cumc.columbia.edu

Table 1. SPHSP Pedagogy of Academic Enrichment Cognitive Apprenticeship Model.

Teaching methods	SPHSP training program
Modeling	Graduate-level coursework; public health seminars
Coaching	Internship mentor
Scaffolding	Professional development
Articulation	Writing workshop
Reflection	Small-group work and case studies
Exploration	Small-group work and case studies

Note. SPHSP = Summer Public Health Scholars Program.

applied experience, the SPHSP aims to expand the capacity to address the workforce shortages by educating, training, and deploying future public health leaders who emerge from communities throughout the United States (Drehobl et al., 2014; Raffoul et al., 2019).

The SPHSP recruits students from all over the country who are interested in public health and biomedical careers. Key eligibility requirements ask students to have a minimum 2.7 GPA (grade point average), be a rising junior, senior, or recent graduate. Demographic data are collected through the application, where students self-identify as underrepresented or low-income. The application system enables students to self-identify their demographics based on questions informed by the CDC's definition of an underrepresented population in public health. Students accepted into the program are those who can benefit most from the program resources offered and pursue a health-related career. SPHSP participants obtain both classroom and small-group learning experiences, including the three graduate-level courses: Introduction to Public Health, Introduction to Epidemiology, and Health Disparities and Cultural Competence. Small-group work includes assessing current public health problems or issues using case studies and an evidence-based approach to identify a problem and cause, and provide potential evidence-based interventions. The case study approach is an instructional strategy that supports the practical application of concepts and principles and enhances scholar's ability to understand the interconnection between courses and real-world interventions (Ertmer & Russell, 1995). Weekly seminars are led by CUIMC faculty and leaders of local public health organizations on topics related to public health research and interventions. Professional development is enhanced through prep for the Graduate Record Exam (GRE) and writing workshops. The extensive network of faculty and leaders in the field offered through the program activities strengthens the four-school collaboration and mentorship provided for scholars. Courses, small-group work, academic enrichment, and mentorship intellectually support scholars and their ability to apply knowledge to practice.

Theoretical Framework

The curriculum proposed for SPHSP was based on two theoretical frameworks: the cognitive apprenticeship theory (Collins et al., 1987) and the situated learning theory (Lave & Wenger, 1993). These theories purport that students' learning and retention are improved when educational activities occur in context and when learning involves a community of practice.

Cognitive apprenticeship posits that students learn from a more experienced teacher or mentor through observation, articulation, and reflection (Spector et al., 2014). The cognitive apprenticeship theory enables students' cognitive and metacognitive abilities. Students observe their teachers to learn how teachers identify and resolve issues. By observing they can articulate their obtained knowledge to clarify and reflect by comparing their own problem-solving skills with that of their teacher.

Situated learning is an instructional approach that suggests that students learn by being a part of the learning experience (Clancey, 1995). It posits that learning is unintentional when students are immersed in authentic activities. Situated learning allows students to cooperate and use their critical thinking skills that can be applicable and transferable to their homes, communities, and workplaces.

These theories enhance both how students learn in academic settings and apply knowledge, critical thinking skills, and problem-solving skills to identify, develop, and implement evidence-based public health interventions.

The SPHSP Pedagogy of Academic Enrichment

Below, we describe the various aspects of the SPHSP training program including (1) graduate-level coursework, (2) small-group work and case studies, (3) public health seminars, (4) professional development, (5) GRE preparation, and (6) writing workshops. We also display in Table 1 how the theoretical underpinnings are used to support these various aspects of the program.

Modeling: when an instructor within the subject area demonstrates tasks explicitly so that the novice can experience and build a conceptual model of the task at hand

Coaching: the observation of the student performing tasks while providing feedback and alternative approaches. Tasks are structured by coaches to assist in professional development

Scaffolding: the application of strategies and methods to support student learning

Articulation: approach through writing workshops allowing instructors to ask students career-related questions allowing them to restate and refine their learning knowledge

Reflection: compare problem-solving processes with experts and other students

Exploration: involves giving students the room necessary to problem solve on their own and the exploration of effective strategies

Graduate-Level Coursework

At the time of application, the SPHSP requires students to self-identify into one of three categories to determine their level of exposure to public health before entering the program. Students with little to no knowledge of public health and/or work on health disparities are categorized as the “exposure” group. Those who self-identify as the “engagement” group include students who are considering the pursuit of public health in the context of another health-related discipline—that is, medicine, dentistry, nursing, and social work, and so on. Last, the “enrichment” group consists of students with an established interest and intent on pursuing public health as a profession. Assessing the students’ relationship to the field of public health prior to entering the program is essential in ensuring that applicants with varying levels of public health exposure are accepted into the program. It also provides our instructors a baseline measurement of students’ knowledge of public health, which allows them to design their course to meet the needs of the incoming students. Courses ensure that scholars are provided a foundation in public health education that will improve their skills in public health communication and information literacy (Nelson-Hurwitz et al., 2018). Despite entering the program at various levels of exposure, interactions between these three distinct groups are not monitored throughout the program duration. Scholars self-identify; however, it has been seen that many misidentify themselves and are less exposed than they realize.

Once accepted, scholars take Introduction to Public Health, Introduction to Epidemiology, and Health Disparities and Cultural Competence for 8 weeks of the program. These courses are taught by CUIMC faculty

using an interdisciplinary collaborative approach and are structured to provide baseline public health knowledge using evidence-based practices. The courses begin to prepare scholars for graduate studies and careers in public health. Course instructors approach teaching using problem identification, risk and contributing factor identification, assessment of appropriate evidence-based interventions, systematic plan for implementing evidence-based interventions, and outcome evaluation. The course instructors come from professionally diverse backgrounds, having worked in academia and research. They also have worked in developing and addressing disparities by working on various community initiatives throughout their careers.

The Introduction to Public Health course provides students with an introduction to the history and philosophy of public health by putting current events into a historical perspective. Students obtain knowledge surrounding public health services, ethical considerations, and issues in the field. They also obtain skills in public health research and professions. The Introduction to Epidemiology course provides scholars with baseline knowledge on epidemiologic principles, including its history, contribution, and current uses in public health. Scholars are introduced to the ethics and philosophy of epidemiology and are briefed on tools and approaches used for research and public health surveillance. The Health Disparities and Cultural Competence course orient scholars to cultural competence due to its significant role in contributing to health disparities. The course provides insight into how social and cultural factors affect health behaviors, which affect a racial or ethnic group’s susceptibility to morbidity and mortality. The course provides core principles and values in cultural competence.

Small-Group Work and Case Studies

The synergy between coursework and small-group work is essential to scholars’ educational advancement. Small-group work is supervised by program-trained teaching assistants to assist in teaching the scholars practical application of the coursework. Scholars work on current health problems using case studies and an evidence-based approach. They learn to identify the problem, causes, and how to select or develop an evidence-based intervention and strategies for implementation. Case study methodology has been cited as an effective approach for improving student performance (Bonney, 2015). One such case study developed by faculty at Mailman School of Public Health looks at the decision of whether to evaluate two hospitals during Superstorm Sandy. Scholars are assigned roles, analyze data, and contribute to small-group discussions based on their assigned roles. The discussions can become very lively. Case study materials are available

through the Columbia University's Case Consortium website (<https://casestudiesctl.columbia.edu/>). Scholars also participate in fieldwork assignments in small groups to observe and gain exposure to current public health efforts in the communities in which they are assigned. In small-group work, the focus is on scholar-centered learning rather than on instructor-centered learning. It is informal and allows for greater interaction and participation than the more formal classroom setting (Michaelson et al., 2014). One such example of small-group work was scholar engagement with Arc XVI, a senior center program in Washington Heights. Scholars interview participants to learn about potential fall risks in their homes and examined potential evidence-based interventions to reduce those risks. Small-group work and case studies allow scholars to better understand the interconnectivity between public health knowledge and real-life public health interventions.

Public Health Seminars

Weekly seminars are organized to introduce students to varying topics of research and interventions within the field of public health. Seminars are led by CUIMC faculty, researchers, and leaders of local public health organizations or initiatives. This opportunity affords students to not only be introduced to diverse areas of public health they might have not known about but also meet and network with people who are in the field. Past seminar topics have included, but are not limited to, disaster preparedness; dental public health; psychiatric health disparities; lesbian, gay, bisexual, transgender, and queer health; maternal and child health interventions; tobacco disparities; vertical farming; and climate change. Seminars range from 60 to 90 minutes with time allotted at the end for students to ask questions and network with the speaker.

Professional Development

Professional development workshops are designed to increase and improve student learning and achievement throughout their academic and career journeys. The professional development workshops enable students to develop the knowledge and skills needed to prepare for a future career in public health. A variety of professional development workshops are offered to address the varying interests and needs of students, whether they want to immediately enter the workforce after college and/or matriculate into a graduate school program to pursue further education. Workshops are led by invited experts on topics such as "Graduate School Admissions," "Personal Statement Development," "Diversity and Inclusion in the Workplace," "Public Speaking Skills," "Public and Private Sector Careers," and "Resume, Cover Letters, and Interviews." Underrepresented professionals deal

with additional challenges in the professional world, such as unequal employment and the opportunity gap. Professional development training helps them develop the skills, knowledge, and behaviors necessary to be successful despite these challenges.

GRE Course

To increase the number of underrepresented students matriculating into public health-related graduate programs, the SPHSP equips students for the application process. Since most graduate and professional schools require a GRE score as part of the student's application, the SPHSP has integrated a GRE preparatory course within the program components, prioritizing students who are taking the exam within 12 months. Research indicates that students of underrepresented backgrounds on average score lower than their White counterparts. For instance, Bleske-Reчек and Browne (2014) found that the mean score for Black students on the combined verbal and quantitative sections of the GRE was 814 in 2007, while the mean score of White students was 1,055, which illustrates a 241-point difference. This score gap is reflective of a century's worth of differential access to educational, economic, and social opportunities. The SPHSP offers the GRE preparatory course as just one solution to assist students in overcoming some of these major obstacles. The cost of a GRE preparatory course ranges from \$500 to more than \$1,300, not including private tutors or supplemental materials. Providing it for free removes a key economic barrier related to adequate test preparation. Second, limited time due to competing priorities can be another factor for underrepresented students, especially if they are still in school or working. Integrating it within our summer program alleviates this burden from our students. With the availability of additional funding, the SPHSP hopes to further relieve the economic barriers of the GRE by providing fee waivers to cover the cost of taking the exam for program participants, which currently costs \$205.

Writing Workshops

The 10-week program experience for each student culminates in a final 10- to 12-page research paper and poster presentation that addresses a public health issue related to their summer internship. The SPHSP final project is a vehicle to train students in scientific writing and introduce them to the expectations of graduate-level school work. Writing workshops, scheduled within the first 3 weeks of the program, are designed to guide students through the process of developing a research paper. With each workshop, students learn how to develop a research question, evaluate sources, conduct literature reviews, and cite references. Assignments are built into each writing

workshop that pushes students to begin working on their research papers early on. Teaching assistants provide an additional layer of support through detailed feedback on every assignment and weekly office hours, where students have the opportunity for one-to-one assistance. All the teaching assistants come from both ethnically and academically diverse backgrounds, which is helpful in academically supporting underrepresented students as it increases the impact of that support. At the end of the 10 weeks, all students present their research papers to the entire cohort, affiliated program administration, and their mentors.

Impact

In consultation and collaboration with key stakeholders, both the process and outcomes evaluation plan for SPHSP was designed to provide detailed information on the program's implementation and effectiveness. Qualitative and quantitative data are collected through surveys, in-depth interviews, focus groups, and document review. The short-term outcomes of interest specifically related to the academic enrichment components of the program include assessing the extent to which the program improved students'

- awareness, skills, and interest in public health concepts, specifically cross-cutting issues of health equity and disparities;
- interest and knowledge of public health career opportunities, along with professional and behavioral expectations for public health professionals; and
- critical thinking skills and readiness for graduate school applications and courses.

The long-term goal of the program is to increase underrepresented groups in public health through enrollment in graduate training programs and employment in the field (Smith et al., 2009). Key indicators used to measure the program's short- and long-term impact include tracking students' academic performance, undergraduate completion, and pursuit of public health training (internships, certifications, graduate school, etc.) or careers postgraduation.

Throughout the 10 weeks of the program, instructors provide coursework feedback directly to students on assignments. Teaching assistants also monitor classroom sessions and observe student engagement. Postprogram completion, surveys with baseline pre- and posttesting are utilized to track students' academic and professional journeys at 6-month intervals for a minimum of 2 years.

Looking at the data collected from the earliest cohorts, at 24 months postprogram, Cohort 1 respondents who had graduated from undergraduate school indicated that 78% are either in public health-related jobs (55%) or

in an MPH (master of public health) program (23%). At 18 months postprogram, Cohort 2 respondents who had graduated from undergraduate school indicated that 67% are either in public health-related jobs (52%) or in an MPH program (15%). Furthermore, a quarter of Cohort 2 participants applied to the CDC's Public Health Associate Program, indicating interest in pursuing further public health training and career opportunities. These numbers support the early success of the program and its ability to foster growth in the field of public health.

Evaluation findings are reviewed by program stakeholders and inform quality assurance and curriculum refinement. For example, findings from Year 1 resulted in changes in course structure and schedule. Rather than having three different courses convening for 1 hour each day, a decision was made to limit it to only one course taught per day; thus, allowing for greater consistency and focus on presentation participation by students in classroom discussion. Further evaluation findings also suggested a greater focus on an interdisciplinary approach to teaching, which resulted in instructors collaborating on the development of case studies to be used across courses to increase the cohesion of the curriculum. The evaluation will continue to be used as a guide for the revision and adaptation of the program each year.

Discussion/Lessons Learned

Historically, public health education in the United States began at the graduate level, which created a need for pipeline programs, such as the SPHSP, to introduce students to the field at earlier points in their academic career (Resnick et al., 2018). However, in the past decade, undergraduate programs in public health across the country have increased dramatically (Leider et al., 2015). This shift aligns with the program's inception in 2011 and was also reflected in the SPHSP applicant pool. Based on the SPHSP evaluation report from 2017, the proportion of exposure students drastically decreased between 2013 and 2017, from 29% of the cohort in 2013 to 10% in 2017. The proportion of enrichment students increased from 31% of the cohort in 2013 to 58% in 2017. The lesson learned from these evaluation findings is that programs such as SPHSP must adapt to the changing undergraduate teaching environment, so the coursework and small-group work sessions were enhanced to better meet the needs of students today.

Adapting has allowed us to offer a more robust program every year for scholars. As a result, scholars have reported that the program changed their view and understanding of public health and health disparities. Scholars have also reported obtaining greater insight into interdisciplinary public health and all the possible career paths that exist within the realm of public health and medicine, nursing, dentistry, and so on. The program reinforces the importance of critical thinking, as well as the impact

of political, sociological, and economic history on the health of vulnerable populations (Mitchell & Lassiter, 2006).

Conclusion

The goal of SPHSP is to equip students with both the knowledge and skills to pursue public health degrees and pipeline students into public health and other health-related professions (Duffus et al., 2014). In addition to the academic enrichment components of the SPHSP described herein, our program also offers mentorship, professional development, and an applied practice experience to improve the overall skills and public health training of our students.

The culmination of the summer program includes submission of a 10- to 12-page research paper and a 10-minute presentation of their project. This final assignment allows scholars to synthesize their knowledge and apply the skills they obtained from the classroom and practical work experiences. In addition, scholars are provided with professional modeling opportunities throughout the summer, such that the program assigned mentors, teaching assistants, and invited faculty to enhance their research skills and professional development.

Scholars who excel in the program are also offered the opportunity to develop a poster to present at the CDC during a closing showcase ceremony. This allows them to share their research and summer internship experience with CDC professionals and network with professionals in their areas of interest for potential mentorship opportunities. Scholars depart from the SPHSP feeling more prepared to complete their undergraduate studies, take the GRE, apply to top public health and health-related graduate programs, and pursue related careers. Throughout this journey, they receive continued support and mentorship from program staff, faculty, and internship mentors.

Public health and the health care workforce are facing a shortage of diverse workers when they are needed the most (Bouye et al., 2016). Training programs like the SPHSP are necessary to increase diversity and aid in eliminating disparities (Scharff & Kreuter, 2000). As a private institution, Columbia University works alongside public and nonprofit organizations to provide a unique experience to students who may not have such an opportunity otherwise. The nation is becoming more diverse, and to eliminate disparities, we must increase diversity, and pipeline programs are where that begins.

Acknowledgments

We would like to acknowledge the numerous Summer Public Health Scholars who have graced our program since its inception. You all make the work we do worthwhile. We would also

like to acknowledge our mentors, speakers, and CUIMC faculty for their tireless contributions to our program.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The authors received financial support for the research, authorship, and/or publication of this article from the Centers for Disease Control and Prevention, Office of Minority Health and Health Equity under the CDC Undergraduate Public Health Scholars Program.

ORCID iD

Danielle M. Joyner  <https://orcid.org/0000-0002-1537-8597>

Supplement Issue Note

This article is part of a *Pedagogy in Health Promotion: The Scholarship of Teaching and Learning* supplement, "Preparing the Future Public Health Workforce: Contributions of the CDC Undergraduate Public Health Scholars Program," which was supported by a cooperative agreement from the U.S. Centers for Disease Control and Prevention, Office of Minority Health and Health Equity to the Society for Public Health Education, entitled "Strengthening Public Health Systems and Services through National Partnerships to Improve and Protect the Nation's Health" (Contract Number 5 NU38OT000315-03-00). The views and findings expressed in this issue are those of the authors and are not meant to imply endorsement or reflect the views and policies of the U.S. government. The entire supplement issue is available open access at https://journals.sagepub.com/toc/phpa/7/1_suppl.

References

- Bleske-Rechek, A., & Browne, K. (2014). Trends in GRE scores and graduate enrollments by gender and ethnicity. *Intelligence*, 46, 25–34. <https://doi.org/10.1016/j.intell.2014.05.005>
- Bonney, K. M. (2015, May). Case study teaching method improves student performance and perceptions of learning gains. *Journal of Microbiology & Biology Education*, 16(1), 21–28. <https://doi.org/10.1128/jmbe.v16i1.846>
- Bouye, K. E., McCleary, K. J., & Williams, K. B. (2016). Increasing diversity in the health professions: Reflections on student pipeline programs. *Journal of Healthcare, Science and the Humanities*, 6(1), 67–79.
- Centers for Disease Control and Prevention. (2018, December 17). *CDC Undergraduate Public Health Scholars (CUPS) Program and the Dr. James A. Ferguson Emerging Infectious Diseases RISE fellowship (Ferguson Fellowship)*. <https://www.cdc.gov/healthequity/features/cups/index.html>
- Clancey, W. J. (1995). *A tutorial on situated learning*. http://methodenpool.uni-koeln.de/situiereteslernen/clancey_situated_learning.PDF
- Collins, A., Brown, J. S., & Newman, S. E. (1987). *Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics*. University of Illinois at Urbana-Champaign, Center for the Study of Reading.

- Drehobl, P., Stover, B. H., & Koo, D. (2014). On the road to a stronger public health workforce. *American Journal of Preventive Medicine, 47*(5), S280–S285. <https://doi.org/10.1016/j.amepre.2014.07.013>
- Duffus, W. A., Trawick, C., Moonesinghe, R., Tola, J., Truman, B. I., & Dean, H. D. (2014). Training racial and ethnic minority students for careers in public health sciences. *American Journal of Preventive Medicine, 47*(5, Suppl. 3), S368–S375. <https://doi.org/10.1016/j.amepre.2014.07.028>
- Ertmer, P., & Russell, J. (1995). Using case studies to enhance instructional design education. *Educational Technology, 35*(4), 23–31. <http://www.jstor.org/stable/44428285>
- Lave, J., & Wenger, E. (1993). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
- Leider, J. P., Castrucci, B. C., Plepys, C. M., Blakely, C., Burke, E., & Sprague, J. B. (2015). On academics: Characterizing the growth of the undergraduate public health major: U.S., 1992–2012. *Public Health Reports, 130*(1), 104–113. <https://doi.org/10.1177/003335491513000114>
- Michaelsen, L. K., Davidson, N., & Major, C. H. (2014). Team-based learning practices and principles in comparison with cooperative learning and problem-based learning. *Journal on Excellence in College Teaching, 25*(3–4), 57–84.
- Mitchell, D. A., & Lassiter, S. L. (2006). Addressing health care disparities and increasing workforce diversity: The next step for the dental, medical, and public health professions. *American Journal of Public Health, 96*(12), 2093–2097. <https://doi.org/10.2105/ajph.2005.082818>
- Nelson-Hurwitz, D. C., Tagorda, M., Kehl, L., Buchthal, O. V., & Braun, K. L. (2018). Developing an undergraduate public health introductory core course series. *Frontiers in Public Health, 6*, 1–9. <https://doi.org/10.3389/fpubh.2018.00155>
- Raffoul, M., Bartlett-Esquillant, G., & Phillips, R. L. (2019). Recruiting and training a health professions workforce to meet the needs of tomorrow's health care system. *Academic Medicine, 94*(5), 651–655. <https://doi.org/10.1097/acm.0000000000002606>
- Resnick, B., Leider, J. P., & Riegelman, R. (2018). The landscape of US undergraduate public health education. *Public Health Reports, 133*(5), 619–628. <https://doi.org/10.1177/0033354918784911>
- Scharff, D. P., & Kreuter, M. W. (2000). Training and workforce diversity as keys to eliminating health disparities. *Health Promotion Practice, 1*(3), 288–291. <https://doi.org/10.1177/152483990000100315>
- Smith, S. G., Nsiah-Kumi, P. A., Jones, P. R., & Pamies, R. J. (2009). Pipeline programs in the health professions: Part 1. Preserving diversity and reducing health disparities. *Journal of the National Medical Association, 101*(9), 836–851. [https://doi.org/10.1016/s0027-9684\(15\)31030-0](https://doi.org/10.1016/s0027-9684(15)31030-0)
- Spector, J. M., Merrill, M. D., Elen, J., & Bishop, M. J. (Eds.). (2014). *Handbook of research on educational communications and technology*. Springer.