

The Effectiveness and Flexibility of Practice-Based Teaching: A Long-term, Cross-disciplinary Evaluation

Public Health Reports

1–9

© 2022, Association of Schools and

Programs of Public Health

All rights reserved.

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/00333549211070768

journals.sagepub.com/home/phr



Jacey A. Greece, DSc, MPH¹ ; Candice Bangham, MPH¹;
James Wolff, MD, MPH, MAT²; Malcolm Bryant, MBBS, MPH²;
Gouri Gupta, PhD, MHA³; and Donna McGrath, MS, EdM⁴

Abstract

Objectives: Schools of public health (SPHs) must train students through real-world situations. Practice-based teaching (PBT) uses immediate application for skill development through multiple modes of delivery including virtual collaborations. PBT provides short-term benefits but is less understood long term. We sought to understand the longer-term impacts of PBT on students, public health agencies, faculty, and SPH administration and determine if the reported benefits of PBT outweigh the challenges.

Methods: We used a mixed-methods pre–post-test evaluation to assess short-term outcomes in spring 2015 and long-term outcomes 3 years later using quantitative and qualitative assessments. The evaluation included 4 PBT courses spanning disciplines in 1 SPH. Participants included students (n = 56), collaborating agencies (n = 9), teaching faculty (n = 7), and SPH administrators (n = 8).

Results: Students reported acquisition of competencies, application at follow-up, and being workforce ready (91.0%) with greater appreciation 3 years post-semester (78.6%). Collaborating agencies reported successful implementation of deliverables (77.8%) and enhanced networks (88.7%) with cost savings and better outcomes for the communities served. Faculty recognized beneficial outcomes to students including workforce preparation (71.4%), and administration recognized the benefits and worth of PBT to the school for teaching (100%) and research opportunities (87.5%).

Conclusions: Given the shifting higher education landscape as a result of the pandemic, public health courses are being redesigned to provide opportunities for skill development, regardless of delivery mode, and enhanced connections to the field are essential. PBT is a flexible pedagogy that results in lasting and innovative resources to agencies and prepares public health students with technical skills and professional competencies to be workforce ready.

Keywords

education evaluation, public health workforce, academic and community collaborations, virtual learning, practice-based teaching

Public health education must be grounded in real-world situations to prepare master of public health (MPH) students for the workforce,^{1–4} especially considering the changing employment sectors of MPH students.⁵ In the context of COVID-19, faculty at schools and programs of public health (SPHs) have struggled to find opportunities for students to apply competencies learned in their program to the field. Proposed updated SPH accreditation guidelines reflect virtual learning,⁶ with evaluations of various learning modalities showing equally effective learning outcomes.⁷ Practice-based teaching (PBT) combines traditional methods of student learning, immediate application of skills, and agency collaborations to address real-world problems, especially when designed thoughtfully, implemented appropriately, and evaluated rigorously.^{8–11}

PBT courses support students' learning inside and outside the classroom,^{12–14} arm students with workplace skills, benefit

collaborating agencies and communities,^{9,15} and can be adapted to delivery modalities,¹⁶ which is necessary in times of natural disasters, pandemics, or other scenarios that rapidly change the public health landscape.¹⁷ This importance became evident in 2020–2021 given the understaffed workforce responding to the

¹ Department of Community Health Sciences, Boston University School of Public Health, Boston, MA, USA

² Department of Global Health, Boston University School of Public Health, Boston, MA, USA

³ Cambridge Health Alliance, Cambridge, MA, USA

⁴ Boston University School of Education, Boston, MA, USA

Corresponding Author:

Jacey A. Greece, DSc, MPH, Boston University School of Public Health, Department of Community Health Sciences, 801 Massachusetts Ave, 4th Fl, Boston, MA 02118, USA.

Email: jabloom@bu.edu

COVID-19 pandemic. The student and faculty connection to the public health field, now facilitated by technology, can result in innovative and sustainable solutions. When a need exists to urgently staff the field to address a crisis,¹⁸ pedagogy that incorporates skill building, immediate content application, tailored feedback, group connections and collaborations, and real-time perspectives ensures a ready workforce. In addition, PBT courses provide flexibility,¹³ allowing faculty to teach skills through multiple modes of delivery and offering SPHs insight into the most current issues.

The aforementioned benefits are important, but challenges to large-scale adoption and implementation exist. Limited research has measured the long-term effectiveness of PBT in attainment of course competencies and collaborating agency outcomes across multiple public health disciplines. For PBT, conventional methods of assessment cannot effectively measure student achievement,¹⁹⁻²¹ and evaluations of all academic and community partners should measure impact.²²

We describe an evaluation of 4 PBT courses for MPH students to examine short-term and long-term effectiveness of PBT on academic and community partners. Although an evaluation of PBT courses has been documented and further evaluations of PBT recommended,²² our study is the first known evaluation of PBT to assess long-term effectiveness of achieving technical public health competencies and professional skills across disciplinary areas. We hypothesized that PBT not only gives students technical and professional skills in the short term but also that those skills are applied and sustained in the long term to contribute to the workplace.

Although this evaluation occurred before the COVID-19 pandemic, the documented outcomes have implications for skill development, especially in a time of increased emphasis on virtual and hybrid learning.^{12,23} Agency collaborations in this evaluation were mostly virtual, and course content was delivered via in-class lectures, prerecorded content, and virtual meetings. Long-term outcomes documented in this evaluation demonstrate the utility of PBT as a fundamental pedagogy in public health training and argue for more wide-scale implementation, especially as SPHs redesign courses, reallocate resources, and explore alternate pedagogies for successful skill-based delivery in the current higher education landscape.

Methods

We conducted a mixed-methods pre-post-test evaluation during the spring 2015 semester and long-term outcomes 3 years later in fall 2018 to address the PBT cross-disciplinary logic model (Figure 1). The process and outcome evaluation obtained qualitative and quantitative data from students, faculty, agency, and the Boston University School of Public Health. An independent evaluator conducted the evaluation, and the Boston University Institutional Review Board approved all activities.

Sample

The sample consisted of 4 PBT courses for MPH students offered in the spring 2015 semester (Table 1). These 4 courses were taught by 4 faculty members experienced in PBT, represented 3 MPH disciplines, and focused on accomplishment of various competencies.

Each course partnered with collaborating agencies ($n = 15$) that ranged from international to domestic and from local health departments to nongovernmental organizations (Table 1). Students ($n = 93$) received a scope of work containing deliverables specific to the course objectives from the agency.⁹ Teams of 3 to 5 students worked with an agency using flexible communication (in-person meetings, virtual meetings, email exchanges) to produce deliverables for the agency's use and the course requirements. Agency interaction in 2 courses was entirely virtual and in 2 courses was hybrid. Because of weather conditions, 1 week of all courses was virtual. Deliverables varied and students presented the deliverables to agencies at course completion.

Data Collection and Measures

The evaluation used data collection strategies from students, agencies, faculty, and administration at various time points (Table 2). The evaluator emailed surveys with 3 reminders during a 2-week period. The surveys were anonymous, were voluntary, and took 15 minutes to complete. Survey questions included a 5-point Likert scale (from 1 = strongly disagree to 5 = strongly agree), multiple-choice questions, and open-ended questions.

The evaluator reviewed course documents to provide context to the course, inform process evaluation measures, and develop targeted surveys, focus groups, and interview questions. Student peer evaluation forms completed at multiple timepoints assessed the quality of student interactions, successes and challenges in teamwork and communication, and areas for improvement and confirmed other data collection. Standardized classroom observations ($n = 8$, 2 per course) conducted by the evaluator centered on content delivery, student engagement, fidelity to the syllabus, and faculty communication, and observations of student presentations confirmed agency satisfaction.

Surveys. Collaborating agencies ($n = 9$) completed an initial post-course survey to assess satisfaction with deliverables and course partnership and a post-course survey 3 years later to assess feedback on PBT, collaboration, and utility and quality of the deliverables.

A random sample ($n = 48$) of full-time faculty engaged in teaching at the SPH received an online survey in fall 2018 to assess perception of outcomes, facilitators, and barriers to PBT for them, students, the agency, and the school. Seven (15%) faculty representing all SPH disciplines responded to the survey.

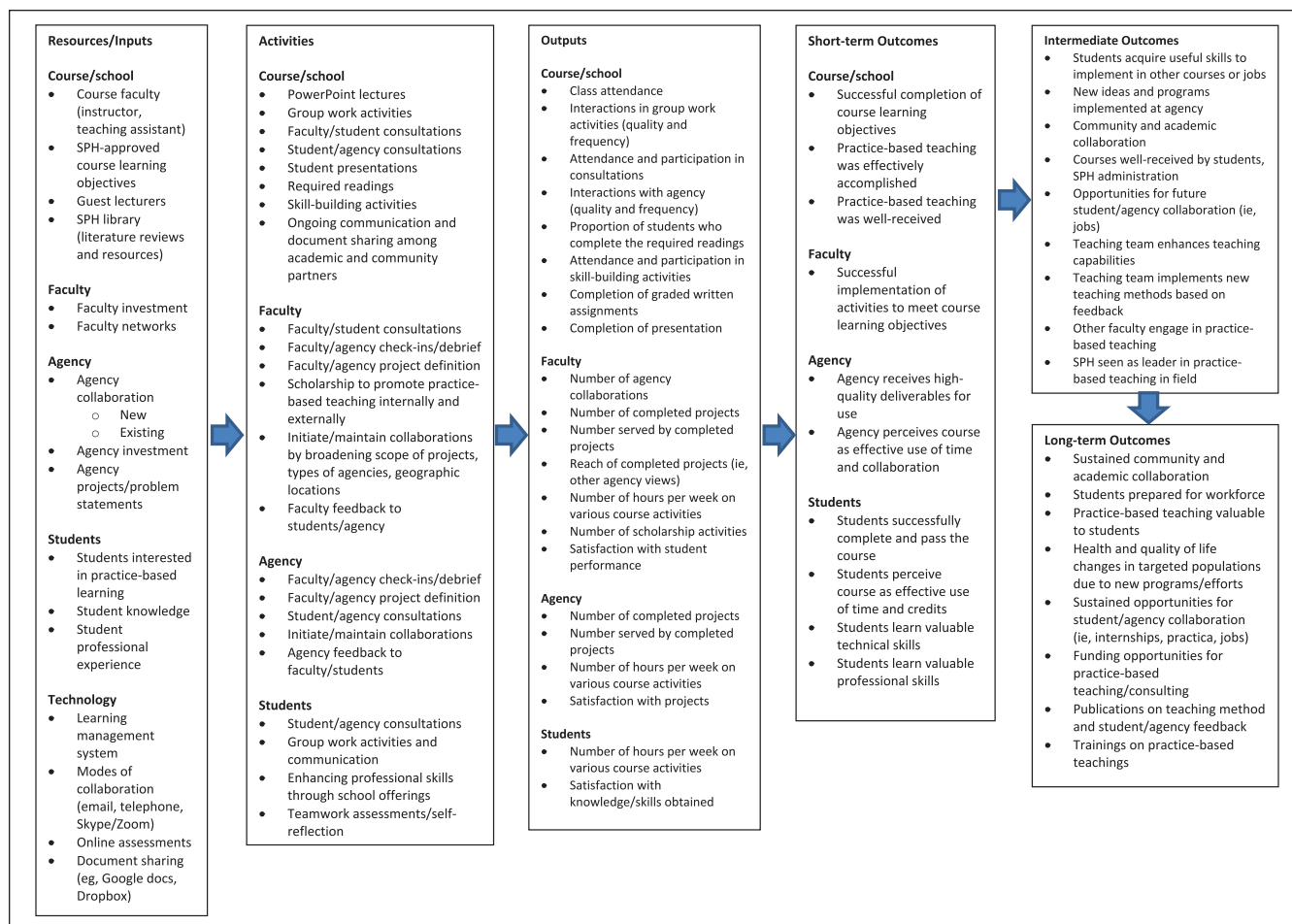


Figure 1. Logic model for cross-disciplinary practice-based teaching in schools and programs of public health (SPHs).

The evaluator surveyed decision-making administrators at SPHs ($n = 22$) representing research, education, practice, and administration in fall 2018 to assess perceptions of PBT outcomes and facilitators and barriers to adoption. Eight administrators responded to the survey.

Students completed online pre-course (conducted the first week of the semester) and post-course (administered the last week of the course) surveys with a unique identifier that allowed for matching ($n = 56$) across timepoints. The pre-course survey assessed student attitudes toward working with an agency, attitudes toward group work, competency with skills (technical and professional), and demographic questions. The post-course survey reassessed those factors along with perceptions of PBT to achieve learning objectives and workforce preparation. Standard SPH course evaluations ($n = 46$) confirmed the student surveys. The evaluator administered a follow-up survey in fall 2018 with the original 56-student sample to assess application of course competencies to careers, utility of practice-based teaching for workforce readiness and skill development, and benefits and barriers to practice-based teaching; 29 students responded.

Student focus group. The evaluator conducted a 1-hour, in-person focus group with 8 students at the end of the spring 2015 semester to elicit opinions on the PBT format, instructor effectiveness, and agency collaboration. The evaluator conducted a similarly formatted focus group in 2018 virtually with 11 students from the 2015 PBT cohort to discuss applicability of PBT to the workforce. Two students overlapped focus groups, and the remaining students were unique.

Data Analysis

The evaluator recorded, transcribed, and managed focus group conversations using NVIVO version 12 (QSR International). We analyzed qualitative data using thematic analysis to identify and compare themes across data sources.²⁴ We used inductive coding for themes because of the exploratory nature of the evaluation questions. Data source triangulation²⁵ of participants allowed for a comprehensive understanding of perspectives, especially across data sources. We analyzed quantitative and survey data using SPSS Statistics version 22 (IBM Corporation); we removed missing responses from analyses. We examined Likert-scale questions by using proportions and

Table 1. Cross-disciplinary evaluation of 4 practice-based teaching courses, deliverables, and collaborating agencies, spring 2015, Boston University School of Public Health

Course (discipline)	Deliverables	Collaborating agencies
mHealth: Using Mobile Technology to Improve Health Outcomes (global health)	<ul style="list-style-type: none"> • Consultant report • mHealth application (ie, Last Mile Health community health workers to identify and manage Ebola cases in the community) • User guide for the application 	<ul style="list-style-type: none"> • Partners in Health • Special Olympics • Mercy Corps • Last Mile Health
Implementing Health Programs in Developing Countries (global health)	<ul style="list-style-type: none"> • eHealth consultation system for remote oncology consultations • Franchise model for mobile clinics in Namibia • Incentive package for community health workers in Ghana • Fundraising and sustainability program for the Afghan National Public Health Association 	<ul style="list-style-type: none"> • Paediatric Oncology Department of the Mexican Ministry of Health • PharmAccess, Namibia • West African AIDS Foundation • Afghan National Public Health Association
Strategy Management in Healthcare (health policy and management)	<ul style="list-style-type: none"> • Service area competitor analysis • Consultant report • Final presentation • Mini-deliverables through the semester related to the project • Case study analysis 	<ul style="list-style-type: none"> • Children's Hospital • Veterans Affairs Healthcare System Boston • Boston Medical Center • Dorchester House
Communication Strategies for Public Health (social and behavioral sciences)	<ul style="list-style-type: none"> • Literature review to inform intervention • Intervention proposal to address public health problem statements • Communication plan to support the intervention • Media executions (ie, press release, apps, blogs, media events, editorials, infographics) 	<ul style="list-style-type: none"> • Boston Public Health Commission • Boston Area Health Education Center • Codman Academy Health Center

Abbreviations: apps, applications; mHealth, mobile health.

continuous variables by using means and SDs. We conducted paired *t* tests on the matched student surveys for skills, value, and reflections, with $P < .05$ considered significant. Because of small sample sizes, we grouped the 5-point Likert-scale survey results as strongly agree/agree, neither agree nor disagree, and strongly disagree/disagree. We organized findings by student, agency, faculty, and administration and describe data collection methods and time points.

Results

Students

Consistent across the 4 courses, students ($n = 93$) represented all SPH concentrations, and 56 (60.2% of enrolled students) students completed the pre-course and post-course surveys. Most respondents were female (89.3%, $n = 50$), were aged 22-25 years (55.4%, $n = 31$), had full-time student status (69.6%, $n = 39$), had <5 years of work experience (92.8%, $n = 52$), and were working <20 hours per week (69.6%, $n = 39$); most students were not working.

In fall 2018, 29 former students (30% of students enrolled in 2015 and 50% of the matched sample) completed follow-up surveys. Most respondents were female (93.1%, $n = 27$), aged 26-30 years (89.7%, $n = 26$), and working full-time

(86.2%, $n = 25$). Alumni worked in various industries and held jobs across various functions.

Eight students representing all 4 PBT courses participated in a focus group at the end of the semester (2015) and 11 students at follow-up; findings were consistent with the survey (Table 3).

Acquisition of Skills

Fifty-six students reported significant increases in all skills including consultation techniques ($P < .001$), literature reviews ($P < .001$), communication plans ($P < .001$), presentations ($P < .001$), program evaluation ($P < .001$), public speaking ($P = .02$), and mobile health ($P < .001$) and a non-significant increase in leadership ($P = .16$). When asked to what extent PBT positively impacted acquisition of skills (answers: not at all, somewhat, or quite a bit), 38 (67.9%) students reported “quite a bit” and 17 (30.4%) reported “somewhat”; the responses were similar for all 4 courses.

At follow-up, students overwhelmingly reported that PBT was important in applying skills (Figure 2) and application 3 years later. One student reported, “It [PBT] gives you a real-life learning experience that cannot be substituted by any other form of learning method.” The acquisition of skills

Table 2. Cross-disciplinary evaluation of practice-based teaching, data collection methods, and timeline, by group, Boston University School of Public Health, 2015-2018

Group	During the semester (2015 pre-course/post-course)							After the semester (2018 follow-up)		
	Presurvey (January 2015)	Mid- semester survey (March 2015)	Postsurvey (May 2015)	Focus groups (May 2015)	Interviews (May 2015)	Classroom observations (January– May 2015)	Document review (January– May 2015)	SPH course evaluation (May 2015)	Follow-up surveys (May–June 2018)	Formal check-ins (May–June 2018)
Students/alumni	✓	✓	✓	✓				✓	✓	
Faculty						✓	✓		✓	✓
Administration									✓	
Agency			✓		✓				✓	

Abbreviation: SPH, school of public health.

remained high, with some variation from post-course to 3-year follow-up (Table 3).

Value of PBT

Fifty (89.3%) students reported that working with an agency enhanced their comprehension of course content, and 54 (96.5%) students reported that working with an agency enhanced the quality of deliverables. Students highlighted the value of PBT to future careers: “[PBT brings] so many skills and abilities together . . . because it is not abstract, it creates hands-on skills, and allows the student to experiment and get a taste of the real thing” (Table 3).

At follow-up, students were asked the value of PBT to their current work environment, and 51 (91.1%) students reported the agency collaboration helped them develop problem-solving skills, enhanced their leadership skills, made them more marketable, allowed acquisition of job-appropriate skills, enhanced teamwork skills and appreciation for the field, and better prepared them to enter the workforce. A focus group participant stated, “Currently in my job there are many times I know how to do something because I did it in my practice-based class . . . it’s very important to . . . the growth of the student professionally” (Table 3).

Challenges with PBT reported in the 2015 focus group included frustration with scheduling group meetings, the fast-paced nature of the course, and communication with the collaborating agency. PBT was less valued for clarifying career plans (69.6%, $n = 39$), finding networking opportunities (53.6%, $n = 30$), and securing a practicum opportunity (37.5%, $n = 21$) or volunteer opportunity (21.4%, $n = 12$).

Reflections on PBT

Upon reflection, 54 (96.5%) students agreed that a PBT course was worth the time investment. Fifty-one (91.1%) students disagreed that they would have gained the same skills, and 46 (82.1%) students disagreed that they would have gained the same knowledge if traditional teaching methods had been used. One student shared, “It is extremely important for courses to bridge the gap between classroom-style/academic

teaching and what the real world is like. Practice-based teaching does exactly that” (Table 3). Forty-four (78.6%) students appreciated the utility of PBT 3 years after the course, and 54 (96.5%) students said more MPH courses should use PBT.

Agencies

Value of deliverables. Of the 9 agencies, 7 reported utility of the evidence-based information, recommendations, and novel ideas provided by the students, and 6 agencies successfully implemented the deliverables within 3 years. Eight agencies reported cost savings for their organization, and 6 agencies reported more targeted programs with better outcomes for their community. One agency reported new or continued funding opportunities after the semester, and 5 agencies reported positive changes in the community served by their organization because of the collaboration.

Value of PBT. Agencies reported gaining knowledge ($n = 7$), skills ($n = 5$), and professional benefits because of the collaboration, including collaborating and networking with an academic institution ($n = 8$) and faculty ($n = 8$), having access to course materials and guest lectures ($n = 5$), and fostering professional development opportunities ($n = 5$). One agency shared, “One of the best things about our collaboration was that the . . . team was able to develop a product that our . . . team did not have time or resources to tackle ourselves” (Table 3). Feedback also highlighted the hope that more SPHs would use PBT.

Faculty

Benefits of PBT. Most faculty agreed that compared with a traditional course, PBT would expose them to topics outside their expertise ($n = 5$) and could enhance the school’s reputation ($n = 5$). Faculty reported PBT could result in professional networking opportunities ($n = 4$) but to a lesser extent it would result in research, practice, and/or scholarship opportunities ($n = 2$). Faculty recognized that successful PBT requires mentorship and support from other PBT faculty ($n = 6$) and considered whether resources existed to support implementation ($n = 6$).

Table 3. Practice-based teaching evaluation benefits, barriers, and future implications, by group, Boston University School of Public Health, 2015-2018

Stakeholder	Benefits	Barriers to adoption	Implications
Students (all currently engaged with PBT)	Short-term benefits: <ul style="list-style-type: none"> • Perceive course as useful and effective • Learning objectives achieved • Professional skills acquired • Agency collaboration seen as valuable Long-term benefits: <ul style="list-style-type: none"> • Opportunities for future student/agency collaboration/jobs • Implement technical skills and professional skills in the workplace 	<ul style="list-style-type: none"> • Scheduling and time constraints • Coordination with group members • Fast-paced course 	<ul style="list-style-type: none"> • Delivers necessary professional skills in addition to learning objectives • Establishes connections with the field • Makes students workforce ready, especially important in times of public health emergency and pandemic • Offers practical insight to problems of the field
Faculty (most not currently engaged with PBT)	<ul style="list-style-type: none"> • Exposure to topics outside their field • Successful course implementation to meet learning objectives • Provides networking opportunities not available otherwise 	<ul style="list-style-type: none"> • Lack of resources and time to find a collaborating agency • Might require faculty supports that the SPH cannot allocate to support PBT implementation • Need to redesign courses and maintain high levels of communication • Lack of knowledge and experience with PBT pedagogy 	<ul style="list-style-type: none"> • Mentorship and support from SPH and other PBT faculty required • Current virtual learning environment is forcing course redesign • More resources may be available to implement skill-based pedagogies
Agencies (all currently engaged with PBT)	<ul style="list-style-type: none"> • Innovation, creativity, and professionalism of PBT deliverables valued • Interaction and engagement with expert faculty helpful • High interest in future collaborations • Virtual collaboration not an impediment 	<ul style="list-style-type: none"> • University connections to agencies may be difficult to establish • Agencies may lack time to participate in PBT • Agencies may lack resources to implement PBT deliverables 	<ul style="list-style-type: none"> • Outreach to agencies should be an essential component of PBT • PBT is a vehicle for building organizational capacity of collaborating agencies • PBT can help agencies address public health problems in a relatively short timeframe and at minimal cost • Ready and skilled public health workforce immediately benefits agencies
Administrators (some familiar with PBT, some not familiar with PBT)	<ul style="list-style-type: none"> • PBT recognized as worth the cost of time and resources to implement • Increased reputational capital for the school • Perception of barriers to PBT greater for those unfamiliar with PBT as compared with those more familiar with PBT 	Might require resources that the SPH cannot allocate to support PBT implementation	<ul style="list-style-type: none"> • Administrators need more information about the importance of PBT and how to support it • Changing educational landscape to virtual learning presents ideal time to shift pedagogies • Delivering skills to students in real time attracts more applicants to SPHs

Abbreviations: PBT, practice-based teaching; SPH, school or program of public health.

Faculty recognized beneficial outcomes for students including higher-quality assignments ($n = 4$), increased acquisition of professional and technical skills ($n = 4$), better workforce preparation ($n = 5$), and the ability of agencies to better serve their target populations ($n = 4$). Increased acquisition of knowledge ($n = 3$) and better preparation for subsequent courses ($n = 2$) were less important.

Barriers to adoption of PBT. Most faculty reported interest in implementing PBT but recognized challenges, including not enough time to find a collaborating agency ($n = 4$), to redesign the course before the semester ($n = 4$), or to teach a PBT course during the semester ($n = 3$); the communication and planning for PBT seemed too daunting ($n = 5$); and a lack of networks in which to find a collaborating partner ($n = 5$). Other faculty reported a lack of knowledge about what is

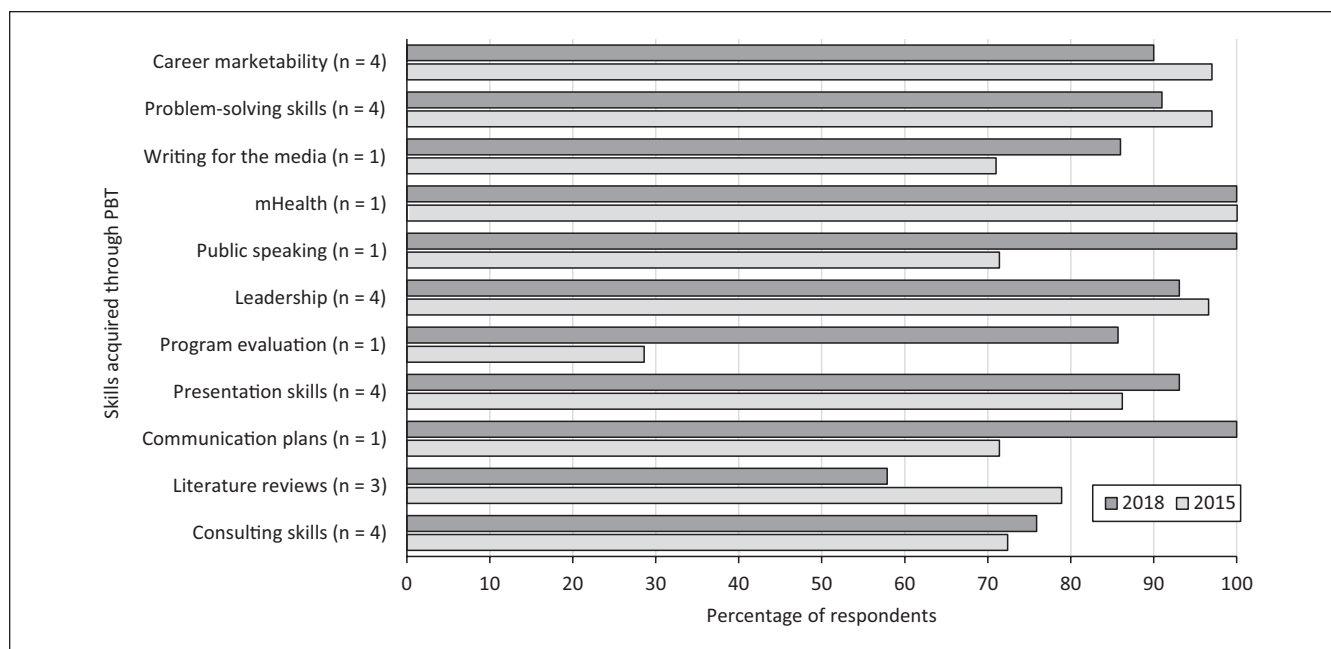


Figure 2. Self-reported acquisition of skills (matched), post-course and follow-up, among students ($n = 29$) enrolled in practice-based teaching (PBT) courses, Boston University School of Public Health, 2015-2018. Numbers represent the number of PBT courses that addressed that skill. Percentages represent the students who reported acquiring the skill. Abbreviation: mHealth, mobile health.

required of a PBT course ($n = 5$). One faculty member commented, “As noted, time is the big reason, and . . . lack of coverage for the effort and time investment [is] needed” (Table 3).

Administration

Benefits of PBT. SPH administrators reported that PBT courses benefit the school through enhanced reputation in teaching and/or community engagement ($n = 8$), professional networking opportunities ($n = 7$), and research, practice, and/or scholarship opportunities ($n = 7$). Seven administrators agreed that PBT was worth the resources, recognizing the vast benefits of PBT to students. One administrator noted, “Practice-based teaching enhances the learning experience for students” (Table 3).

Administrators did not agree with as many benefits to faculty; 3 administrators reported that PBT courses may expose faculty to other topics outside their expertise. Administrators did perceive positive agency outcomes, including sustained agency partnerships ($n = 6$), providing tailored deliverables to communities ($n = 7$), and products being implemented ($n = 5$).

Barriers to PBT. Although the perceptions were equally reported by administrators who were more familiar with PBT as a pedagogy ($n = 4$) and those who were less familiar ($n = 4$), administrators less familiar with PBT reported more barriers and that PBT implementation would require SPH

administration support or PBT faculty mentorship ($n = 8$). One administrator noted, “Percent effort would have to be increased to cover the time/effort it takes to really do this well” (Table 3).

Discussion

The COVID-19 pandemic has enhanced the need for academic public health institutions to rapidly deploy a well-trained workforce to meet the changing needs of the public health field, which even before the pandemic had shifted employment sectors of MPH graduates.⁵ During the pandemic, public health students were deployed to support understaffed local health departments.¹⁸ This effort illustrates the need for training that fosters technical and professional skill acquisition through applied opportunities and real-world situations resulting in innovative and sustainable solutions.^{26,27} Our evaluation is timely given the current urgency for a trained and ready public health workforce and the shift to virtual and hybrid learning in higher education.

For students, the evaluation demonstrated achievement of learning objectives and acquisition of knowledge and skills acquired during the semester; consistent with other research,²⁸ students largely attributed the increase to the PBT course. Students received course content through in-person and virtual modalities. Students also more fully appreciated the essential nature of the skills developed—problem-solving, leadership, and teamwork skills—in the PBT course 3 years after being exposed to various functional roles in the

workforce. These skills are important, particularly now in the changing public health landscape. These courses delivered competencies in a hybrid approach, with PBT a flexible pedagogy to teach virtually¹⁶ and with increased technology.²⁹

Collaborating agencies expressed an interest in continuing collaboration, which is especially relevant given our virtual environment. Agencies connected either virtually or in a hybrid format (ie, a combination of virtual and in-person interaction). PBT is not only capable of being delivered through virtual connections with agencies but can be enhanced by technology¹²; it has the ability to connect the classroom to agencies regardless of geographic boundaries. The longer-term benefits to the agency reported in this study reinforce already documented benefits, including cost savings and more targeted programs with better community outcomes.³⁰⁻³²

Consistent with previous research, faculty recognize the benefits of PBT³³ and that successful implementation requires resources and poses some barriers.³⁰ SPH administrators also recognized these barriers but reported it was worth the investment to successfully implement the pedagogy. Strategies to support the implementation and sustainability of PBT include time coverage to design or redesign a course for PBT, enhanced networking through alumni and career services offices, mentorship from experienced faculty, and structured trainings with resources.

Limitations and Strengths

This study had several limitations. First, we conducted the evaluation on 1 semester of PBT courses, which may have limited the generalizability of findings, although students in these courses represented all public health disciplines. Second, some sample sizes were small; however, respondents represented a variety of perspectives, and quantitative and qualitative data collection strategies yielded similar themes. Third, follow-up survey response rates were low (30%), but the sample was demographically similar to the students enrolled during the semester.

This evaluation also had several strengths. First, it was conducted by 1 evaluator unaffiliated with the program who examined 4 courses across public health disciplines with various learning objectives, assessments, and deliverables. Second, it examined application of skills in the field 3 years post-course, which is often too resource-intensive to assess. Third, PBT was delivered by 4 faculty members with different teaching styles and backgrounds but all with reliance on virtual connections. Fourth, collaborating agencies represented a variety of public health sectors and issues. Finally, the mixed-methods evaluation, a proposed update to SPH accreditation criteria,⁶ resulted in a robust picture of the pedagogy.

Conclusion

The ability to develop and redesign courses that focus on skill development is at the forefront of higher education and

will become more relevant as SPHs modify and expand their offerings. Resources are being reallocated to provide hybrid and virtual learning opportunities to students that did not previously exist, technology is more available to connect people,²³ and virtual learning will remain part of our higher education landscape.³⁴ The barriers that prevented large-scale adoption and implementation of PBT in SPHs will likely be addressed by the increased resources given to virtual, online, and hybrid learning.²⁶ PBT is a flexible pedagogy that can use a hybrid approach and leverage technology to connect the classroom to the field to prepare a ready public health workforce. Future research should explore the extent of resources needed to design and implement PBT courses, and other courses should be evaluated for short-term and long-term impacts across various delivery models.

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 received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Jacey A. Greece, DSc, MPH  <https://orcid.org/0000-0003-2044-9270>

References

1. Council on Education for Public Health. *Accreditation Criteria: Schools of Public Health & Public Health Programs*. 2016. Accessed January 15, 2021. https://media.ceph.org/wp_assets/2016.Criteria.pdf
2. Institute of Medicine. *The Future of Public Health*. National Academies Press; 1988. doi:10.17226/1091
3. Association of Schools and Programs of Public Health. *Public Health Trends and Redesigned Education: Blue Ribbon Public Health Employers' Advisory Board: Summary of Interviews*. 2013. Accessed February 22, 2021. <https://www.aspph.org/teach-research/models/blue-ribbon-public-health-employers-advisory-board>
4. Hilliard TM, Boulton ML. Public health workforce research in review: a 25-year retrospective. *Am J Prev Med*. 2012;42(5 suppl 1):S17-S28. doi:10.1016/j.amepre.2012.01.031
5. Krasna H, Kornfeld J, Cushman L, Ni S, Antoniou P, March D. The new public health workforce: employment outcomes of public health graduate students. *J Public Health Manag Pract*. 2021;27(1):12-19. doi:10.1097/PHH.0000000000000976
6. Council on Education for Public Health. *Accreditation Criteria: Schools of Public Health & Public Health Programs*. Amended October 2016. Accessed April 16, 2021. <https://media.ceph.org/documents/2016.Criteria.redline.7.pdf>
7. Walker ER, Lang DL, Alperin M, Vu M, Barry CM, Gaydos LM. Comparing student learning, satisfaction, and experiences between hybrid and in-person course modalities: a comprehensive, mixed-methods evaluation of five public

- health courses. *Pedagogy Health Promot.* 2020;7(1):29-37. doi:10.1177/2373379920963660
8. Greece JA, DeJong W, Gorenstein Schonfeld J, Sun M, McGrath D. Practice-based teaching and public health training: bringing real-world projects to the classroom to teach intervention planning and communication strategies. *Pedagogy Health Promot.* 2019;5(1):55-61. doi:10.1177/2373379918760929
9. Greece JA, Wolff J. Practice-based teaching in public health. In: Sullivan LM, Galea S, eds. *Teaching Public Health*. Johns Hopkins University Press; 2019:195-208.
10. Greece JA, Wolff J, McGrath D. A framework for practice-based teaching in public health. *J Public Health Manag Pract.* 2019;25(5):E30-E38. doi:10.1097/PHH.0000000000000863
11. Kratzke C, DeLeon O, Rao S. Practice-based teaching model for undergraduate public health students: partnership for exercise is medicine on campus initiative. *Pedagogy Health Promot.* 2020;7(3):242-248. doi:10.1177/2373379920935460
12. Ezeonwu M. Community-based education in global low-resource settings: a unique interprofessional collaborative experience in primary care delivery. *Pedagogy Health Promot.* 2020;6(1):56-62. doi:10.1177/2373379919891183
13. Gardner JK, Ronzio C, Snelling A. Transformational learning in undergraduate public health education: course design for Generation Z. *Pedagogy Health Promot.* 2018;4(2):95-100. doi:10.1177/2373379917721722
14. Husmann PR, O'Loughlin VD. Another nail in the coffin for learning styles? Disparities among undergraduate anatomy students' study strategies, class performance, and reported VARK learning styles. *Anat Sci Educ.* 2019;12(1):6-19. doi:10.1002/ase.1777
15. Atchison C, Boatright DT, Merrigan D, et al. Demonstrating excellence in practice-based teaching for public health. *J Public Health Manag Pract.* 2006;12(1):15-21. doi:10.1097/00124784-200601000-00004
16. Ezeonwu M, Berkowitz B, Vlasses FR. Using an academic-community partnership model and blended learning to advance community health nursing pedagogy. *Public Health Nurs.* 2014;31(3):272-280. doi:10.1111/phn.12060
17. Association of Schools of Public Health. *ASPH Policy Brief: Confronting the Public Health Workforce Crisis—Executive Summary*. December 2008. Accessed April 13, 2021. <https://www.healthpolicyfellows.org/pdfs/ConfrontingthePublicHealthWorkforceCrisisbyASPH.pdf>
18. Massachusetts Department of Public Health. Academic Health Department Consortium (AHD). 2019. Accessed March 1, 2021. <https://www.mass.gov/info-details/academic-health-department-consortium-ahd>
19. Blumberg P. *Assessing and Improving Your Teaching: Strategies and Rubrics for Faculty Growth and Student Learning*. Jossey-Bass; 2014.
20. Fink LD. Evaluating teaching: a new approach to an old problem. *To Improve the Academy: Resources for Faculty, Instructional, and Organizational Development*. 2008;26(1):3-21. doi:10.1002/j.2334-4822.2008.tb00497.x
21. Spooren P, Brockx B, Mortelmans D. On the validity of student evaluation of teaching: the state of the art. *Rev Educ Res.* 2013;83(4):598-642. doi:10.3102/0034654313496870
22. Joly BM. Teaching graduate students to evaluate public health programs through community-based learning. *Pedagogy Health Promot.* 2020;6(2):119-127. doi:10.1177/2373379919855094
23. Fox K, Bryant G, Lin N, Srinivasan N. *Time for Class—COVID-19 Edition Part 1: A National Survey of Faculty During COVID-19*. Tyton Partners and Every Learner Everywhere; 2020. Accessed February 12, 2021. <https://www.everylearner-everywhere.org/wp-content/uploads/TimeforClass-COVID19-Part-1-NationalFacultySurvey-Final.pdf>
24. Riessman CK. *Narrative Methods for the Human Sciences*. Sage; 2008.
25. Patton MQ. Enhancing the quality and credibility of qualitative analysis. *Health Serv Res.* 1999;34(5 pt 2):1189-1208.
26. Council on Linkages Between Academia and Public Health Practice. *Academic Health Departments: Core Concepts*. January 2011. Accessed February 12, 2021. http://www.phf.org/resourcestools/Documents/AHD_Concepts_2011Jan14.pdf
27. Erwin PC, Harris J, Wong R, Plepys CM, Brownson RC. The academic health department: academic-practice partnerships among accredited U.S. schools and programs of public health, 2015. *Public Health Rep.* 2016;131(4):630-636. doi:10.1177/0033354916662223
28. Hartwig KA, Pham K, Anderson E. Practice-based teaching and learning: an example of academic-community collaboration. *Public Health Rep.* 2004;119(1):102-109. doi:10.1177/003335490411900118
29. Groff J. Technology-rich innovative learning environments. *OECD*. 2013. Accessed September 14, 2021. <https://www.oecd.org/education/ceri/Technology-Rich%20Innovative%20Learning%20Environments%20by%20Jennifer%20Groff.pdf>
30. Kegler MC, Lifflander A, Buehler J, et al. Multiple perspectives on collaboration between schools of public health and public health agencies. *Public Health Rep.* 2006;121(5):634-639. doi:10.1177/003335490612100522
31. Breny JM. Developing agreements and delineating tasks: creating successful community-engaged service learning projects. *J Civic Commitment.* 2012;19:1-14.
32. Schlaff AL, Robbins A. Teaching health departments: meeting the challenge of public health education. *J Public Health Manag Pract.* 2009;15(5):439-442. doi:10.1097/PHH.0b013e3181a7a679
33. Neri EM, Ballman MR, Lu H, Greenlund KJ, Grunbaum JA. Academic-health department collaborative relationships are reciprocal and strengthen public health practice: results from a study of academic research centers. *J Public Health Manag Pract.* 2014;20(3):342-348. doi:10.1097/PHH.0b013e3182a152c6
34. Govindarajan V, Srivastava A. What the shift to virtual learning could mean for the future of higher ed. *Harvard Bus Rev.* March 31, 2020. Accessed February 12, 2021. <https://hbr.org/2020/03/what-the-shift-to-virtual-learning-could-mean-for-the-future-of-higher-ed>