Applying Kern’s Six Steps to the Development of a Community-Engaged, Just-in-Time, Interdisciplinary COVID-19 Curriculum

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ABSTRACT: Universities and medical schools often work towards operationalizing their shared mission of facilitating community-engaged work independently. Based on their experience teaching the COVID-19 Elective course at Stanford University School of Medicine, the authors proposed a novel solution for universities and medical schools to achieve an interdisciplinary collaboration within a diverse student population by creating targeted, project-based, and community-engaged courses for addressing emergent health needs. In this article, the authors discuss their curriculum, which was created using Kern’s six-step approach for curriculum development, to address emergent health needs related to the novel coronavirus pandemic. The curriculum provides an opportunity for universities and medical schools to advance community health, educate students across the medical and non-medical education continuum, and foster interdisciplinary cooperation.

KEYWORDS: interdisciplinary studies, curriculum, community health services, population health, COVID-19

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On March 11th, 2020, the World Health Organization classified COVID-19 as a pandemic. As little was known about COVID-19 and the multi-faceted impact it would have locally and globally, an opportunity existed to teach students about COVID-19 in real-time while simultaneously addressing the community needs created by the pandemic.

Noticing this gap at the Stanford University School of Medicine, we created an elective course on COVID-19 in a matter of days. In April 2020, we launched a course to allow a wide range of students to hear from experts in their fields about the latest information regarding COVID-19. Additionally, our interdisciplinary student population created novel community-engaged projects addressing emergent health needs. Student-led interventions can be valuable during efforts across the university. Despite having a shared dedication to community service, universities and medical schools often work towards this goal independently. This presents a missed opportunity for collaboration that could produce a plethora of novel approaches to health care-related problems.

In the context of health care, community-engaged work involves working with a community partner to effect changes for their work. One way to maximize the impact of this shared dedication to community service is to facilitate interdisciplinary, community-engaged efforts across the university. Despite having a shared dedication to community service, universities and medical schools often work towards this goal independently. This presents a missed opportunity for collaboration that could produce a plethora of novel approaches to health care-related problems.

Canada include community-engaged work in their mission statement (103/173) and many universities list community service as a core tenet of their mission. One way to maximize the impact of this shared dedication to community service is to facilitate interdisciplinary, community-engaged efforts across the university. Despite having a shared dedication to community service, universities and medical schools often work towards this goal independently. This presents a missed opportunity for collaboration that could produce a plethora of novel approaches to health care-related problems.

We used Kern’s six-step approach for curriculum development to create PEDS 220: COVID-19 Elective. The course,
which is open to all students in all degree programs, works to educate and mobilize students across the university in the fight against the novel coronavirus pandemic. To date, we have taught 661 students from 35 undergraduate and 44 graduate programs (Figure 1) and have incubated 26 community-engagement projects (Table 1). To resemble the multidisciplinary student population, the Teaching Team consists of an attending physician and both undergraduate and graduate students. The course’s student population includes non-medical, pre-medical, graduate, and medical students, and practicing physicians. In addition to educating students on COVID-19, our course teaches the best practices for community-engaged work. This article will outline the development of our curriculum through the lens of Kern’s six-step approach and also include a case study describing an individual student’s project.

Step 1: Problem Identification and General Needs Assessment

Using problem identification and needs assessment strategies, course organizers identified a specific community health concern on which to focus the class, curriculum, and student work. As there was a lack of formal university-level education and prior literature about the pandemic in March 2020, we conducted a needs assessment through conversations with medical students, graduate students, and hospital physicians. We identified a need for a virtual class about COVID-19 where students could learn from experts and work closely with peers across fields to perform high-impact and well-informed community work.

Step 2: Targeted Needs Assessment

Identify Cohort and Individual Student Needs. We realized that the interdisciplinary environment our university had to offer and the creativity and innovation encouraged on campus made an ideal ecosystem for learning about and mitigating the negative impacts of the pandemic. We wanted students to hear from experts on the frontlines about the problems and solutions that arose throughout the pandemic. As the pandemic went on, we continued to evaluate gaps that our class could address through continuous conversations with students, experts, and community partners. After the first iteration of the course, it became clear that there were numerous community needs that could be addressed by a multidisciplinary student population. Realizing this potential, we added a course projects portion to the course where students could address a community-health need related to COVID-19 in collaboration with community partners. The curriculum’s specific focal point around COVID-19 provides students with course content complementary to their projects.

Identify Community Needs. Students partnered with community organizations that were well-poised to facilitate the implementation of projects addressing COVID-19. We connected students with community partners, which provide an interface with specific communities to implement the projects, but also provide realistic assessments of needs. By virtue of the reciprocal nature of community partnerships, students received guidance on implementing community work and community needs from the partner while working closely with them to consciously deliver projects in the community.

Step 3: Goals and Objectives

The third step of Kern’s approach requires defining broad goals and specific measurable learning objectives. We adjusted the overall goals for the course every academic term based on the most current information about the pandemic and feedback from students. At the beginning of the COVID-19 pandemic, the overall goal of the course was focused on understanding medical and scientific aspects of SARS-CoV-2, while later iterations of the course included lectures on the pandemic’s mental health, psychosocial, economic, and legal implications. Due to the varied topics addressed by the course, specific objectives for each class were set by speakers.

For the course projects, specific objectives were developed individually for every project by the student(s), community partner(s), and Teaching Team to maximize effectiveness and provide a standard to evaluate the impact of the project. At the conclusion of the course, we obtained feedback from students and community partners related to the course’s ability to meet its goals and their input for adjusting the overall goals and objectives of the course for the next academic term.

Step 4: Educational Strategies

The fourth step of Kern’s six-steps, “Educational Strategies,” describes the curricular strategies and content that will be employed to facilitate course objectives.

In order to provide relevant, just-in-time learning about this rapidly evolving pandemic, new course topics were updated each academic term to capture novel knowledge gaps. During academic year 2020-2021, to coincide with developments being made in the process of COVID-19 vaccine rollout, a number of lectures were tailored to address COVID-19 vaccination, from the creation and basic immunology behind the vaccines to the moral considerations of vaccine rollout during the pandemic.

When developing a set of lectures, the Teaching Team leveraged the virtual course format to allow for geographically diverse lecturers who represent a variety of disciplines. This helped the course accurately represent the current landscape of COVID-19 related work. Given the diverse student cohort, in terms of discipline and academic level, all lecturers were encouraged to give talks at the introductory graduate level, so students with any level of medical knowledge can benefit from their lecture. Students of many backgrounds took the course, which facilitated unique connections between
students from different backgrounds who may have otherwise never interacted together. Virtual learning promoted social distancing during a pandemic and allowed all students, no matter where they are located around the world, to benefit from the course.

Course lectures were followed by a discussion with the lecturer. Additionally, discussion questions were crafted by the lecturer, such that their expertise was leveraged to provide thoughtful prompts for students.

The course also utilized community-engaged course projects as a core educational strategy, allowing for a curriculum that emphasizes experiential learning. The course leveraged a number of interdisciplinary partnerships to obtain our holistic set of course objectives. These partnerships included teaming up with a campus public service entity to provide resources for developing well-constructed, ethical, community-engaged projects, encouraging partnership among our multidisciplinary student cohort, and engaging with potential community partners. We worked with students to determine their individual skills that could be useful in creating a solution to the problem they want to solve through guided brainstorming activities in class and individualized mentorship meetings.

Interdisciplinary collaboration was fostered using a multi-team approach: the immediate project team, the class team, and the team beyond the class. The immediate project team consisted of students who chose to work together on a particular community-engaged course project. The Teaching Team encouraged students, often at different stages of their education and from different degree programs, with similar interests to work together. The class team consisted of all of the course projects students and the Teaching Team. The Teaching Team provided longitudinal feedback throughout the quarter via mentorship meetings and detailed, prescriptive assignment feedback. Course project students from different disciplines provided feedback to their peers about each project. Finally, we created a team beyond the class by encouraging students to seek mentorship and advice from faculty and students throughout the University and from outside experts and community partners. We asked students to invite their community partners and anyone else who contributed to their course projects to our final class project symposium where students present their projects. By taking a multi-team approach, we ensured that all students, even those who are completing course projects independently, were leading projects with an interdisciplinary lens.

**Step 5: Implementation**

The fifth step of Kern’s approach entails administering the curriculum, which allows us to translate our educational strategies from theory to practice by considering the following criteria.16

**Assembling an Interdisciplinary Cohort.** In order to attain an interdisciplinary cohort of students, the Teaching Team took a three-pronged approach. Firstly, the course had no prerequisite coursework, ensuring all interested students could enroll. Secondly, the course was advertised to students of all degree programs by sending out infographics and flyers to email lists for different departments and programs. Thirdly, the Teaching Team further incentivized students to take the class by getting it approved to satisfy requirements towards various degree programs.

**Curating Lectures and Course Projects.** Expert speakers were invited to give guest lectures and address the identified knowledge gaps. Speakers are chosen to represent the diversity of the
scholars working on COVID-19, in terms of race, ethnicity, gender identity, sexual orientation, institutional affiliation, and educational background. This lecture took the form of an approximately 40-minute lecture followed by an interactive class-wide discussion that allowed students to directly engage with the guest speaker.

The course projects aspect of the course was also carefully implemented in collaboration with support from the university’s center for public service. Firstly, projects were broken down into manageable assignments over the academic term. Students completed a project proposal, budget proposal, two individual check-ins with the Teaching Team, and turned in their final project deliverable. Students were encouraged to collaborate with each other by an informational session at the beginning of the course in which students introduce themselves and provide preliminary project ideas. Throughout the course, students were able to communicate with and provide feedback to each other through various applications (eg, Canvas, GroupMe, and Slack) and during peer review and peer feedback hours.

Secondly, student project development was supported by a weekly one-hour course section. This class meeting taught students best practices for their community-engaged work and incorporates didactic lectures, interactive activities, and peer review.

Lastly, student projects were highlighted during a student course projects symposium. The Teaching Team invited all past students, community partners, and expert lecturers to attend, in addition to advertising the event to the general university community. Each group was expected to give a short presentation summarizing their project.

Step 6: Evaluation and Feedback

As Kern’s six-step approach suggests, evaluation and feedback for the course is two-pronged, as evaluation of both the Teaching Team and students are critical. Students completing projects were evaluated iteratively through mechanisms, such as individual check-ins, peer feedback events, assignment brainstorming and drafts, and the project symposium. We created a culture of continuous quality improvement during the course, which could help prevent unintended consequences of projects. Given that the course utilized a satisfactory/no credit grading system, feedback was not given to justify a grade, but with the sole intention of mentoring students in developing their projects, and to instill skills needed to practice ethical, community-engaged work. The campus public service entity evaluated students’ experience at the end of the course.

Our course utilized the University’s end-of-term student course-evaluation survey to gauge student satisfaction with the course and success in meeting learning objectives. This standardized form allowed students to provide feedback on if they reached the learning goals, how they engaged with the course, if they would recommend the course to others, and other suggestions. For student projects, specific surveys were conducted in collaboration with the campus public service entity. One student noted the following:

“It was easy to attend the lectures as the classes were online and all of the speakers had very interesting presentation[s] that were informative. I believe the class could be improved by incorporating more participatory aspects.”

Student feedback has transformed the course over the last two years. The course continues to change with each iteration because student interest and engagement remain high. To

Table 1. Examples of past successful projects created using this framework.

| PROJECT | TYPE OF COMMUNITY | IMPACTED COMMUNITIES |
|---------|------------------|----------------------|
| Writing and disseminating a children’s book to combat vaccine hesitancy in multiple languages | University health education center, medical clinics, community schools and libraries | English, Spanish, and Portuguese speaking families nationally |
| Creating an international alliance of students to address vaccine hesitancy | International community health education non-profit | International, communities with low vaccination rates |
| Organizing an international COVID-19 research symposium to update public on progress of coronavirus research | University health education center, various research institutions | International, members of the public seeking more information about COVID-19 research |
| Creating a needs-assessment for natural disaster evacuations during the COVID-19 pandemic to prevent outbreaks during natural disasters | Municipal office of emergency preparedness | Mid-sized US city that is prone to natural disasters |
| Creating state-specific Twitter accounts to advertise vaccine appointment availability in real time | News stations | Members of the public in multiple US states seeking COVID-19 vaccination |
| Creating and validating an algorithm to detect COVID-19 using cough audio samples in areas where assay-based tests are not readily available | Hospitals and medical facilities in low- and middle-income countries | Patients being screened for respiratory disease in low- and middle-income countries |
| Organizing a panel of legal experts to increase the awareness of legal and ethical implications of vaccine mandates | Interdisciplinary legal center | University students and affiliated community members |

Selected community-engagement and COVID-19 focused projects from PEDS 220: COVID-19 Elective.
improve student participation, the online class environment was re-formatted from Zoom webinar to a regular Zoom meeting, as well as adding a class-wide discussion component after lecture. Additionally, we learned that more students provided feedback for the course when a multi-modal approach was taken including meeting with students to gauge course-related feedback, course satisfaction and quality reviews conducted in the middle of the term, and end-of-term surveys. Gathering this student feedback has been pivotal in iteratively improving the course.

**Student Project Case Study.** The following case study provides an example of a community-engaged project that was incubated by our course. A student identified a need for a project to combat vaccine hesitancy in families with young children and focused on teaching about herd immunity and vaccines. This project was inspired by her experiences witnessing vaccine hesitancy among family, friends, and peers. Through course lectures, she learned about the nuances of vaccine hesitancy and realized the lack of accessible information about vaccines available for young children and families. She decided to develop a children’s book about herd immunity and vaccines targeted at children ages 5–11.

Both the Teaching Team and peers in the class were able to provide feedback on and support for the student’s project. The Teaching Team played a vital role in connecting the student to experts and community partners who could provide feedback on and help distribute the project.

The student worked with multiple community partners including the Stanford Center for Health Education, Stanford Graduate School of Education, Stanford Biology Department, and pediatricians at Lucile Packard Children’s Hospital Stanford. Through guidance from experts on vaccines and vaccine hesitancy, early education, and health education the student was able to refine her project to accomplish her goals.

The student communicated with community partners throughout developing her project to define and redefine her goals. The student’s overarching goal was to reach as many families as possible across the nation, especially in minority and under-vaccinated communities, and combat vaccine hesitancy.

The student leveraged the interdisciplinary nature of the class to create a project that uses science, medicine, art, and education to create a useful resource for combating vaccine hesitancy. The student’s book is available on Amazon in paperback and Kindle versions and as a free eBook on Stanford Medicine’s Digital Medic website. The book teaches children about herd immunity, explaining the importance of vaccination for their own health and for protecting their loved ones and communities. Additionally, the student has led vaccine education workshops for elementary school students throughout the county.

The student piloted an early version of her book through focus groups in kindergarten through fifth-grade classrooms. Additionally, the student sought feedback from experts in vaccines and education including virologists, professors of pediatrics, pediatricians, and educators to validate the content and ensure the book would be an effective pedagogical tool. The student is able to receive longitudinal and continuous feedback by tracking the number of views of the eBook on Stanford Medicine’s Digital Medic website. Even after completing this course, this student has continued to work on and expand her project.

**Conclusion**

We used Kern’s six-step approach to curricular development to create a project-based course for interdisciplinary students to address COVID-19 in real time. Although this course was focused on COVID-19 education, our approach can be used to develop curricula for other emerging health needs as well. This novel application provides an opportunity for any university to advance community health, educate students across the medical education continuum, and foster interdisciplinary education for just-in-time learning across health topics. Our hope is that we can improve student experiences and better respond to the many multifaceted health issues that have emerged across the globe, all while encouraging creative interdisciplinary work to solve future public health issues. In promoting interdisciplinary teamwork and giving students the opportunity to contribute to problem solving in current health crises, we are working towards a more interconnected and collaborative community of future professionals, in medicine and beyond, to better tackle the emergent public health problems of tomorrow.

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**Ethical Approval**

Not applicable, because this article does not contain any studies with human or animal subjects.

**Informed Consent**

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