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Development and implementation of a COVID-19 Vaccine and Pandemic Planning course: An interprofessional education approach

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ABSTRACT

We developed an online interprofessional COVID-19 Vaccine and Pandemic Planning course at the height of the pandemic to prepare health science students for future vaccine delivery. Faculty from nursing, pharmacy, medical, and dentistry developed a six-week online co-curricular interprofessional education activity open to all health science students across seven schools on three campuses within the same University system. Total enrollment included 303, with 228 completing the course from 16 programs. The majority of students were from the Doctorate in Dental Surgery (DDS) program (26.2%) and the Midwestern urban campus (90.3%). Successful rapid course development and implementation was attributed to several factors. The broad range of students across health science programs and differing years in respective programs provides insight to plan future co-curricular activities. The rapid development of a system-wide health science IPE course has implications for continuously changing professional health education needs.

1. Format

The COVID-19 Vaccine and Pandemic Planning (C-19VPP) course was a six-week online course consisting of six modules with video presentation content, assigned readings, and weekly discussion or reflection exercises (see [Appendix A](#)).

2. Target audience

The online COVID-19 VPP course was open all University health science professional students across seven schools (Nursing, Pharmacy, Dental, Medicine, Allied health, Public Health, and Veterinary Medicine) and three campus within the same University system.

3. Objectives

The course objectives included:

1. Demonstrate an understanding of the public health role that health care practitioners play with respect to population-based disease prevention.

2. Examine COVID-19 vaccine safety, development, and pandemic planning.
3. Describe COVID-19 vaccination handling and storage
4. Describe COVID-19 vaccine administration procedures
5. Explore documentation and reporting COVID-19 vaccine adverse events
6. Demonstrate knowledge of interprofessional roles in the COVID-19 vaccine and pandemic response planning

4. Activity description

To provide C-19VPP educational content to health professional students using the IPEC competencies (communication, teamwork, knowledge of roles, and values/ethics) as a framework for course content and activities. Students who complete this course will gain a broader understanding of COVID-19 and its vaccines but not acquire the skills necessary to administer vaccines.

The C-19VPP course builds on a successful vaccine course offered annually for nursing and pharmacy students since 2000 at the University called "Immunization Tour".¹ The C-19VPP course was developed over four weeks (Jan 1 - Feb 1, 2021). The interprofessional development

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team included faculty from nursing, pharmacy, medicine, and dental schools. Weekly team meetings were held to discuss logistics, content development, and course planning. The included content topics were based on current vaccine knowledge at the time of course development and that would appeal to a broad range of health science students. The team elicited lectures and presentations from colleagues across health science schools with specific content expertise such as vaccine development. Course faculty reviewed current literature and included relevant peer-reviewed articles that aligned with course content to provide additive knowledge to the topics. We employed online teaching strategies to facilitate student engagement and modified active learning strategies to the online environment to engage a broad range of health science students. Specific online strategies included purposeful online discussion, reflection activities, and intentionally placing students into small interprofessional discussion groups (approximately 12–15 per group).

Course planning was informed and supported by other IPE resources available at the University. In particular, the National Center for Interprofessional Practice and Education, a public-private partnership that provides leadership and resources to support IPE² and is located on our campus, and IHealth³ a program offering health sciences students curricula to understand and value the importance of teamwork, communication, and collaborative care as they grow into their roles as a health professional. This existing infrastructure provided support for this interprofessional collaborative faculty effort to rapidly develop and deploy training that would prepare health professions students across the University system.

We used the learning management system, Canvas, to store, deliver and manage the online content. We elected to offer the course as a co-curricular activity (not for credit) and free of cost to all health science undergraduate and graduate students including Nursing, Pharmacy, Medicine, Dental, Public Health, Veterinary Medicine, and Allied Health across three University campus locations. The course was advertised through the Office of Academic and Clinical Affairs (OACA), formerly the Academic Health Center (AHC), distributed through listserves within each respective health science schools, and included an active link for students to register and gain access to the course.

5. Assessment

Students need to complete all module activities before continuing to the next module. Students that completed all six modules and passed the final quiz (>70% passing grade and unlimited attempts) received a certificate of completion. Enrolled students were given the opportunity to attend a skills workshop to learn to give intramuscular injections using a realistic injector pad if relevant to their health profession's scope of practice.

6. Evaluation

Enrolled students completed a pre-survey questionnaire and included questions such as Campus location; "What is your professional program?"; "Year in the program?"; "What do you hope to learn from this class?" (free text response); "How would you rate your current knowledge of COVID-19?"; and "How would you rate your current knowledge of COVID-19 vaccines?" (1–5 scale; 1 = no knowledge; 5 = superior knowledge); and "Have you had experience giving a vaccine (i.e. intramuscular injection)?" (yes/no response).

The post-survey included: "After taking this course, how would you rate your knowledge of Sars-Cov2?"; "After taking this course, how would you rate your knowledge of COVID-19 vaccine(s)? (1–5 scale; 1 = no knowledge; 5 = superior knowledge); "What was the most valuable content you learned from this course?"; "What could be improved in this course?" (free text response); and "Would you recommend this course to fellow students?" (yes/no/maybe). We assessed student learning via graded discussion (See [Appendix B](#)) and a final multiple choice quiz.

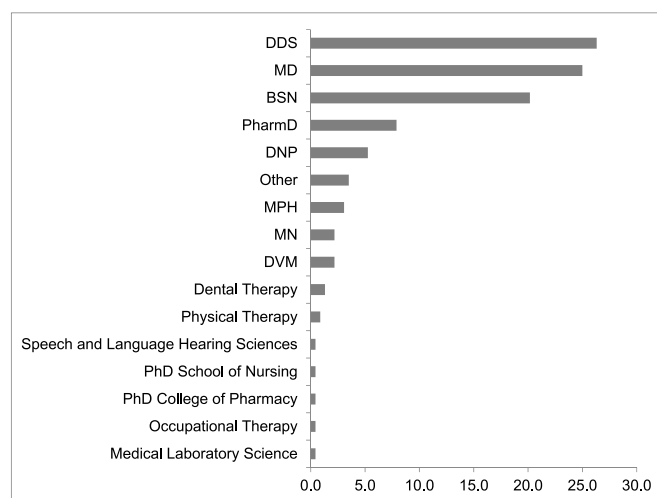
Student survey responses were analyzed using descriptive statistics. Authors independently analyzed and themed the open-ended question, differences were resolved by consensus.

7. Impact

The six-week online course was offered (Feb 8 - March 21, 2021) to all health science students across three campuses. A total of 303 students enrolled in the course and 228 (75.2%) completed the course. Of the students that completed the course, the largest number were Doctorate in Dental Surgery (DDS) (26.2%), followed by Medical Doctor (MD) (25.0%), Bachelor Science in Nursing (BSN) students (20.2%), and Doctorate of Pharmacy (PharmD) (7.9%) ([Fig. 1](#)).

Across the three campuses, a majority of students were from the urban (90.4%) and northern rural (9.6%), with no students from southern rural campus. Most MD students (38.6%) were in their first year, DDS (56.7%) and BSN (76.1%) students were in the second year, and most PharmD students (50%) were in their third year. The pre-course survey showed students reported an average knowledge rating score of COVID-19 infection (3.28 ± 0.68), average knowledge rating score of COVID-19 vaccines (2.98 ± 0.74), and 74.1% had not had experience giving an intramuscular vaccine injection.

Five themes emerged from the open-ended question "What do you hope to learn from this class?": 1) Vaccine distribution and pandemic planning; 2) COVID-19 vaccine development; 3) Vaccine administration and service in vaccine efforts; 4) Educating patients/families about vaccines; and 5) COVID-19 virus and patient management of COVID-19 ([Fig. 2](#)).



Notes: Other=MS Dentistry, Pediatric Dental Residents, Post-Doctorate Nursing, Periodontology

Fig. 1. Student enrollment by health science program

Notes: Other = MS Dentistry, Pediatric Dental Residents, Post-Doctorate Nursing, Periodontology.

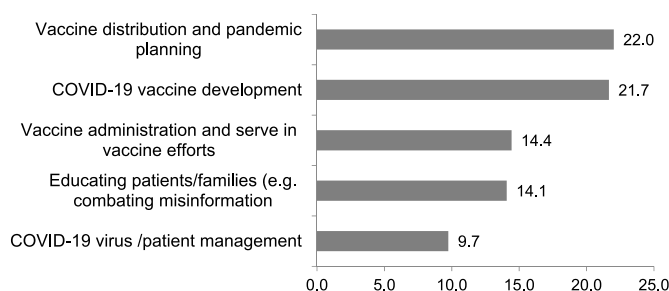


Fig. 2. Percentage-themed responses "What do you hope to learn from this class?"

Health Science Program	COVID-19 Virus /Pt Management	COVID-19 Vaccine development	Vaccine distribution and pandemic planning	Educating patients/families (e.g. combating misinformation)	Vaccine administration and serve vaccine efforts
DDS	7	17	8	11	17
MD	7	8	20	10	12
BSN	6	22	8	4	6
PharmD	1	6	5	5	1
DNP	1	1	7	3	
MPH		1	4	1	1
Other	1		3	1	2
DVM		1	1	3	
MN	2		2	1	
Dental Therapy	1	2			
Physical Therapy		1	1		
Speech and Language Hearing Sciences		1			
Medical Laboratory Science	1				
Occupational Therapy			1		
PhD College of Pharmacy			1		
PhD School of Nursing					1

Fig. 3. Themed responses by health science program.

Themes varied by health science programs. For example, DDS students were equally interested in COVID-19 vaccine development and vaccine administration/service efforts; MD students were interested in vaccine distribution and pandemic planning content; and both BSN and PharmD students were interested in COVID-19 vaccine development. For all responses see Fig. 3.

A total of 52 (22.8%) students that completed the course attended the skills workshop and included 33 DDS (63.5%), 13 MD (25%), 5 BSN (9.6%), and 1 other (1.9%). Unfortunately, the post-course survey response rate was minimal and therefore not interpretable.

There was a broad range of interprofessional students representing 16 health science programs. Students also represented differing years within their respective programs and varying intentions for taking the course. While there are differences, this also suggests there is shared interest across programs to acquire knowledge related to relevant current health topics. It was interesting to note that dental students contributed to the majority of students that completed the course and attended the skills workshop. This could be attributed to dental licensing and scope of practice in the State of Minnesota that allows dentists to provide influenza and COVID-19 vaccines; this can be leveraged to increase vaccinations across the state.⁴

Lessons learned throughout the development and implementation are many. First, IPE course development is complex. For example, IPE efforts that include multiple programs should consider content applicability for included professions, various course loads, potential credit restrictions, and clinical rotation schedules (if applicable) by semester or year for each program during the activity planning phase.^{5,6} This knowledge has implications for course development and potential course success when including multiple health science programs.^{7,8} Second, the number of students that dropped or did not complete the course could be attributed to the timing of when the course was offered and the course format. The course was offered during the pandemic and the additional workload could have impacted completion rates.

Additionally, students needed to complete all module activities (e.g. discussion forum) before continuing to the next module. This formatting decision was due to the interprofessional focus of the course and the desire to facilitate student discussions within the small groups. Last, another factor impacting student completion rates could be the course was offered for free and not part of an official health science program. Students have many competing demands in required courses therefore non-credit or "free" courses may not be a priority. It should be noted the C-19VPP course was approved as a University IPE co-curricular activity and upon successful completion, it will be listed on the students' official transcript, so it was not without some academic value.

8. Required materials

All course materials were developed from University faculty and researchers. Materials were hosted on the University's course management platform, Canvas. Course materials available upon request from corresponding author.

CRedit authorship contribution statement

Robin R. Austin: Conceptualization, Methodology, Data curation, Writing – original draft, Visualization, Supervision, Writing – review & editing. **Ann M. Philbrick:** Conceptualization, Methodology, Data curation, Writing – original draft, Visualization, Writing – review & editing. **Craig Roth:** Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing. **Keith A. Mays:** Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing.

Declaration of competing interest

None.

Appendix A. COVID-19 Vaccination and Pandemic Planning Course Content, Readings, and Discussion Topics

Week/Module Topic	Video Presentation (s)	Assigned Reading(s)	Discussion/Reflection	IPEC
1: Overview of COVID-19	"Overview of COVID-19"	N/A	IPE Discussion: Please introduce yourself to class by providing the following: 1. Name, program, and year	VE, RR, IC, TT

(continued on next page)

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Week/Module Topic	Video Presentation (s)	Assigned Reading(s)	Discussion/Reflection	IPEC
2: COVID-19 Vaccine and public health role of health providers	"COVID-19 vaccine development"	Andrasfay, Theresa, and Noreen Goldman. "Reductions in 2020 US life expectancy due to COVID-19 and the disproportionate impact on the Black and Latino populations." <i>Proceedings of the National Academy of Sciences</i> 118.5 (2021). Goldman, Joanne, and Andreas Xyrichis. "Interprofessional working during the COVID-19 pandemic: sociological insights." <i>Journal of Interprofessional Care</i> 34.5 (2020): 580–582. Stieb, Matt. "Emerging crisis of vaccine racial gap". New York Times. January 31, 2021 Shapiro, Air "Striking Racial Disparities in who's getting COVID-19 vaccine" National Public Radio. January 28, 2021	2. Experience in vaccine administration (at the UMN or other institutions) 3. Experience in interprofessional activities IPE Discussion 1. How can your profession promote public health? As a healthcare profession student, how have you handled COVID misinformation?	VE, RR, IC, TT
3: Vaccine safety and development	"How do we know vaccines are safe" "Emergency Use Authorization"	FDA Infographic: The path for a COVID-19 vaccine from research to emergency use authorization.	IPE Discussion Vaccine safety, development, and Emergency Use Authorization (EUA) IPE Discussion 1. Given what you now know about vaccine safety and development, how will you handle the statement 'this vaccine was made too quickly so it's not safe'?	VE, IC, TT
4: Vaccine Administration Procedures	"Intramuscular vaccine administration" "Storage and handling" "Managing patient safety" "Check your steps"		Vaccine administration procedures, storage and handling (safe injection technique/PPE) Journaling/reflection: Discuss a time when you were in a clinical situation (as a student or a patient) where potentially unsafe practices were used (safe injection technique, inappropriate PPE, medication error, etc). How did you handle it?	RR, IC, TT
5: Documentation and reporting COVID-19 vaccine adverse events	"Adverse reactions"	Faculty developed "Near miss – Case study"	Documentation and reporting COVID-19 vaccine adverse events Journaling/reflection: "Near Miss-Patient Safety and Quality Care" case study 1. What thoughts came to mind when reading this case study? Could this happen to you? What roles could your profession play to prevent these mistakes from happening?	VE, RR, IC, TT
6: Current COVID-19 Vaccine Resources		Stifter, Janet, et al. "A short report on an interprofessional mobilizer team: innovation and impact during the COVID-19 pandemic." <i>Journal of Interprofessional Care</i> 34.5 (2020): 716-718 Schiller, Daryl S. et al. "COVID-19 pandemic planning, response, and lessons learned at a community hospital." <i>American Journal of Health-System Pharmacy</i> (2020).	Current COVID-19 Vaccine resources/pandemic planning; Role of interprofessionalism in program implementation for improved team performance. IPE Reflection discussion: (Limit responses to 2 pages) In the context of this course, COVID-19 vaccination and pandemic planning: 1. How has this course informed your knowledge of interprofessional practice? 2. How will you use this information in your current/future professional health practice? 3. Why is it important for your current/future professional health practice? Include two or more of the following interprofessional competencies in your answer. Roles and Responsibilities: Develop an awareness of the diversity of expertise that underpins effective interprofessional collaborative teams. Interprofessional Communication: Acquire an exposure to the positive and negative experiences of interactions and communication with patients, families, communities, and other health professions and develop an appreciation for their impact. Teams and Teamwork: Establish basic concepts of effective teamwork across professions, given an understanding of the impact of communication. Values/Ethics for Interprofessional Practice: Explore the emerging concept of interprofessional ethics and professionalism as an underpinning of interprofessional collaborative practice.	VE, RR, IC, TT

NOTES: VE=Values/Ethics for Interprofessional Practice; RR = Roles/Responsibilities; IC=Interprofessional Communication; TT = Team and Teamwork.

Appendix B. Discussion Rubric

Online Discussion Forums and Grading Instructions	
<i>Purpose:</i> We want you to use the online discussions in this course to explore and apply concepts and learn from each other as you do. The richer the discussion, the more we all learn! The following grading scheme outlines minimal expectations.	
Grading reflects the following components:	Points
Overall. Read assigned materials and consider the discussion question thoughtfully, answer relevantly, and cite evidence where needed.	2
Initial posting. Provided a unique response (no repeats from another posting) that directly address the main points of the question. Provide evidence to support your response, minimum 2 paragraphs.	3
Response to a classmate. Provided a unique response, thoughtfully responded to the other student's main points, adding new information, a minimum of 2–3 sentences in length. Cite the readings from the module in your responses.	2
	TOTAL 5 POINTS
Simple Netiquette	
Follow the same standards of politeness as you would in face-to-face encounters, remain professional, respectful, and courteous at all times.	
<ul style="list-style-type: none"> ● Be complete and use abbreviations sparingly. Make sure everyone is familiar with any jargon that you use. ● Don't shout (typing in all capital letters). ● Don't mumble (typing in all small case letters). ● <u>Proofread and check your spelling</u> when using electronic communication. It makes your posting easier to read and understand. 	

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