

Global One Health Case Competition: Building Capacity for Addressing Infectious Threats

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Abstract

Extracurricular inter-professional activities advance pre-service student skills and confidence before joining the workforce. This article describes an extracurricular model, whereby students engaged in experiential learning, and had the opportunity to challenge themselves in interprofessional groups guided by faculty and inspired by professionals in their respective fields. The Global One Health Case Competition involved students from the University of Rwanda in collaboration with the University of Minnesota, and required students in teams to address an Ebola outbreak containment and response scenario. Forty students, seven faculty coaches, and five judges participated in this event. Students gained collaborative teamwork skills as they developed comprehensive strategies for managing a response to a zoonotic disease outbreak, considering political, financial, logistical, and other factors. Faculty strengthened skills in writing complex case studies for a competition model, and in mentoring of multidisciplinary student groups. Case competition is an effective educational mechanism for building the outbreak response capacity of our future workforce before they are in their real-world professional roles responding to actual zoonotic and other infectious disease threats.

Keywords: Africa, emerging infectious diseases, higher education, Ebola, multidisciplinary, capacity building, one health, workforce development

University undergraduate programs across the globe have historically been, and continue to be, delivered in discipline-specific degree programs, with few, if any, inter-professional educational opportunities. Certainly, there are benefits to this traditional approach, including obtaining depth of understanding in a particular field in order to meet criteria for licensure or certification. Depth of knowledge in one's field is paramount to maintaining a standard of care and professionalism from one generation to another. This foundational education is necessary to enter one's profession, whether that be as, for example, a veterinarian, epidemiologist, nurse, physician, economist, or lawyer (Robertson & Bandali, 2008).

An unintended consequence of this approach in higher education is limited inter-professional preparation, and missed opportunities to strengthen the awareness and abilities of new professionals to collaborate across disciplines routinely, and in emergency situations such as zoonic outbreaks or pandemics. Even though students are able to practice their profession and integrate theory into practice, they often lack other learning opportunities that would increase their employability. Such skills that increase their employability include ability to collaborate, informed decision making, leadership, communication, and readiness to work. Emerging infectious disease threats to global health exemplify the need for a multidisciplinary approach to devise sophisticated prevention, detection, and response efforts that many new graduates are unprepared to undertake (Smith, Ferns, & Russell, 2014). Indeed, the Global Health Security Agenda (Global Health Security Agenda [GHSA], 2017) has overarching objectives consistent with the One Health Workforce project, and has prioritized university partnerships that advance interprofessional educational opportunities in field and classroom settings [One Health Workforce (OHW), 2017]. Extracurricular educational activities are particularly appealing because the students are able to engage in multidisciplinary projects alongside their silo-based degree program. For instance, at Indiana University, extracurricular experiential learning activities were shown to cultivate student leadership skills through peer-to-peer mentorship programs and community service activities (Veronesi, & Gunderman, 2012). While a long-term higher educational goal is the inclusion of interprofessional educational opportunities as part of any degree program, this takes cooperation, coordination, and time, and few successes are demonstrated in universities around the world (Chen, Delnat, & Gardner, 2015). Therefore, extracurricular inter-professional educational opportunities remain critically recommended to more effectively advance the skills and knowledge of pre-service/undergraduate students (Illingworth, & Chelvanayagam, 2017). The purpose of this article is to describe an extracurricular case competition model, whereby students engage in experiential learning outside of the traditional classroom model, and have the opportunity to challenge themselves competitively in multidisciplinary groups guided by faculty and inspired by professionals in their respective fields. The Global One Health Case Competition, involving students from the University of Rwanda One Health Innovation Club, is one such extracurricular model implemented and evaluated in December 2016. The process and participant/stakeholder evaluation results are described below.

1. Background: One Health Innovation Club

The One Health Innovation Club (OHIC) model was developed using existing extracurricular university-based student club frameworks in which students are encouraged to extend their learning and relationship-building beyond the classroom and formal curriculum activities through club sponsored activities. A student club, in this case, is defined as a group of students who meet regularly, face-to-face and virtually (e.g., social media), to enhance personal learning, conduct community outreach and educational activities, hold friendly competitions among many others (Pittaway, Gazzard, Shore, & Williamson, 2016; Cox, & Goff, 1996). Student-led, with faculty and university support, the OHIC has a formalized vision, leadership structure, and operational bylaws that guide leadership succession, membership, and activities. As the OHIC model has expanded over time to all four University of Rwanda campuses and to private universities within Rwanda, the students have revised the club framework to ensure equitable and inclusive representation and communication strategies. Campus coordinators collaborate with the OHIC President, for example, to organize country-wide student activities during events such as the Rabies Awareness Week, and to nominate representative students from diverse disciplines to faculty for participation in smaller events such as the two-week intensive field attachments at the Akagera National Park, or the Global One Health Case Competition. The OHIC, therefore, serves as a mechanism by which students have unique access to extracurricular, multidisciplinary applied and service learning opportunities. It is in this context that the Global One Health Case Competition was developed and piloted with University of Rwanda One Health Innovation Club (UROHIC) members in December 2016. A key benefit to this approach was the existing infrastructure of the student club that facilitated student communications about the event, an application process for the teams, and a structure for selection of students to participate in the pilot Global One Health Case Competition.

2. Writing the Ebola Case: An Interdisciplinary Effort

A Global One Health Case Competition first requires development of a compelling and realistic case that the students can react to. The case should focus on a major challenge affecting the community, such as an emerging infectious disease outbreak. This case development is followed by a competition preparation phase, presentation of the case by students, and judging of the case. For the UROHIC, the focus was on developing a case about an Ebola virus outbreak, and was based on the recent and real outbreaks that had occurred in West Africa, and nearby in the Democratic Republic of the Congo, and Uganda. The writing team was comprised of graduate students and a faculty mentor from the University of Minnesota in collaboration with faculty from the University of Rwanda. The University of Minnesota graduate students had previously competed in Case Competitions held at the University of

Minnesota (1st place winning team) and at Emory University (Participant's choice winner; 3rd place overall) (Korschun, 2017). By having the case topic address a global emerging infectious disease threat, the case competition also served as a model for the broader One Health Central and Eastern Africa (OHCEA) network of universities and student clubs, of which the University of Rwanda is a member.

After the selection of Ebola as the case competition problem to address, the writing team conducted background research on Ebola, the specific healthcare infrastructures likely to be found in Rwanda, socio-economics, and political circumstances of Rwanda, pandemic threat response frameworks, the Global Health Security Agenda, and other factors relevant to mounting a response to Ebola in Rwanda. For example, the students researched a hypothetical Council of East and Central Africa Football Association (CECAFA) tournament to add a need for a timely and more immediate solution to the Ebola problem. After gathering the information, and reviewing previous case competition templates, the writing team reconvened to write the Rwanda Global One Health Case Competition challenge. In addition to the case itself, the writing team wrote an instructions page to guide the students' understanding of the case. Thereafter, the instructions and the case were sent to University of Rwanda faculty and One Health Workforce colleagues for feedback and final edits. See Figure 1 for an excerpt from the case scenario which required students to make justifiable decisions as they generated a solution to handle a fabricated Ebola outbreak in Rwanda.

The minister's secretary walks into the meeting room, excuses herself before walking up to the minister and whispering to her "Madam, there is a very urgent call for you!". The minister looks somehow perplexed but proceeds to whisper back "...Can you keep it on hold till the end of this meeting?" to which the secretary responds "I am afraid it's very urgent and may be an important agenda for this meeting." The minister proceeds to excuse herself and goes to take the call. As it turns out, there is a report of several patients in Kinigi who have presented with symptoms of a hemorrhagic fever transferred from Kinigi Health Center and placed in isolation wards at Musanze District hospital. The minister walks back to the room and breaks the news to the committee members where they decide to confirm the case and then take the matter to a cabinet meeting. Samples from the patients are sent to Kigali where laboratory tests confirm the patients have Ebola! This development leads to a call for a crisis Cabinet meeting chaired by the President and all the Ministers. A few days later before the cabinet meeting, similar cases are reported in Kayonza and Kigali.

The final resolution is to hire an emergency response consulting team which will deal with the outbreak. The Ministers decide that the USAID grant should be used to address this outbreak. The team sends out a request for proposals in an attempt to hire a consulting team with a comprehensive and innovative approach to using the available funds and addressing the outbreak. The competing consulting teams will present their proposed strategies and budget to the Cabinet's selection committee.

Given the background of the outbreak and available funding, your consulting team must develop quick and innovative strategies to deal with the outbreak, taking into account the concerns of the different ministries, the short timeframe, and the budgetary limit. Your proposal must demonstrate capacity to control and effectively respond to the outbreak before the start of the Council for East and Central Africa Football Associations (CECAFA) football tournament in January 2018.

You are competing against other teams to be chosen as the Emergency Consulting Team tasked with controlling and ending this outbreak. Your intervention and strategy are confined to a budget of \$3 million USD and you must touch on each of the One Health Model focal areas: prevention, detection, and response. You must address all three aspects but are free to distribute and budget your resources as you deem necessary.

Figure 1. Excerpt from the Case

3. Global One Health Case Competition Preparation Process

All club members were informed about the opportunity to participate through the campus OHIC campus coordinators. Students were requested to apply for the competition with a 300-word letter of interest. Over 100 club members applied, and five faculty volunteered to select students using criteria that included writing clarity and demonstrated understanding of One Health principles. Forty students were selected across different disciplines of the University of Rwanda. Five teams of eight students were formed with each team having a minimum of three disciplines, including human medicine, nursing, veterinary medicine, environmental health sciences, and wildlife and aquatic resources management. The University of Rwanda campus structure is such that specific faculties or schools are on certain campuses around the country, which meant that student teams were required to make connections via digital communication channels (i.e., email, WhatsApp) prior to the in-person competition held in Kigali, Rwanda. The UROHIC has an active WhatsApp group, which has been a primary communication mechanism for One Health education, club activities, funding opportunities and conferences. Each team was assigned a student captain who was encouraged to reach out to team members and to organize the team with a strategy for undertaking the case competition. Inability to meet in-person before the competition weekend was a limitation and was not entirely mitigated by the digital communication tools available to the students.

A faculty coach was assigned to each team. Faculty coaches volunteered, many of whom, previously supported or been engaged in the UROHIC activities. Faculty coaches also came from different disciplines including veterinary medicine, nursing, environmental health, and public health. Faculty coaches were provided a standardized training adapted from the University of Minnesota Global Health Case Competition toolkit. The training provided an overview of the case competition model and goals, the student expectations for preparation and for competition day, and the faculty expectations. Most importantly, faculty coaches were advised of their role to support student learning and to ask thought-provoking questions without guiding students toward specific solutions or ideas used in their solution to the case challenge. For example, the training offered coaching questions, along with reinforcement of the coaching role to foster a positive, collaborative team environment for the students. Some faculty coaches were able to meet with their teams prior to competition week electronically, and all of them worked with their teams on the preparation day held before the case competition. Faculty coaches were encouraged to serve as liaisons for the students to professionals and other faculty or researchers who could provide relevant information to the students as they generated their case solutions. This is a valuable role faculty coaches have, and one of the benefits of participation in case competition for students; namely, the ability to connect with experts within and across One Health disciplines. Two weeks before the two-day case competition event, student captains were emailed the case with instructions to develop an innovative comprehensive solution.

3.1 Judges for the Global One Health Case Competition

To expose the students to professionals in Rwanda employed in a variety of settings and addressing similar infectious disease threats to population health, judges were invited from different governmental agencies (i.e., Rwanda Biomedical Centre, Rwanda Agricultural Board, Rwanda Development Board), non-governmental agencies (i.e., Gorilla Doctors), and private public health practitioners. This contributed to student learning as they received contextualized criticism of their respective projects. This strategy also removed the risk of bias that could occur if faculty served as judges in the competition and were known to some, but not all, of the student competitors. Judges received standardized scoring templates and a briefing about the case and the case competition model prior to the competition day.

3.2 Case Competition Day

On the case competition date, student groups individually and privately presented their proposed solutions to handle an Ebola outbreak in front of a 3-judge panel. Each team speaker explained their collective reasoning behind the solution proposed, including considerations of economic constraints, and monitoring and evaluation outcomes. The formal 15-minute presentation was followed by a 20-minute question and answer session with the judges. Adherence to time limits was strictly enforced. This initial round of the competition was held in two separate rooms, with the teams split between the rooms; a winning team was selected from each room to compete in the final round.

For the final round, the teams were given an additional real-life challenge to address in their presentation and a half an hour to consider their strategy to do so. The final round presentations were made by the two semi-finalist teams, to a 7-member judging panel consisting of the original six judges and an additional member. All other students and faculty were present for the final competition round. The winning team manifested a strong multidisciplinary solution to the containment of Ebola, with careful consideration of proposal feasibility and contingency strategies.

The winning team was granted a trophy as champions and each member of the competition was given a medal and certificate of participation.

3.3 Global One Health Case Competition: Feedback from Students, Faculty Coaches, and Judges

Follow-up evaluations were completed by nearly all of the participating students, faculty coaches, and judges. Overwhelmingly, all involved reported satisfaction with the event, and outlined benefits of their participation in the case competition process. Students expressed gratitude for the opportunity to develop and demonstrate skills and knowledge regarding outbreak response. They identified gained appreciation for multidisciplinary collaboration, and especially valued the attention, feedback, and encouragement they received from the judges. The constructive criticism offered by a few students addressed logistical challenges they encountered including limited time to work as a team in-person before the competition day, and traveling distance and time for some students coming from outside of Kigali. Faculty coaches reflected on the advantages of this case competition model compared with other learning experiences such as debates, including, for example, the focus on decision-making and generating an optimal strategy amid numerous real-world challenges versus a debate situation in which there are two distinct positions being deliberated. There was not a lot of orientation provided to the faculty coaches, and some felt that a more in-depth orientation would have been beneficial.

Finally, the volunteer judges described their perceptions of the benefits to the students, and to themselves. The judges saw the case competition model as one that offered unique opportunity for students to address the complexities faced in the real world when there is an outbreak or large-scale event. The judges gained personally from the solutions the students posed, and in some cases expressed that they were presented with relevant and readily applicable ideas and solutions to real-world scenarios. Also, many commented positively about the students' professionalism in their presentations, highlighting the importance of these soft skills. Table 1 (below) provides representative comments from the students, faculty coaches, and judges regarding strengthened knowledge areas and competencies.

4. Conclusion

The University of Rwanda One Health Innovation Club members, faculty coaches, and professionals who served as judges, were the pioneers in conducting the Global One Health Case Competition in the African region. This extracurricular educational initiative provided both students and faculty an opportunity to work in multidisciplinary teams, and to strengthen critical collaboration and team building skills. The complex outbreak case provided an opportunity to apply theoretical knowledge to a real-world scenario, while also expanding students' knowledge about zoonotic disease prevention and control. Exposure to professionals' experiences with real world response to complex problems, and the related bureaucratic challenges, was noteworthy and expanded students' appreciation for generating viable solutions. The Global One Health Case Competition model demonstrates the positive influence that creative inter-professional learning opportunities can have in preparing the future workforce to lead and contribute to solving complex health challenges.

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Declaration of Conflicting Interests

No authors have any conflicting interests to report.

Table 1. Participant Evaluation: Representative Quotes from Students, Faculty Coaches, and Judges

	<i>Students (n=37)</i>	<i>Faculty Coaches (n=7)</i>	<i>Judges (n= 5)</i>
Competency: Multidisciplinary teamwork	<p>"I learned team work, building trust, hard work and systems thinking" (medical student)</p> <p>"... it shows me that no single discipline can tackle an urgent outbreak; it has really given me the skills and knowledge of working with others" (public health student)</p>	<p>"An example, is when a medical student suggested human surveillance for Ebola investigation, another student from veterinary suggested animal surveillance, and environment screening by a student from environmental health sciences." (veterinary medicine faculty)</p>	<p>"Team members contributed according to their disciplines and hence provided a multi-pronged approach to disease outbreak and response." (veterinary medicine professional)</p>
Competency: Field Readiness	<p>"I discovered my strength and weakness in working in a team." (nursing student)</p> <p>"I now know how to look at the bigger picture when dealing with an outbreak." (public health student)</p> <p>"It gave us leadership qualities, good team-working spirit, and developing critical thinking." (public health student)</p>	<p>"This [case competition] helped the student's in way of opening their mind to the real world. E.g., when searching for strategies to use during the outbreak." (nursing faculty)</p>	<p>"... to deal with outbreak, there is a need of strong collaboration with people from different sectors, and no one discipline is sufficient to manage all aspects of outbreak." (public health professional)</p>
Knowledge: Detection, Prevention, & Response to Infectious Disease Threats	<p>"I learnt that all these aspects are interconnected. For example, you cannot prevent a disease [unless] it is first detected and then you can be able to deal with proven cases." (biotechnology student)</p>	<p>"...helped students to gain leadership and planning in outbreak prevention and response. For example, students were able to plan activities with a relevant budget." (veterinary medicine faculty)</p>	<p>"It [case competition] was one of the exposures to empower and enable them to be competent in key aspects of surveillance, outbreak detection and response with a multidisciplinary approach." (public health professional)</p>
Knowledge: Zoonotic Threats	<p>"Now I know how to respond to an Ebola outbreak." (student field not provided)</p> <p>"[I learned] how to prevent Ebola spread and how to respond to the outbreak." (agriculture student)</p>	<p>"Students were able to discuss the importance of the Ebola transmission cycle and burden of the disease." (veterinary medicine faculty)</p>	<p>"They learned about setting up different strategies to contain zoonotic events like Ebola Treatment Units (ETUs) and using available resources like military, community health workers (CHWs) and others to contain these zoonoses. They identified wildlife as a potential zoonotic risk and advised on how to control risks from such sectors."</p> <p>"Students have learned that a disease that is initially a zoonotic disease [could] become a human big threat and cause huge outbreaks."</p>

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