

How problem based teaching in a multidisciplinary continuing education classroom can contribute to improving professional skills

Yaovi Mahuton Gildas Hounmanou

Department of Veterinary and Animal Sciences
University of Copenhagen

Background

Demands for continuing education for professional retraining or advanced training courses are increasing (Reis et al., 2022). With the advent of internet and technological advances, rapid changes are being observed across every field where most professionals to stay up to date, undergo various capacity strengthening activities. These can be in the form of workshops, short courses, conferences, seminars, peer-consultation, research etc., organized in a physical setting, and/or online (Blackmore & O'Mara, 2022). In the health sector, the needs for continuing education for all professionals is pivotal and continue to grow because life sciences evolve rapidly with novel methods and approaches in the face of new challenges (Macedo Couto & Brandespim, 2020). Participants who enroll for such programs are predominantly adults who have graduated with at least one University degree and already working in their field of expertise (Institute of medicine, I. of M. (US) C. on P. a C.H.P.E., 2010). They are characterized by their experienced view on applied topics and they perceive the continuing education platform as a tool for their professional improvement, maintenance and increased competitiveness (Pereira, 2019). In this context, the search for innovative teaching methods is paramount to respond to their needs.

The University of Copenhagen offers a variety of such opportunities, one of which is the “One Health Specialization” course organized by the

Department of Veterinary and Animal Sciences in collaboration with the DANIDA Fellowship Centre. This is a master's level course targeting professionals from Denmark, Kenya, Nigeria, Mexico, Columbia, Brazil, Vietnam, and China within the human, animal, and environmental health sectors, as well as professionals from the food safety domain. The course employs mainly the research-based teaching approach executed through different teaching and learning activities.

After over six years of implementation in such a multicultural and multidisciplinary background, we assessed among the foreign participants, what teaching formats and teaching activities encouraged deep learning and supported a good alignment between the course's learning objectives and the knowledge/skills that they have taken home to implement in their work contexts.

Rationale of the report

The One Health specialization course aims to improve public health practices through the integrated One Health approach. The overall goal of the course is for the participants to acquire in-depth knowledge about the One Health approach when solving national, regional, and global challenges. Participants when in Denmark are taught diverse modules including narratives of Danish best practices. To make sure that the overall learning goal is achieved with the teaching formats being used, it is important to assess how much of the acquired knowledge the previous participants have been able to incorporate into their work practices upon return to their home countries. In short, this report intended to understand to what extent foreign participants have put into practice the things that they have learned from the One Health course and how the teaching methods contributed to that. Ultimately, we highlighted some insights that can be helpful to improve the teaching activities, and content of the course in order to enhance assimilation and practical incorporation of the knowledge that the foreign participants have acquired in Denmark.

Data collection

During June and July 2022, I interviewed 20 alumni of the one health course through an online platform. The interviews were conducted using a semi-structured questionnaire also designed online at <https://www>.

onlineundersoegelse.dk/s/n4f7fw9. The interviews explored specific questions about how the course has helped the participants in their current positions, what teaching activities were impactful, which ones were less helpful and what are their recommendations to improve teaching activities in future courses. The original course description was also explored to identify the intended learning goals, in order to confront them with the participants' achievements. The obtained responses were content analyzed following standard qualitative research methods (Lester et al., 2020). The results are presented by categorization into subtopics and illustrated by quotes (Q) from the participants. The respondents who participated in this study took the One Health course at different periods notably in 2017, 2018, 2019 and 2022 and come from Kenya, Nigeria, Mexico, Columbia, Brazil and Vietnam. I could not get any of the Chinese alumni to join.

Overview on the One Health Course

One Health is a methodological approach, which implies interdisciplinary collaboration, joint efforts, and communication in all aspects of veterinary and public health aiming to protect humans, animals, and the environment (Macedo Couto & Brandespim, 2020). Recent challenges requiring a One Health approach include the spread of antimicrobial resistance, the Avian Influenza epidemics and to some extent the ongoing COVID-19 pandemics. These problems have emphasised the importance of close collaboration between the medical-, veterinary-, food and agriculture sectors in prevention and control. Experience has shown that collaboration between the research community, authorities, industry, and other stakeholders is essential in prioritized decision-making, timely, and effective prevention, and control. Over the past six years the course has put special focus on health problems associated with pathogens transmission, mainly:

- Food safety from farm to fork – transmission and exposure
- Outbreak investigations including use of genomic tools
- Preparedness and response to emerging zoonoses - SARS-CoV-2 and Risk assessment
- Interventions to prevent and control antimicrobial resistance
- Climate change and emerging pandemic threats

Categorization of teaching activities reported by participants

Field visits: learning by seeing

Information retracted during the interviews with the course alumni reveal that the course activities included visits to relevant authorities in the human and animal health sectors in Denmark, visits to companies, livestock farms, abattoirs, and other relevant institutions to learn how they work and collaborate in a One Health consortium to solve health challenges. These visits represented about 30% of the course and are perceived by the respondents as one of the key practical teaching and deep learning environments where they acquired more knowledge. One of the respondents said: Q1 *“Field visits have a special relevance because they allow a close perception of problems and solutions. The presentations and speeches given by the visited authorities and the willingness of farmers to show their technical know-how gave new insights to take home”*.

Another respondent postulated that: Q2 *“Field visits helped understand the Danish system and how it can be imitated at home. We also observed a good collaboration between the different stakeholders from farmer cooperatives to the Danish veterinary and food authority in inspections and regulatory services, for food safety from farm to fork”*.

We can add some concluding quotes to this section from other alumni who said Q3 *“the field visits helped to have practical experiences and understanding of the one health concept”*; Q4: *“The field visits were very illustrative regarding the methodologies and work strategies”*.

Overall, the different testimonies confirm that learning by seeing in the field was a very effective didactical tool in the practical sense that worked excellently in a context of continuing education where most participants already have their theoretical background. This activity should be reinforced further.

Active participations: learning by doing

The data gathered also showed that the alumni were involved in various active participation during their learning experiences, which they found very impactful. These were mainly problem-based group works and practical exercises. Exercises and problem-based learning involve cases/scenarios in which the course participants worked in groups under supervision from

teachers and external contributors. The participants were able to formulate interventions and context-based mitigation programs for the control of infectious diseases and antimicrobial resistance using AMU and AMR surveillance data from their national action plans. Through casework, the participants developed systematic, stepwise approaches into cost-efficient and sustainable disease control programs based on evidence from literature and new/own investigations of zoonotic diseases and other food safety problems. Approaches to handling both foodborne (e.g. salmonella), waterborne (e.g. *Vibrio*) and air-, vehicle or vector-borne pathogens in relation to climate change were some of the topics that they found interesting working on during hands-on modelling exercise. In this multicultural classroom, the fact that the group exercises were based on actual practical cases and requested context-specific and country-based solutions was well appreciated by the respondents because this enabled them to inductively develop new and sustainable skills while solving the cases. Below are a few quotes from the respondents to illustrate that the active participation during group work type of exercise was a good teaching format that enhanced deep learning.

Q5 *“In order of importance, I would mention the group activities, since they were carried out in teams made up of colleagues from very different backgrounds in a country group and that allowed that we knew very different points of view”.*

Q6 *“I like this diversified teaching method, which has benefited me a lot. In particular, group exercises allow people from different countries to collide their thoughts, break their thinking patterns, understand the development of different countries and fields, and learn from each other’s useful thinking methods”.*

Q7 *“Well, some of the exercises like the journal clubs allows to work with new research data together with our existing situations from our home countries”.*

Q8 *“Group work was a method of teaching that I found very influential to my understanding, the exercises given also helped in reflecting and understanding our own country situation”.*

In summary the active participation using group exercise and context specific case works triggered deep learning and instilled sustainable understanding of the One Health approach in the participants who are now applying the acquired knowledge in their home countries.

Interactive dialogs or peer learning

During the course, participants have presented and discussed challenges they are facing their home countries and proposed solutions, which were discussed in plenary with other participants. This is directly linked to the previous section as respondents described that their active presentation of group findings and plenary discussions enable them to grasp the different concepts much easily for long-term use. Some quote below further illustrate how preparation of slides and group presentations followed by discussions represent a good learning tool to people participating in a continuing education program.

Q9 *“To presenting results of our working group or homework group sessions was an opportunity to integrate the notions in a better way”.*

Q10 *“The discussions from group presentations have provided me with a lot of new knowledge about animal diseases and effective epidemic prevention measures which have been applied in other countries”.*

Q11 *“From presentation by my groups and discussion with other colleagues based on paper reviews and group exercises I was able to better understand the needs for stakeholders analysis as well as the global vision in intervention strategies for one health problems, particularly in the subject of Antimicrobial Resistance”.*

Q12 *“Interaction with participants from other countries during plenary discussion was useful. I think we were able to get more out of each other’s knowledge and experiences”.*

Overall, the plenary discussions as well as the individual or group-based peer-feedbacks that were actively conducted during the different modules allowed participants to assimilate the concept in a much better way for capacity development and future use of new skills. The impact of participants’ interaction as a useful didactical tool in encouraging deep learning has been proven in previous research (Todorov, 2018).

Translating learning into action and passing on knowledge

Upon completion of the course, participants were able to instruct colleagues at their institutions based on what they have learned during the course but mainly most of them have been able to put the newly acquired knowledge into practice by incorporating them into their activities. Several examples were reported and a selection of some are provided in this report as quotes from the respondents recapitulated in table 1.

Table 1. Selected responses on how the One Health course alumni are applying their new knowledge.

What are the knowledge/skills that you have acquired in Denmark that you are currently applying or have applied in your position?	
A	It has helped in terms of integrating our training programs on antimicrobial use by the dairy farmers; Sensitization on antimicrobial resistance within the dairy industry; Promotion of effectively pasteurized milk.
B	In my country, there is currently a very strong discussion on how to incorporate One health in public policies. The agricultural, health and environment sectors are very involved in this discussion. We, as the national health institute, play a relevant role in this, especially in what has to do with zoonotic diseases, transmitted by vectors and environmentally conditioned. Therefore, all the elements discussed in the course are being of great importance to me as part of these national reflections. I am also involved in the discussion to incorporate One-health topics into our graduate public health curricula.
C	I work in my country's health agency, where I carry out risk assessment projects, so the One health course in particular allowed me to participate in the development of the country's national action plan against Antimicrobial Resistance and now participate in the strategy for its implementation.
D	This course has been very useful in my professional performance and I have been able to apply the knowledge in a practical way in my area of expertise, as a researcher and professor. I am currently part of our government's work team that plans and executes the National Plan for reducing the teniasis-cysticercosis complex. In addition, I have had the opportunity to use the One Health approach with my undergraduate and graduate students in Parasitology and Microbiology and I have participated in several research projects looking into the epidemiology of antimicrobial resistance in pets and production animals.
E	The course has helped me to incorporate One Health topics into the study plans of the veterinary medicine career in my University, in addition to integrating myself into various national and international work groups related, mainly, to the control of emerging zoonoses.
F	A client came for registration at my work and I handle the issue of fipronil contamination in eggs while counseling the client on safety based on knowledge from one of our group exercises on fipronil during the One Health Course. Later on, I was given an assignment to make a presentation on our national health regulatory capacity from one health capacity focusing on food and; Strategies to address the burden of food borne diseases. I called my college at NCDC and FMARD to make input on what their organization is doing I had to submit. They did not respond but they promise to get back on data so we can share information and recommendation. I had to submitted my slides inspired from knowledge from the One Health course, and to my surprise the Director found my input very useful made little correction and forward recommendations. My director said I will be one of Desk officers on one health VMAP Veterinary medicine and allied product Directorate and I will be training my colleagues on one health.
G	With new knowledge from this course, I have applied novel approach for my work. For example, How to investigate an animal outbreak quickly and exactly to come up an effective epidemic prevention methods. Besides, how can I effective connect with my colleague and staff to control animal outbreak at local area where I am in charge.
H	I have impressed the management of the importance of having PCPB involved in AMR work in my country. In my writing concepts for projects, I now use one health approach. I am involved in a project that deals with wet markets and we use the one health approach. I use the knowledge acquired in training, project implementation and I relate it well with impact on trade. As a member of SSC project steering committee, the responsibility of FBO in the agriculture sector is a new concept we are implementing with an expectation of a change of attitude for all actors in the value chain. The one health concept is expected to enhance safety for both animals, humans and the environment. The knowledge acquired was also impactful in the review of PCP bill (For PCPB) which I was actively involved in the process. I use the knowledge to also influence the work at the National Codex Committee in my country especially in making decisions for pesticides of duo use in plant and animals.

Limitations in the teaching methods and recommendations

Despite the good appreciations of the teaching methods described above and how these have encouraged deep learning and long-term application of acquired skills, the course alumni have also reported a number of limitations that needs to be addressed to improve uptake of knowledge in the course. Most of these concerns are towards the few passive teaching activities such as slide-based lecturing sessions where participants may not gain as much knowledge as compared to active teaching activities. These claims are illustrated in a few quotes below: Q13 *“There were nice presentations in terms of contents, however, some presenters had challenges articulating points adequately”*. Q14 *“Perhaps some lectures given as class teachings fell into repetitive themes”*.

Moreover, the respondents expressed a number of recommendations for improvement of the course content and teaching activities in the context of this course and considering that it is a continuing education where the applied side of the knowledge should be prioritized. These cut across course content issues, as well as organizational and structural matters around the learning objectives. Below are some quotes that support these recommendations:

Q15 *“Now that the issue of the One health has been raised to the G-20 and after the lessons learned after Covid-19, it will be important to include teaching activities section on the political, economic and social context around the One health approach, and a fundamental piece for the analysis and intervention of the One health public health problems”*.

Q16 *“Considering the multisectorial and multicultural scope of the One Health approach I would like to encourage the course to persuade participants to work together with people from other countries. I know it is difficult, but a step by step process and for some simple activities or tasks/homework might be done”*.

Q17 *“I would probably allocate more time to team exercises, as they are the easiest way to acquire knowledge”*.

Q18 *“I think that much more interaction between the participants is needed. I think we were able to get more out of each other’s knowledge and experiences. I would open more spaces for exchange among attendees. On the other hand, I understand the interest in knowing the Danish experience but I think that experiences in other parts of the world should be looked at in more detail”*.

Concluding remarks

Analysis of responses obtained from the One Health course alumni indicates that the use of different inductive teaching methods with contents inspired from updated research findings has enabled acquisition of new skills and knowledge that most are already putting into practise in their different working environments. From the discussions, the following sets of skills were acquired from the teaching activities:

- Better understanding of the One Health concept and its interdisciplinary aspects.
- Improved ability to identify infectious disease challenges that need One Health approaches.
- Application of various scientific methods and research findings to specific One Health problems.
- Ability to critically discuss and respond to One Health challenges in specific contexts.
- Ease to identify the roles, responsibilities and needs of key stakeholders in prevention and control of infectious diseases.
- Capacity to take part in an interdisciplinary group aiming to solve a complex health challenge in a constructive manner drawing on own core competences.

References

- Blackmore, J., & O'Mara, J. (2022). Putting professional learning practice first in innovative learning environments. *Studies in Continuing Education*, *44*, 232–246. <https://doi.org/10.1080/0158037X.2021.1977921>.
- Institute of medicine, I. of M. (US) C. on P. a C.H.P.E. (2010). Scientific foundations of continuing education [Available at:]. <https://www.ncbi.nlm.nih.gov/books/NBK219802/>
- Lester, J., Cho, Y., & Lochmiller, C. (2020). Learning to do qualitative data analysis: A starting point. *Human Resource Development Review*, *19*, 94–106. <https://doi.org/10.1177/1534484320903890>.
- Macedo Couto, R., & Brandespim, D. (2020). A review of the one health concept and its application as a tool for policy-makers. *Int J One Health*, *6*, 83–89. <https://doi.org/10.14202/IJOH.2020.83-89>.

- Pereira, J. (2019). Formação em contexto no âmbito da pedagogia-em-participação: Conceitos e práticas em diálogo. *Da investigação às práticas: Estudos de natureza educacional* (pp. 4–18). <https://doi.org/10.25757/INVEP.V9I1.165>.
- Reis, T., Faria, I., Serra, H., & Xavier, M. (2022). Barriers and facilitators to implementing a continuing medical education intervention in a primary health care setting. *BMC Health Services Research*, 22, 638. <https://doi.org/10.1186/s12913-022-08019-w>.
- Todorov, K. (2018). The specificity of manifestation of pedagogical communication as a special construct.