Blended Learning Approach to Build Sustainable Wise Workforce with Social Media, Virtual & Augmented Reality

Gene G. Olinger, Kenny Yeh, Julia Michelotti, Debanjana Dasgupta, & Joe Bogan

MRIGlobal
Gaithersburg, Maryland, USA

Abstract

Outbreaks of high consequence and emerging pathogens, such as *Brucella* species and Middle respiratory syndrome coronavirus (MERS-CoV), do not stop at national borders and require international cooperation. For many years, such cooperation has facilitated efforts to contain outbreaks that may impact public health and security. We have, in a number of instances, been engaged to implement science that includes cooperative biological research, activities in biosafe and security, quality management, and the development and implementation of multi-faceted tra strategies in Kazakhstan and West Africa. Such training programs facilitate the ability of host countries to prepare and respond to the next disease outbreak. There are, however, limitations to the existing comprehensive programs. They are not always customized to address the specific circumstances of individual host country laboratories and resource-limited countries are unable to sustain some detection and diagnostic technologies, such as multiplex RT-qPCR and Next-Generation Sequencing. Our team has developed a Capacity Building Pathway (CBP) aimed at cost effective training and knowledge acquisition. The system of blended learning, documentation, and quality processes that can be co-developed with the host nation culminates in a knowledge transfer process that is adopted, maintained, and sustained by the host nation to train future generations. The approach utilizes a web-based platform that will provide a forum for continued communication between the partner country and international participants. We have begun to utilize virtual reality and augmented reality in our latest training to introduce and help in retention of knowledge sharing. As capacities grow, the program will work towards supporting a regional network of "communities of practice" whereby in-country partner laboratories can effectively share information and coordinate their efforts. The proposed workflow is adaptable to various types of training including: biosafety, biosecurity, sample management, research projects, standard operating procedure development, and proficiency testing. Moreover, critical components can be migrated to other users that may need the knowledge generated. As one moves through the Capacity Building Pathway, ownership of the process increases for the host nation until they have the ability to independently manage it.

Introduction

A disease outbreak caused by a high-consequence pathogen in a low income country generally requires an international incident response that includes national public health agencies, the World Health Organization, and private organizations such as MSF (Doctors without Borders). This is challenging because in 2017 the World Bank listed 31 low and 52 lower-middle income countries. If the disease outbreak is caused by an unknown pathogen, then even well resourced countries need international help through universities, national research laboratories (NIH, CDC) and often military research resources. In the case of the MERS outbreak in Saudi Arabia, which was first identified as an acute respiratory disease in June 2012, the international response was fairly rapid and identification of a novel viral agent with sequencing was achieved within several months [1]. In the case of *Brucella* species, which are well understood bacterial pathogens, outbreaks often occur in locations where disease surveillance and diagnostic capability is not adequate so the infections keep recurring and international response is continually required especially when human cases are reported [2].

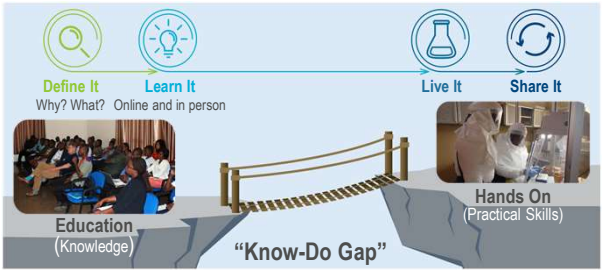
Figure 1- Map showing the geographical areas where human cases of MERS and Brucellosis have occurred in the past ten years. [Data compiled from ProMED, International Society for Infectious Diseases]

Shared Mentored AR and VR Technology (SMART)

Blended Learning Model

Currently, the methods used to define the site specific training needs and the style in which the training is conducted are not always providing sustainable solutions for the host countries. The big gaps are lack of successful engagement with host countries during the objective setting phase and training without context instead of using innovative approaches that enable knowledge to be directly applied. The World Health Organization (WHO) has noted this issue and identifies bridging this *Know-Do* gap as one of the most important challenges for global health engagement [3]. One blended learning model that addresses this gap includes four phases and culminates in the trainees sharing the information (Fig. 2,3). In addition, the day-to-day activities of a clinical diagnostic laboratory are complex the specific assays required during an outbreak scenario may or may not fit within the existing skill sets. A blended learning approach involving in-person didactic classes, hands-on training, interactive online content and communication groups that enable information sharing will allow the trainees to advance through the learning phases with consistent support in place.

Figure 2- The Know-Do Gap and four phases of technical learning. The diagram shows the workflow of a blended learning model. Bridging the gap refers to the process of transferring the knowledge for practical use (e.g., working in a biosafety cabinet). This also involves quality assurance and proficiency assessments.



Workforce sustainability solutions

Ideally, workforce development initiatives should allow continued open dialogue even after the contract is closed so the in-country participants can get the assistance needed to continue their current activities, apply for additional funding for future work, update technical skill sets, and improve data and sample management. We have developed a Capacity Building Pathway to meet the needs of all learning phases (beginner, intermediate, and advanced). For this model, we propose to host internet-based groups that can function during the training period and then be transferred to the host laboratory management for continued use. We have used Facebook apps and SharePoint for various training initiatives. For example, WhatsApp was used successfully in Sierra Leone during the Ebola outbreak by ourselves and others as a communications tool for response team staff [4]. It enabled in-country teams to request consumables that were difficult to obtain due to shipping challenges and allowed communication with trainers and service engineers to help solve technical and equipment issues.

Capacity Building Pathway

Figure 3- Diagram showing elements of the CBP process and the areas where social networking tools maximize learning. Workplace is used to introduce and develop teams while SharePoint 365 is used for groups to store searchable files such as manuals and standard operating procedures that will be kept long term.

Summary

An optimal approach to knowledge transfer is to make it unique, dynamic, and fitted to the specific needs of the learners. It should involve traditional training, social networking and newly emerging virtual learning approaches that aim to bridge the *Know-Do* gap. The goal is to transfer ownership of the process, and customized knowledge, to the host nation for current and future trainees. Ultimately, the content should be easily modular and applicable to other laboratories in-country that need the training. This will reduce costs and allow for efficient deployment leading to sustained capacity-building. Social networks provide platforms for consistent communication, connections between in-country and international partners, and the ability to coordinate team activity.

References:

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