

Interdisciplinary Problem-Based Learning as a Method to Prepare Micronesia for Public Health Emergencies

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Abstract

Context: The University of Hawai'i Pacific Basin Bioterrorism Curriculum Development Project has developed a problem-based learning (PBL) curriculum for teaching health professionals and health professional students about bioterrorism and other public health emergencies. These PBL cases have been incorporated into interdisciplinary training settings in community-based settings, such as in the small island districts of the U.S. Affiliated Pacific Islands. Methods: Quantitative and qualitative methods have been utilized in the evaluation of the PBL cases, PBL tutorials, and the accomplishment of learning objectives. Findings: Evaluation of the PBL tutorials demonstrates that PBL is an educational and training modality appropriate for such settings. Participants found it helpful to learn in interdisciplinary groups. The educational process was modified in accordance with local culture. Conclusion: PBL is a useful educational modality for settings where healthcare staffing and available resources are limited. (PHD 2007 Vol 14 No 1 Pages 57 - 65)

Context

Terrorist incidents, such as 9/11¹ and the anthrax attacks,² emerging diseases, such as Severe Acute Respiratory Syndrome (SARS)³ and avian influenza,⁴ and natural disasters, such as the 2004 Indian Ocean tsunami⁵ and

1 September 11, 2001 terrorist attack on the Twin Towers, World Trade Center, New York, New York.

2 2001 and 2002 deliveries of deadly anthrax spores to various targets, primarily in New York and Washington, DC, via the U.S. Postal Service

3 First reported in Asia early in 2003, SARS to other countries in Asia, as well as North America, South America and Europe before being contained.

4 Avian influenza (bird flu), commonly found in wild birds worldwide, can infect and kill domesticated poultry, and has been passed on to humans. From 2003 to 2007, 270 human cases and 164 human deaths have occurred worldwide, primarily in Asia.

5 At 2:59P (HST) on December 26, 2004, a great earthquake, ultimately measured at 9.0 on the Richter scale, hit off the NW coast of Sumatra, Indonesia, generating multiple tsunamis throughout the Indian Ocean, resulting in ~300,000 dead or missing persons and several millions other homeless in 11 coastal countries.

Hurricane Katrina⁶ have demonstrated the need for the health professional workforce to be prepared to respond to bioterrorism and other public health emergencies. Health professionals need to be knowledgeable about specific public health emergencies and the expected community response. The conventional method of teaching and training on such subjects is to consider sequentially the problems, agents, or pathogens that might be encountered. Typically, a lecture series or chapters of a manual on unconventional weapons sequentially covers anthrax, smallpox, chemical weapons, and so on.¹

In a real situation, however, those first responders to an incident are unlikely to know the responsible agent in an emergency. This is the rationale for field exercises in which participants are not informed prior to the emergency exercise to which they must respond. In

6 As the eye of Hurricane Katrina passed over New Orleans, LA at 10:00A (CDT) on August 29, 2005, it was a Category 3 hurricane with sustained winds of 125 mph. Breaching the city's levees, 80% of the city flooded. That, plus failure of federal emergency response, ultimately resulted in 1,836 deaths and an additional 705 missing persons and \$81.2 billion in damage throughout the Gulf region.

such exercises, health personnel may be confronted with any number of agents with which they are unfamiliar, and must make on-the-spot decisions in the face of uncertainty. For example, they might have to decide whether or not to utilize personal protective equipment, to isolate patients, to request specific laboratory tests or imaging, to alert specific staff, or to notify public health authorities. Without personal experience in such situations, it is difficult to recognize the deficits in one's knowledge or skills.

Conducted with personnel likely to be involved in responses, tabletop exercises are less resource-intensive than field exercises. An example of a tabletop exercise for public health officials to learn about pandemic influenza can be found on the world wide web.² A scenario is presented, and questions are posed to participants. The instructions for this tabletop exercise mention little regarding the prior preparation of participants, but a degree of expertise (participation by "epidemiologists and emergency management staff") is assumed. Thus, tabletop exercises are generally intended for participants to apply knowledge that they have acquired via other means.

One concern that goes unaddressed in conventional pedagogy regarding public health emergencies is the *motivation* for the non-expert learner to acquire the requisite knowledge and skills. Secondly, conventional curricula lack a mechanism by which the learner can systematically *discover deficiencies* in his or her knowledge base. Thirdly, conventional curricula do not provide a mechanism by which learners can engage the material in an *active, self-directed* manner.

Because learners are initially unaware regarding which agent is responsible for casualties, problem-based learning (PBL) is an appropriate educational modality for education regarding public health emergencies. By a process of self-directed learning, learners fill in the identified gaps in their knowledge. They identify and research learning issues relevant for their particular disciplines and for the interdisciplinary response to bioterrorist events or public health emergencies. At a subsequent tutorial session, students present learning issues to the PBL tutorial group.

In community settings, such as small island districts or community health centers, where the absolute numbers of health personnel are limited, health workers must be ready to respond in a coordinated, multidisciplinary

manner to any contingency. In the face of public health emergencies, health professionals will assume specific responsibilities within the context of *interdisciplinary*, coordinated efforts. It is, therefore, appropriate for learners in the various disciplines to learn about the roles of other professionals and participate in *interdisciplinary* curricular offerings.

Efforts to train students in the health professions together began in the late 1970s.³ Variations on "interdisciplinary" and "multiprofessional" have been used to describe such educational efforts. The meanings of these terms have ranged from; "to know about," to "be able to work with," to "be able to substitute for," and to having the ability to "move across careers."⁴ Here, the term, "interdisciplinary," means that group members move beyond their specific disciplines to develop collaborative approaches to problem solving.⁵

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**Methods
Setting**

The small islands of Micronesia – the Northern Marianas, Palau, Yap, Chuuk, Pohnpei, Kosrae, and the Marshalls – were held in trust by the U.S. following World War II through a 1947 United Nations Mandate as the "Trust Territories of the Pacific Islands" (TTPI). Strategically located relative to U.S. military concerns, particularly as sites for conducting nuclear weapons testing, these Micronesian islands constituted a colonial war prize in the region, as did the U.S. Territory of Guam (as well as The Philippines) after the Spanish American War of 1898. Beginning in the 1960s, U.S. aid for TTPI increased, leading to a cash economy fueled by government jobs. In the late 1980s, the former Trust Territories became the Commonwealth of the Northern Marianas Islands (CNMI) and the Freely Associated States: the Federated States of Micronesia (FSM), the Republic of the Marshall Islands (RMI), and the Republic of Palau (ROP), whose Compact was delayed by a non-nuclear provision in their proposed constitution.

Development

At the University of Hawai'i, the Pacific Bioterrorism Curriculum Development Project has developed cases for the teaching and training of bioterrorism and other public health emergency topics, drawing upon the principles of and long experience with PBL, as well as with community-based, interdisciplinary training. We have written a series of case studies set in small island settings and in community health settings in Hawai'i. These cases have patients and practitioners representative of

the islands' ethnicities, with cultural beliefs and attitudes reflecting their respective backgrounds. Cases depict resources typically available in such settings.

Implementation

The cases are written in the McMaster/University of Hawai'i sequential disclosure style;⁶ as such, prepared as Microsoft Word documents of five to eight pages in length. One of the case studies utilized is summarized in the Appendix. Led by a facilitator familiar with the case studies, student groups review the cases, page by page, ascertaining patient histories, physical findings, etc., as well as the respective public health responses. Utilizing a whiteboard, groups organize their collective understanding of cases through discussion, then develop lists of topics; called learning issues, for further study. Dividing up learning issues among them, students research their topics before their next meeting, generally creating handouts or other teaching materials for the benefit of the group. At a subsequent session, students present learning issues to the group, teaching each other regarding the results of their information search. These case studies have been implemented in multidisciplinary learning groups in CNMI, FSM, RMI and ROP.

At a 2005 meeting of the Pacific Basin Medical Association (PBMA), we introduced the use of PBL for public health emergency training. In order to implement PBL, we have trained in-country personnel in; Saipan, Palau; and the FSM states of Yap, Chuuk and Kosrae; Majuro and Ebeye of RMI in PBL tutoring skills, education and training.

Particular enthusiasm for PBL has been displayed in Yap State in the FSM where the cases have been used to train interdisciplinary groups of clinical and public health practitioners. As a result, Yap State has adopted PBL cases as a central methodology of delivering continuing education for healthcare professionals of all disciplines.

Evaluation Methodology (B)

Evaluation of the cases in the USAPI has been via attendance logs, anonymous post-session evaluation questionnaires, and qualitative data obtained from participant interviews. Suggestions from participants have guided the subsequent editing and continuous quality improvement of the cases.

Participants (C)

Of 85 participants who completed evaluation forms, there were 31 physicians, 24 nurses, four public health

workers, three hospital administrators, seven lab workers, four radiology technicians, four medical records clerks, two cancer registrars, three pharmacy workers, and one dental assistant. The remaining participants were in other professions or chose not to indicate their profession.

Findings

No formal evaluations were conducted at the first sessions in Yap and Palau. The responses to the evaluation questionnaires (N=85) were compiled from sessions held in Saipan, Chuuk, Kosrae, Majuro and Ebeye, as well as the second session in Yap. Results of subsequent Yap sessions were not included since many of the participants repeated the training.

1. Was the case appropriate to the setting in your hospital?

**Yes: 83, No: 0,
Possibly: 2**

2. Do you like having several staff members research and present parts of the teaching for the second session (instead of one person giving a lecture as usual)?

Yes: 84, No: 1

3. Do you have any suggestions to make the case better for learning?

Yes: 33, No: 52

- This is very good to have wide vision of this case which stimulates our thoughts to come up with different thoughts.
 - Longer time to analyze the case and prepare for the discussion on the learning issues.
 - More time to discuss about the case. Involve staff from different departments within the hospital including administrators, too.
 - Doing any research on anything refreshes us and also gives us more knowledge.
 - I believe some of us learn things easily with pictures so it is good to provide quality image of things discussed (e.g., shapes of coronaviruses).
4. Do you have any suggestions for the group facilitator?

Yes: 22, No: 63

- Should have more in-depth knowledge of the cases.
- Suggest facilitator involve all the members for their input in the group discussion.
- Have more cases to train the facilitator, so everyone will have hands-on training.
- This present case went well, but for our part, whoever is going to facilitate next session needs to know how to stimulate and lead the discussion.

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5. Is it helpful to have a mixed group of doctors, nurses, lab and public health for learning in this kind of case?

Yes: 80, No: 6

6. Overall, was this case worthwhile as a continuing education activity?

Yes: 84, No: 1

In interviews, participants indicated that they look forward to working through more such cases. Participants readily appreciated and volunteered many of the positive points of PBL, including direct evaluation comments on the PBL process: 1) active learning, 2) universal participation, 3) more motivating and interactive than "PowerPoint talks", 4) shared teaching roles, and 5) emphasis upon the intrinsic learning value of teaching others.

Quality Improvement Modifications Based on Cultural Considerations (B)

After conducting three case study trainings in Yap, participants suggested that the research of identified learning issues should be assigned to teams composed of two to three participants, rather than to individuals. Typically, junior health workers and participants of differing disciplines (e.g., a physician with a laboratory technician and a nurse) have been assigned to each team. This has given team members opportunities to share research techniques (e.g., PubMed searches) with one another.

In Yapese culture, which maintains a traditionally rigid hierarchy of status, people of certain social backgrounds are uncomfortable instructing others in public settings; learning issue teams select a spokesperson to speak for the team, allowing other members to participate comfortably behind the scenes.

It became apparent that many of the Micronesian facilitators (usually physicians) adopt an overly didactic style, which interfered with the identification of learning issues by group participants. To address this, a workshop for PBL facilitators was conducted at the PBMA meeting in Chuuk state (in FSM) in August 2005, in which facilitators from each jurisdiction had the opportunity to observe others lead cases as facilitators, highlighting the differences between facilitator and traditional teaching roles.

Discussion

PBL is a useful teaching modality for small islands and community settings where healthcare staffing and available resources are limited. Appropriately written PBL cases encourage training participants to discover

and address deficits in their knowledge and skills, and become more familiar with methods of gaining access to needed information. Participants also become aware of the resource limitations in their practice settings. Interdisciplinary learning environments encourage learners to explore the interdisciplinary nature of the response necessary for bioterrorism and other public health emergencies.

Limitations

Ideally, it is preferable to present cases with unusual scenarios, such as bioterrorism interspersed into a general PBL curricula, to ensure that trainees are unable to anticipate case content. Indeed, victims of bioterrorism may not always recognize themselves to be such, thus they present for health services interspersed with other patients. In health curricula, such as that

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of the University of Hawai'i, School of Medicine, utilizing PBL as the main mode of instruction allows for the promotion of authenticity and the unexpected nature of such incidents. As districts, such as Yap, adopt PBL as the central mode of interdisciplinary continuing education, bioterrorism cases can be interspersed among other PBL cases.

Further Directions

As we expand these trainings to districts where medical practitioners desire continuing medical education credits, we

will develop post-tests on which learners will need to achieve a predetermined percentage of correct answers in order to receive credit. These case studies are also being implemented in discipline-specific training settings, such as public health, medicine, nursing, medical technology, and emergency medical services.

Appendix

Summary of a PBL Case

This case is an eight-page sequential disclosure case. Page 1: A 33 year-old Chinese garment factory worker presents to the outpatient department of the Commonwealth Health Center in Saipan with (page 2) cough, fever, and a few crackles on respiratory examination. She is treated for community acquired pneumonia with oral antibiotics. Page 3: She returns to the emergency department in (page 4) respiratory distress.

Page 5: Peripheral opacities are seen on chest x-ray.

Page 6: She is admitted to the hospital and placed on intravenous antibiotics.

Page 7: She is placed on mechanical ventilation on the third hospital day.

Page 8: The patient dies. An epidemic of respiratory illness is recognized. Commercial flights into and out of the Commonwealth are cancelled. SARS is identified as the pathogen.

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13 years ago in Pacific Health Dialog, C. Chang stated, " In our moral posturing, based in parts on the notion of innocence and guilt, we justify the withholding of information and means that could help more people from being infected" PHD, 1995, 2 (1): 179