Portable and Mobile Classroom, Year 2: Deployment, Education, and Operation

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Abstract

The Portable and Mobile Classroom (PortMoC) began as a prototype to bring Internet connectivity to places where there was none for education and healthcare, as well as to keep the connection cost-sustainable. Under the "Delivery of Education to Rural Areas (DERA)" prototype, Saint Francis University's Center of Excellence for Remote and Medically Under-Served Areas (CERMUSA) developed and deployed a trailer combining a small form factor with a satellite dish, self-contained power and IP distribution, and twenty-two 802.11b standard laptop computers. The PortMoC has evolved into a platform that utilizes different technologies to bridge the communications gap prevalent in rural areas. CERMUSA will use the PortMoC for Weapons of Mass Destruction (WMD) training for police, firefighters, and other first responders. The research will determine: 1) The efficacy of WMD training to first responders, 2) The efficacy of this method of deployment, and 3) "Best practices" for technology deployment. CERMUSA will use this research to determine the educational, medical, and technological best practices for rural and medically under-served areas.

Background

The threat of a possible terrorist attack on the United States has made it imperative that first responders be trained to recognize and properly respond to potential attacks. The RaPiD-T for Rural First Responders course educates first responders to recognize WMD involvement in a situation, correct protection and decontamination sequences, and proper triage and treatment procedures. Since training on this subject is vital, CERMUSA has previously conducted a research prototype entitled "WMD: RaPiD-T for First Responders at a Distance" in collaboration with the University of Pittsburgh (Pennsylvania) Medical Center's (UPMC) Center of Emergency Medicine. This research prototype looked at best practices in providing this essential training to rural first responders via distributed learning methods.

The educational materials in the WMD prototype consisted of recorded sessions that incorporated a lecture, PowerPoint slides, and handout materials that students could use for reference. These recorded sessions were then streamed to computers in the fire or ambulance stations. The authors of the content were Michael Allswede, D.O. and Joseph Suyama, M.D., both from UPMC's Center of Emergency Medicine.

One important lesson learned in the previous research project is that the technology available to provide education to first responders in rural areas is limited. A technology assessment completed in March 2003 with 99 first responders' stations within Cambria County (Pennsylvania), indicated that many stations (95.4% of the survey respondents) have computers available; however, these computers have:

- Out-dated computers and operating systems
- Limited bandwidth
- Limited memory
- Little utilization by members

According to the Pennsylvania Emergency Management Agency (PEMA) report (PEMA, 2002), the majority of first responders within Pennsylvania are volunteers. Funds are not available for high-tech computers and the Internet. Available funds are utilized for essential emergency response equipment. This has major implications for rural first responders. With limited technology, rural first responders may have difficulty accessing the educational information available via the Internet through emergency response centers such as PEMA and Federal Emergency Management Agency (FEMA).

In an effort to bridge this technology availability gap, various methods of delivering the technology to the rural first responders were evaluated within this prototype. The utilization of a kiosk and the PortMoC provided the technology to access these sites for this essential training.

The PortMoC consists of a HaulMark trailer outfitted with the technology needed to connect a remote classroom or area with the Internet. Testing in the past showed average speeds in the 40 to 60 Kbs range, which is similar to a dial-up connection. Testing is currently in progress to determine what level of Internet interaction and instruction is feasible through the bandwidth allotted from the PortMoC's Internet connection.

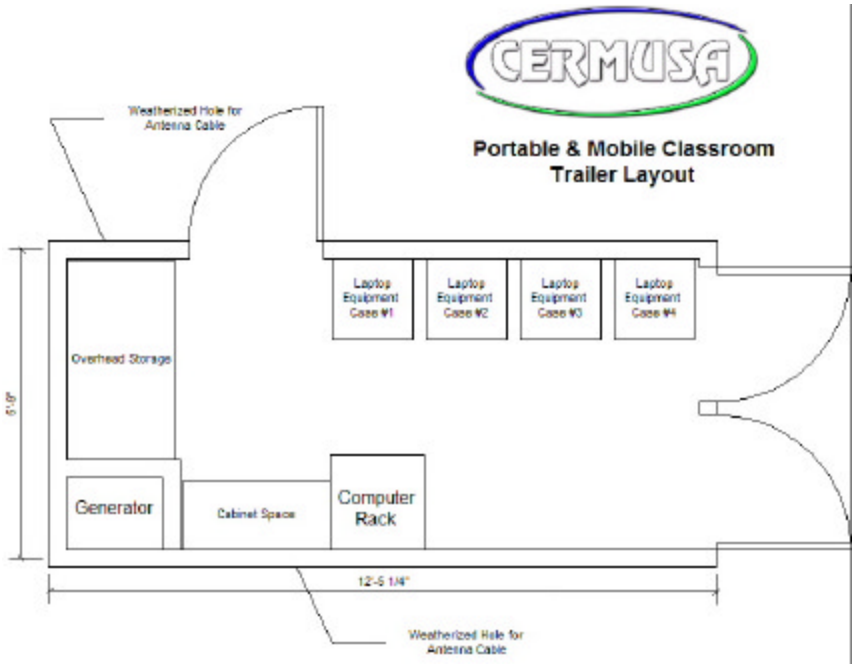
Materials and Methods

There were three pieces of technology used in the DERA project to deliver the content: The PortMoC, the kiosk, and a server-based streaming solution.

The PortMoC

As stated in the ASCUE 2004 report, the PortMoC trailer is a platform that has a satellite dish for Internet connectivity, a routing system and 802.11b wireless network for IP distribution, and 22 laptop computers that are equipped to work with the PortMoC's 802.11b network. Figure 1 shows the interior layout of the PortMoC.

Figure 1: PortMoC Layout



Figures 2 and 3 show the trailer at the East Hills Ambulance Association, Johnstown, Pennsylvania, and the Emergency Medical Technicians (EMT) utilizing the technology, respectively.

Figure 2: PortMoC in Johnstown, PA

Figure 3: EMTs Utilizing the PortMoC laptops

The cost associated with the construction of this prototype was approximately $60,000. Monthly satellite connection fees, maintenance fees, and fuel for the generator are approximately $220/month.

The Kiosk

Kiosks are used in a variety of commercial places; Wal-Mart and Target use them as a convenience for customers. The kiosk CERMUSA utilized for the DERA prototype was programmed as a web-server, with all of the online course material loaded into the onboard computer; thus, an Internet connection was not necessary. All course information, grading, and records were kept within the kiosk, and were later downloaded by CERMUSA technicians. The grading information was forwarded to the appropriate continuing education organizations. The kiosks were placed in eight rural first responder stations. Sixty-three participants completed the course requirements in this fashion. Figure 4 shows a close up of the touch screen web interface. Figure 5 shows a CERMUSA staff member setting up the kiosk at the Berlin (PA) EMS station.

Figure 4: Close-up of the Kiosk Touch Screen

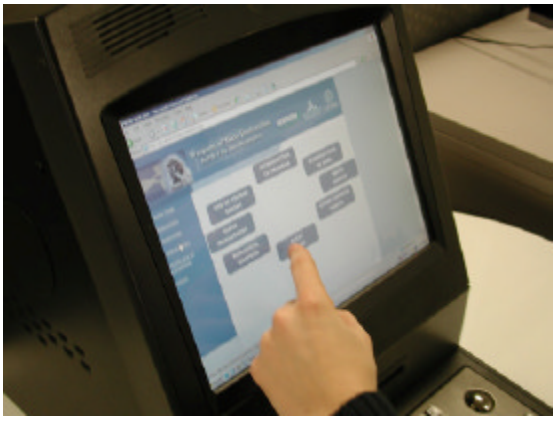


Figure 5: Gabrielle Cronin, CERMUSA staff member, and EMS Staff from Berlin, PA, EMS with the Kiosk

The Streaming Server Solution

The streaming server solution could be considered a hybrid of the PortMoC and the kiosk, as well as a backup to the PortMoC. In times when satellite connectivity is lost due to weather or equipment failure, the streaming server will take over. This server is a laptop loaded with the WMD web session. This laptop issued as a streaming server which is then channeled into the PortMoC's wireless network. The students each had individual PortMoc laptops, ensuring no interruption of the class. Student information, grading, and other data were downloaded from the streaming server by CERMUSA staff after the class.

Implementation of the Technology

Utilization of the technologies in the DERA prototype brings its own issues and practices. As part of the research, CERMUSA has determined the best approach, from both an anecdotal and technical point of view, for deploying various kinds of communication technologies.

Research found that Emergency Medical Service (EMS) stations with a small crew utilized the kiosk best. The students need to allot a specific amount of time to do each class section. However, leaving the kiosk at a station for a week lengthened the amount of time each student had to complete each course.

The PortMoC was better suited to one-time, full-day events, due to the number of staff needed to support the trailer and other technical matters. However, more students could take the course at the same time because of more computers being made available.

Content Presentation

In the initial offering of the "WMD: RaPiD-T to First Responders at a Distance," the students completed the course in the following manner:

1. A pre-test was administered to the students to determine prior knowledge.
2. The students then participated in the course by watching video segments on the course topics.
3. Following the completion of the course videos, the students were administered a post-test.

Completion of the course took over four hours. Many participants indicated that this was too long. Also, since the students completed the post-test after the course completion, there was a time delay at testing for some of the content. The data collection indicated a large increase in knowledge for the topics covered closer to the post-test. It is possible that this increase was partially due to the fact that they just completed that section of content.

When revising the course for the current funding year, the material had been "chunked out" and presented in smaller learning modules. When entering a section of the course, students took the pre-test, watched the corresponding video, and then took the post-test. This allowed first responders to complete either a couple of sub-sections or the entire course at each sitting.

Pre and Post Examination Results

The training consisted of five distinct sections: Biological Agents, Blast Injury, Chemical Agents, Nerve Agents, and Scene. For each section, a test was administered to all participants prior to receiving the training to measure the degree of WMD knowledge each possessed. Those participants that scored above 80% on any of the five sections of the pre-test were exempted from that particular section of the training. Those that failed to meet the 80% minimum requirement on any section were administered the relevant training. Once this training was completed, the same test was then re-administered.

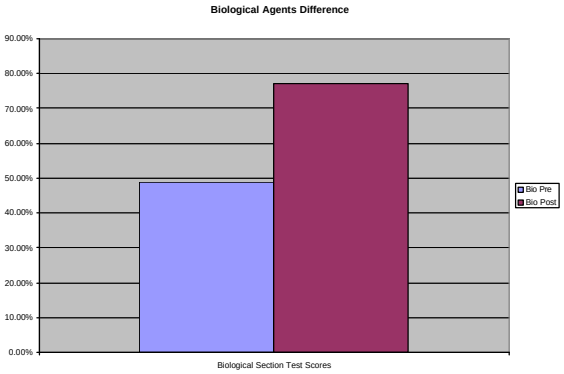
The results of the pre- and post-tests for these participants were stored and a comparative analysis of the results for both tests was conducted. This comparative analysis will be used to evaluate the effectiveness of the training.

Please note that the scores of the participants that were exempted from the training based on their proficiency on the pre-test were also stored. However, these scores are not used in the comparative analysis, as they do not allow for measurement of the effectiveness of the training itself. Nonetheless, the percentage of exemptions for those that passed the pre-test can give insight as to what sections of the training are most needed in the first responder community.

Biological Agents Section

Of the 52 participants that took the pre-test, 53.85% demonstrated requisite proficiency in Biological Agents and were exempted from this section of the training. Those that were administered the Biological Agents section of the training, Figure 6, show that, on average, respondent's scores on the Biological Agent section of the WMD test increased from 48.83% (light grey) to 77.01% (dark grey), an average increase of 28.18%.

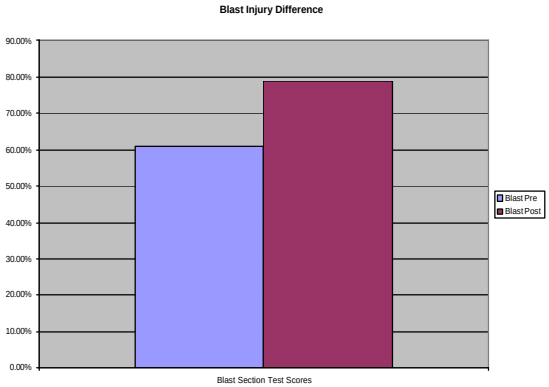
Figure 6: Biological Agents Test Scores



Blast Injury Section

Of the 57 participants that took the pre-test, 31 (54.39%) demonstrated requisite proficiency in Blast Injury and were exempted from this section of the training. Those that were administered the Blast Injury section of the training, Figure 7, show that, on average, respondent's scores on the Blast Injury section of the WMD test increased from 60.97% (light grey) to 78.84% (dark grey), an average increase of 17.84%.

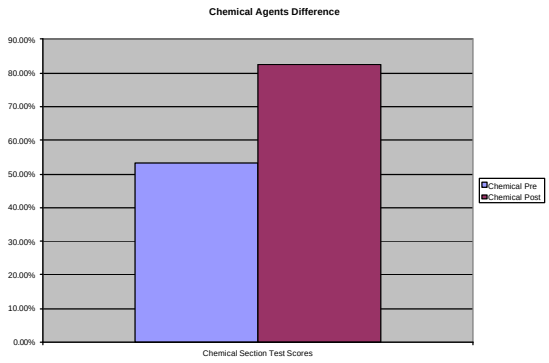
Figure 7: Blast Injury Test Scores



Chemical Agents Section

Of the 57 participants that took the pre-test, 28 (49.12%) demonstrated requisite proficiency in Chemical Agents and were exempted from this section of the training. Those that were administered the Chemical Agents section of the training, Figure 8, show that, on average, respondent's scores on the Chemical Agent section of the WMD test increased from 53.35% (light grey) to 82.41% (dark grey), an average increase of 29.06%.

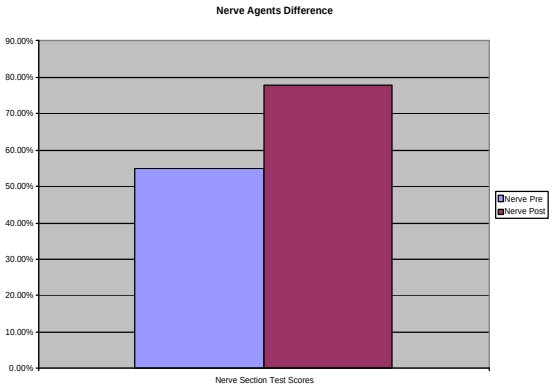
Figure 8: Chemical Agents Test Scores



Nerve Agents Section

Of the 60 participants that took the pre-test, 20 (33.33%) demonstrated requisite proficiency in Nerve Agents and were exempted from this section of the training. Those that were administered the Nerve Agents section of the training, Figure 9, show that, on average, respondent's scores on the Nerve Agent section of the WMD test increased from 54.97% (light grey) to 77.96% (dark grey), an average increase of 22.99%.

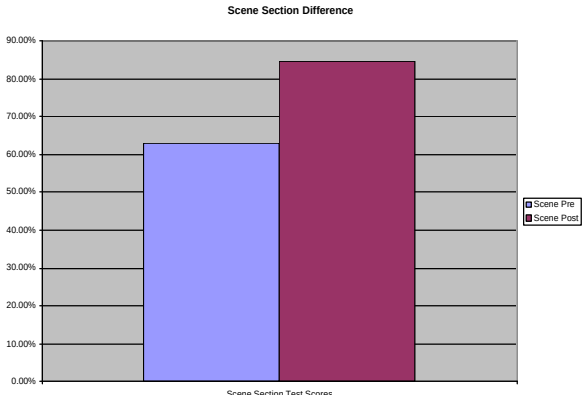
Figure 9: Nerve Agents Test Scores



Scene Section

Of the 58 participants that took the pre-test, 22 (42.31%) demonstrated requisite proficiency in Scene Conduct and were exempted from this section of the training. Those that were administered the Scene Conduct section of the training, Figure 10, show that, on average, respondent's scores on the Scene section of the WMD test increased from 62.97% (light grey) to 84.52% (dark grey), an average increase of 21.55%.

Figure 10: Scene Test Scores



Conclusions/Discussions/Lessons Learned

CERMUSA's mission is to find sustainable healthcare and education solutions for deployment in rural areas. Often times technology is a major factor in what can be done, especially in communication technology. Conclusions learned from the DERA research:

- This method of deployment is effective for education.
- Upgrades would be needed to facilitate higher-speed applications.
- Minimal staff operation is necessary.

The DERA prototype found that the use of this technology was effective in delivery of educational materials as well as enhancing user knowledge. As indicated in Figures 6 through 10, an increase of knowledge in each section has occurred. The PortMoC and the kiosk have proven themselves capable to deliver education effectively to rural and under-served areas.

CERMUSA is finding that the PortMoC, in its current configuration, is a reliable means of providing education in a low- to medium-bandwidth situation; however, the costs to bring higher-speed connectivity would include a new satellite dish and the connectivity fees involved. The last estimate received in April of 2005 to purchase a 1.5 Mbs/500Kbs uplink/downlink was $23,000 for the dish and another $1300/month for connection fees. This higher speed would provide real-time collaborations and Internet2 demonstrations. It would also necessitate a higher cost to construct and utilize on a monthly basis.

Another issue with the PortMoC is finding sufficient staff to operate it. While the satellite operation is a simple procedure, setting the trailer up, bringing the computers into a building, and parking the trailer are all tasks that can require two or more people. Possible solutions would be to convert a station wagon or small sport utility vehicle to the operations vehicle, mount a satellite dish and wireless equipment to its roof, and stow the computers inside the vehicle. This would increase costs as a vehicle, whether new or used, would have to be purchased. However, lower staffing costs, plus ease of use and ease of equipment set-up/tear down, would make the communication technology even more accessible to areas that would not normally have it available.

What applications are appropriate for the PortMoC in its current configuration? These authors would say most websites, web-based Course Management Tools, low-bandwidth streaming media, and audio conference calls. With higher bandwidth potentially available, video teleconferencing, higher-quality streaming, and Internet2 access could be possible, bringing a new level of collaboration to students in areas where Internet connection is currently poor or non-existent.

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