Idaho State University

Disaster Response Complex

College of Science and Engineering

Department of Civil and Environmental Engineering

IGEM20-001

A Disaster Response Complex for Emergency Responders in Idaho

3rd Year Final Report

July 1, 2021 – June 30, 2022

August 29, 2022

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1.0 Basic Project Information

Funding Agency

Higher Education Research Council - Idaho Global Entrepreneurial Mission Program

Awarded Institution

Idaho State University, College of Science and Engineering, Department of Civil and Environmental Engineering

Grant Number

IGEM20-001

Project Title

A Disaster Response Complex for Emergency Responders in Idaho

Principal Investigator

Mustafa Mashal, Ph.D., P.E., Associate Professor

Co-Principal Investigator

Bruce Savage, Ph.D., P.E., Professor and Department Chair

Report Type

3rd Year Final Report: July 1, 2021 – June 30, 2022

2.0 Executive Summary

In the post 9/11 years, the national demand for training of emergency responders from the military and law enforcement branches has grown rapidly. There is a higher demand for training of emergency responders than the current facilities can support. In 2019, researchers at Idaho State University were awarded funding from the State of Idaho under the HERC-IGEM Grant. The focus of the project is the development of a Disaster Response Complex (DRC) for research, certification, and training of emergency responders in collaboration with the Directorate of National & Homeland Security at the Idaho National Laboratory (INL), and the Center for Advanced Energy Studies (CAES). The DRC has three pillars: 1) research, 2) curriculum and certification, and 3) training. All three pillars include the development of new indoor and outdoor complexes with training lanes/simulations to be used in both research, teaching, and training of emergency responders and the instrumentation of a collapsed structure. The training lanes will be used in combination with Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) surrogates/markers, the use of robots/small Unmanned Aerial Vehicle (sUAV), Virtual Reality (VR), Augmented Reality (AR), Geographic Information System (GIS), Light Detection and Ranging (LiDAR), and Radio-Frequency Identification (RFID). The curriculum pillar includes offering courses in topics such as emergency response, gamma/chem spectroscopy, and safety protocols. For the training pillar, the facility can be used to host events for clients such as the Department of Defense (DoD) CBRNE Response Enterprise (CRE), military personnel, Idaho National Guard, and law enforcement agencies/fire departments from Idaho and the region. It is expected that the DRC will be a comprehensive facility that will incorporate natural (earthquakes, hurricanes, flooding) and man-made hazards in the training of emergency responders.

3.0 Summary of Project Accomplishments (July 1, 2021 – June 30, 2022)

This is the progress report for the third and final year of the project. The third-year budget for the project is $283,100. Despite the ongoing global pandemic, the project personnel made substantial progress in the final year of the DRC as described below.

- From July 1st, 2021 to June 30th, 2022 more than 650 individuals excluding instructors and role players have participated in exercises and trainings offered through the DRC. The participants consisted of civil responders, community representatives, volunteers, county workers, and military personnel. Many of the participants were from the following entities: ISU EMT and other programs, ISU Public Safety, Healthcare professionals, Idaho State Police, Pocatello Police, Fire departments, Bomb squads, Bannock County Coroner's Office, and search and rescue units, Civil Support Teams from the National Guard representing multiples states, including Idaho and Oregon National Guard. More members of the National Guard from across the country are expected to train at the DRC in the fall of 2022. ISU DRC will be continuing its collaboration with INL and other partners on the training of the National Guard units. Numerous civilian responders are also expected to use the DRC for their training in the fall of 2022 and beyond.
- The DRC has been expanding its collaboration with local, regional, and national stakeholders. A Memorandum of Understanding (MoU) between ISU and Bannock County was explored to house the Regional "Emergency Operations Center" (EOC) inside the Armory building (indoor DRC) in Pocatello. The benefits for the Regional EOC in the indoor DRC (Armory building) were:
    - Centralized location
    - Consolidated resources dedicated to supporting all counties
    - Higher engagement and collaboration among counties
    - Dedicated normal operation area
    - Additional space readily available during activation

- Excellent collaboration and partnership opportunities with ISU and other stakeholders in the region

Through the EOC partnership, the DRC would have received funds (approximately $1.6M) from the American Rescue Plan Act of 2021 (ARPA) allocation of Bannock County. The funds were planned to be used towards the renovation of the Armory building (e.g. ADA compliance, utilities upgrade etc.). In late August 2022, ISU was notified that "Bannock County has elected to step away from the MOU and go in a different direction to utilize funding for a new county-owned facility that will best fit their needs." The collaboration between Bannock County Emergency Management and the DRC on the development of programs and the EOC are expected to continue.

- The EOC has the potential to expand and include seven counties in Southeast Idaho (Bannock, Bear Lake, Bingham, Caribou, Franklin, Oneida, Power) in the future. Many elected officials from Southeast Idaho, including the Bannock County Commissioners, have shown strong interest in collaborating with ISU and making the EOC a reality for the community of Southeast Idaho. The EOC will provide significant opportunities for everyone, including training, curriculum, and research opportunities for ISU students and researchers. The Director of the Idaho Office of Emergency Management (General Brad Richy) and some of his colleagues visited the Armory in the fall of 2021 to learn about the DRC and plans for the Regional EOC in Southeast Idaho. The basic operational structure of the Regional EOC is shown in Figure 1. The EOC will be a multidisciplinary unit with an assemblage of more than one function engaged in emergency management. The primary functions of the Regional EOC will be:
    - Collecting, analyzing, and sharing information
    - Supporting resource needs and requests, including allocation and tracking
    - Coordinating plans and deterring current and future needs
    - Providing coordination and policy direction

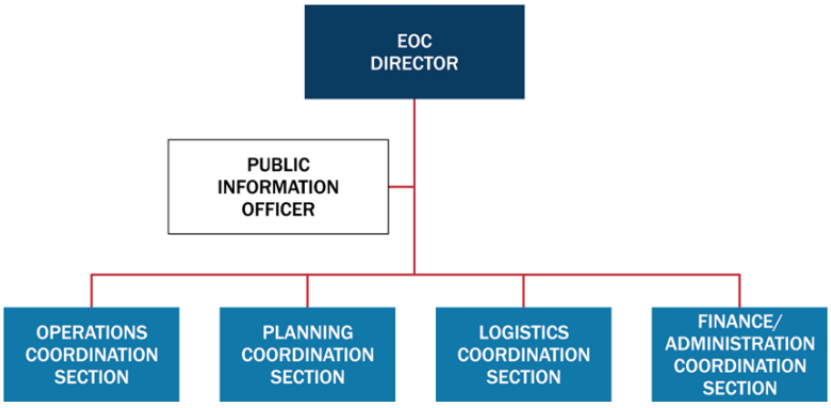

Figure 1. Structure of an EOC (after National Incident Management System, 3rd Ed., FEMA)

There will be three activation levels for the Regional EOC: Level 3: Normal Operation/Steady State; Level 2: Enhanced Steady-State/Partial Activation; and Level 1: Full Activation.

- The first annual Disaster Preparedness and Response Conference (DRPC 2022) was held at the DRC indoor facility (Armory Building) on April 8th and 9th, 2022. The conference hosted in excess of 100 participants for a two-day conference. The conference was very well received and tremendous support was shown for the continuation of the conference in future years. Appendix 4 presents surveys collected from the participants of this conference. The DRC is hoping to make this conference an annual event and partner with other interested entities for future events.

- Multiple tours of the DRC were held for the leadership from INL, CAES, Higher Education Research Council, Idaho Office of Emergency Management, Speaker of the House (Mr. Scott Bedke), legislators, elected officials, and others.
- Several tours of the DRC were provided for the stakeholders and potential partners on the project. There are ongoing discussions and collaboration between the DRC and private/public partners on new initiatives and programs. An example of such collaboration is the partnership between the DRC and the Qal-Tek Associates for offering a curriculum in disaster preparedness and response. Another example is the validation of instruments and equipment using the DRC collapsed structure (rubble pile), which took place in March of 2022.
- Additional research funds were obtained from ISU and CAES to engage more students and researchers on the DRC project. The DRC expanded its programs to include energy security, human-factors, biodefense collaboration, EOC collaboration, sensor data and other trending areas within INL and the Department of Energy.
- External proposals were submitted or are being developed to HERC-IGEM and NSF. More information is provided under the "Research" pillar.
- Students and researchers participated in scholarly activities in disaster response, such as submission of peer-reviewed journals, presentation of research in a national conference and at the DPRC 2022.
- A one-year marketing plan was developed for the DRC.
- A draft business plan for the long-term self-sustainment of the DRC was developed and shared with IGEM-HERC. The business plan is currently being finalized.
- Several media articles were published to promote and spread the word about the DRC and its potential as well as new focus areas such as energy security, sensor data etc.
- The DRC website (https://isu.edu/cee/research-facilities/drc/) was improved. New fliers, trifold, banners, and other marketing materials were developed to promote the DRC.
- The current HERC-IGEM funding concluded in June 2022. Given the potential benefit of the DRC to ISU and overall Idaho, the College of Science and Engineering at ISU provided support for a full-time employee (DRC manager) to continue the project beyond June 2022. Small support for the Director of the DRC and admin support were also provided.

A. Research Pillar

Efforts were primarily focused on research work and program development (whitepapers) in topics such as the use of robotics, Mixed Reality (Augmented Reality/Virtual Reality), electronic simulations of markers/surrogates for CBRNE training, public health, and disaster preparedness and response. Updates in each area of the research pillar are outlined as follows.

<u>Robotics:</u>

- An ISU doctorate candidate from Mechanical Engineering has been working on the robotic aspects of the DRC project in collaboration with ISU and INL researchers. The student has made good progress toward his dissertation focused on the use of robotics in disaster response. The student is expected to graduate in 2022.
- The DRC is collaborating with INL to investigate the use of mobile robots in infrastructure security and remote inspection tasks in Human-robot shared environments. The research is focused onthe advancing technologies of "dog" robots. CAES provided $50,000 for program development for the project titled "Mobile Robot for Security Applications in Remotely Operated Advanced Reactors." Refer to Appendix 1 for a news release on this project.

AR/VR:

- Six students (two doctoral, two masters, and two undergraduates) from various disciplines (Mechanical Engineering, Nuclear Engineering-Health Physics, Computer Science, Pharmacy, and Business Informatics) at ISU have worked under the supervision of the ISU/INL researchers on the AR/VR aspect of the project. The researchers from ISU and INL have been holding regular biweekly meetings to identify further research opportunities in this area. The AR/VR is an emerging area of research interest to many public and private institutions, especially during a pandemic when travel is limited. The project personnel held several demos for the use of AR/VR for the training of emergency responders.
- In 2022, CAES provided $50,000 for program development for a project titled "Investigation on designing a framework of utilizing sensor data in virtual training for disaster preparedness and response" which is led by INL researchers in collaboration with the DRC.
- In 2021, Dr. Mashal was awarded $20,000 for research in AR/VR through Idaho State University – Center for Advanced Energy Studies (ISU-CAES) funding. The project aims to develop AR/VR templates (e.g. exercises) for responders from both military and civil sectors. ISU is collaborating with researchers from INL on this project. The project was successfully completed. Two AR/VR templates have been developed. One template uses VR and focuses on the training of military responders in an immersive environment that simulates the aftermath of a Radiological Dispersible Device (RDD) (Figure 2). The other template uses AR and focuses on training of civil responders in a trench rescue scenario (Figure 3). The trench is currently under construction in the DRC.

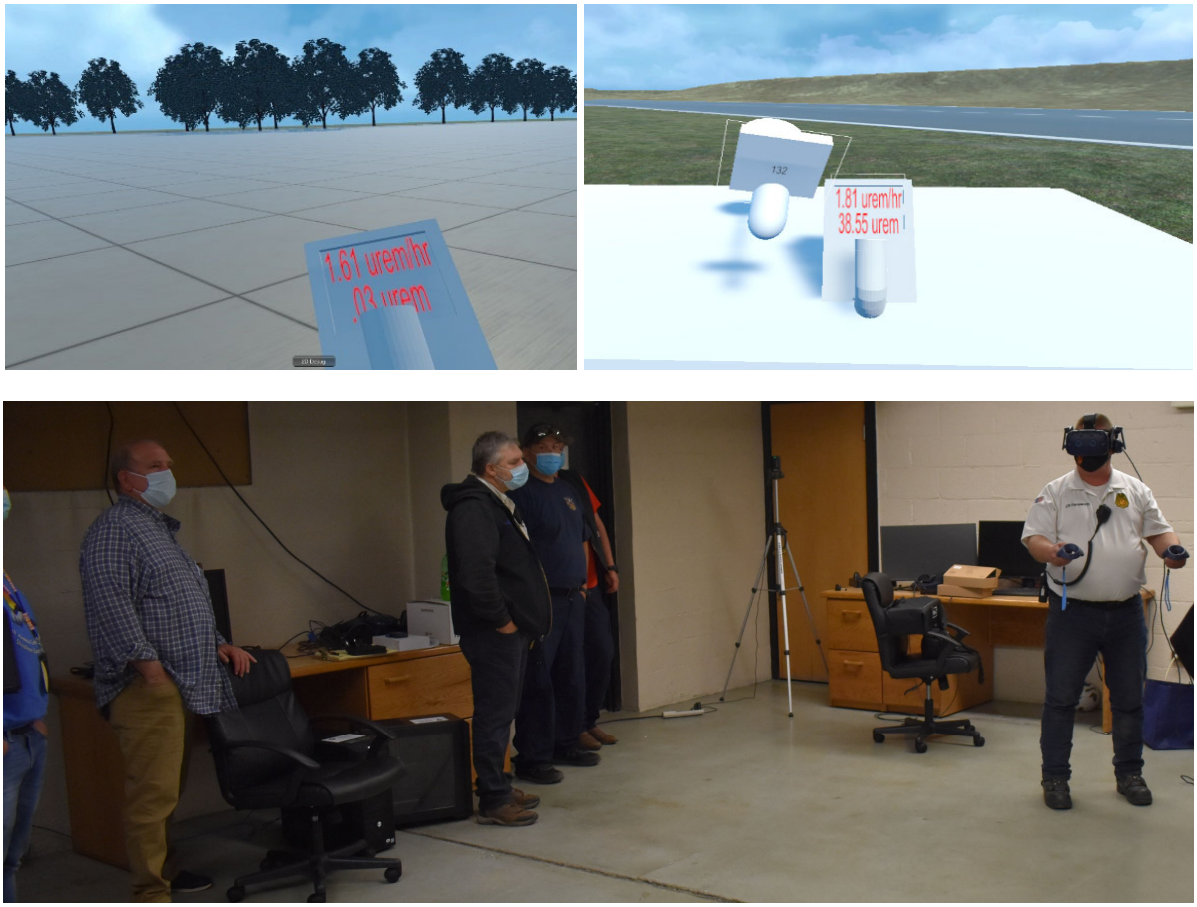

Figure 2. A volunteer responder is trying the VR set for a simulated RDD training in the GVL

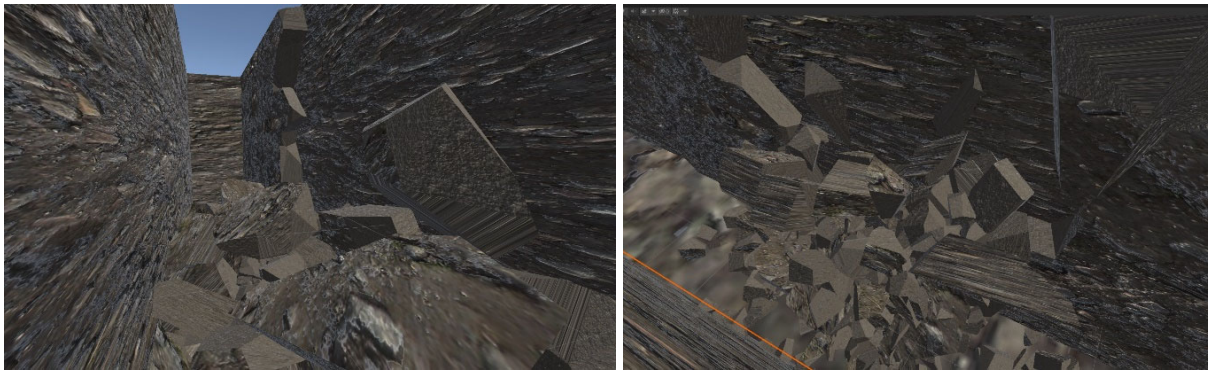

Figure 3. Shots of trench collapse template using AR

- New capabilities, space, and equipment were added in the new Gaming and Visualization Laboratory (GVL) which is located in the indoor DRC (Armory building). Several computers and AR/VR equipment were donated by a new faculty at ISU to upgrade the capabilities of the GVL. New students from Computer Science and Business Informatics have joined the GVL. A new "Gaming and Visualization" Club was also started to attract talents and create professional, training, social, and networking opportunities for ISU students. The DRC project principal investigator, Dr. Mashal, is the founding faculty advisor for the "Gaming and Visualization" Club at ISU.

Chemical, Biological, Radiological, Nuclear, and High Yield Explosives (CBRNE) Simulation:

- Further discussions and meetings were held between ISU and INL researchers to explore electronic simulations of CBRNE training.
- In May 2021, CAES funded $50,000 for program development for a Radiological Dispersal Device (RDD) Training using electronic simulations. The principal investigator from the ISU side is Dr. Mashal. All funding has been transferred to ISU. The majority of the funding is spent to support a graduate student from Nuclear Engineering-Health Physics at ISU on this project. The project has three phases. Phase I of the project was completed in September 2021. Phase II and Phase III are currently underway and will be completed by September 2022.
- CAES has also provided funding for biodefense collaboration as well as EOC collaboration between ISU and INL.

External Proposals:

- The project personnel submitted a proposal titled "A Disaster Response Complex for Emergency Responders" for $1,016,400 for three years (2022-2025) to HERC-IGEM. The proposal was not successful.
- The project PI (Dr. Mashal) led a team of researchers from three states (Idaho, Montana, and Wyoming) representing five universities (Idaho State University, Boise State University, University of Wyoming, Montana State University, and Montana Technological University) and Idaho National Laboratory, and submitted a concept paper titled "NSF Engines: Type 1: Resilient and Equitable Communities in the Northern Mountain West" for a competitive funding call from the National Science Foundation (NSF) Regional Innovation Engines Program. The concept paper was accepted and the team is planning to submit a full proposal in September 2022. The NSF Engines program provides up to ten years of funding per Engine award with a maximum budget of $160 million, with the opportunity to receive up to two years of funding ($1 million) to support

development activities prior to NSF Engine creation. The DRC is one of the main focuses in the ISU's proposal to NSF.

- The project personnel are considering pursuing a funding opportunity titled "Building Resilient Infrastructure and Communities" (BRIC) from the Department of Homeland Security.

Scholarly Activities:

- A journal paper titled "Virtual and Augmented Reality in the Disaster Management Technology: A Literature Review of the Past 11 years" was published in the Frontiers of Virtual Reality journal.
- A journal paper titled "Should We Offer Disaster Preparedness and Response Training Workshops Across Idaho? A Feasibility Study" was published in the Journal of Emergency Management.
- A journal paper titled "A Disaster Response Complex for Training of First Responders in Idaho" was revised and submitted for publication in the Journal of Emergency Management. The paper is currently being peer-reviewed.
- An ISU graduate student presented a 35-minute presentation on "Virtual Reality and Augmented Reality as Novel Tools for Training of Emergency Responders" during the 6th Annual International Conference of the Campus Alliance for Advanced Visualization (CAAV 2021) hosted by Purdue University on November 1-4, 2021 (virtual presentation).
- An ISU graduate student presented a 30-minute presentation on "RDD Training Utilizing VR and Live Training" during the 6th Annual International Conference of the Campus Alliance for Advanced Visualization (CAAV 2021) hosted by Purdue University, November 1-4, 2021 (virtual presentation).
- Five ISU students working on the project presented their work through a poster presentation at the 2022 Disaster Preparedness and Response Conference (DPRC) in Pocatello. These posters were:
    - K. Hogarth, M. Mashal, and J. Cantrell. "A Disaster Response Complex (DRC) for Research, Curriculum, and Training of First Responders."
    - M. Iqbal, M. Mashal, M. Khan, J. Grider, R. Squires, R. Richardson, J. Koudelka, A. Thornley and I. van Woerden. "Should We Offer Disaster Preparedness and Response Training Workshops Across Idaho? A Feasibility Study."
    - U. S. Medasetti, J. Dunker, Z. Free, S. Banda, and M. Mashal. "Disaster Response in VR."
    - U. S. Medasetti, A. Sebastian, and M. Mashal. "Scaled Source Recovery in Mobile Hot Cell Using UR5e."
    - J. Dunker, M. Mashal, and B. Marsh. "Radiation Dispersal Device Response Training."
- Dr. Mashal Presented a lightning talk at the INL Collaboration with NUC and CAES titled "Disaster Response, High-Performance Concrete, Hydrogen Storage, Industry 4.0: Where Civil Engineering Crosses Other Disciplines" on July 28, 2021.
- Dr. Mashal was invited by INL to present a webinar on the Disaster Response Complex for the INL Resilience Optimization Center on July 14, 2021.
- Dr. Mashal and Bryon Marsh from INL presented a talk on the DRC collaboration at the CAES Codebreaker Series to researchers from INL and CAES consortium on May 5, 2022.
- A master's student from the Department of Civil and Environmental Engineering at ISU successfully completed and defended his Master's Special Project titled "Design and Construction of a Disaster Response Complex in Idaho for Training of Emergency Responders."

- A master's student from the Department of Nuclear Engineering-Health Physics at ISU has been working toward his thesis on the electronic simulation of HazMat in disaster training.
- A PhD student from the Department of Mechanical Engineering has been writing his dissertation on the use of robotics in disaster response.
- The DRC collaborated with ISU's Department of Community and Public Health, ISU's Continuing Education Workforce Training, INL, CAES, Qal Tek Associates LLC and other partners from the public and private industry, to host a two-day conference titled "Disaster Preparedness and Response Conference" in the indoor DRC on April 8th and 9th, 2022 (Figure 4). The Conference drew more than 100 participants. President Satterlee of Idaho State University delivered the opening remarks for the conference.
- The Conference themes focused on: 1) innovative technologies in disaster response and preparedness; 2) public health. The attending participants consisted of researchers/students; fire department; law enforcement; military; healthcare professionals; non-profit search and rescue; and other responders. The participants received Continuing Education Units (CEUs) for attending the conference. A few highlights of the conference included the following sessions:
    - Keynote Speaker: Laurie Holien, Idaho State University, Homeland Security and Emergency Management Director
    - Guest Speakers: the conference hosted managers, leadership, and world-class researchers from several governmental agencies (e.g. military, Bureau of Emergency Medical Services and Preparedness) within the State of Idaho to be speakers and panelists
    - Invitation to attend the conference was extended to everyone at INL, CAES Universities, and some nearby universities in Utah
    - Parallel sessions on different topics (e.g. Introduction to Disaster and Management Cycle; Disasters and Response/Recovery at the US level; Differences in Community Vulnerability and Resilience; Transportation; Military Support; Infectious and Emerging/Reemerging Diseases; Communication/Evacuation Plan; Mitigation/Recovery; Emergency/Pandemic Preparedness; Emergency Preparedness Kits; Networking)
    - Student and Researcher poster session
    - Hands-on activities and demonstrations by Qal-Tek Associates, Pocatello Fire Department, Applied Visualization Laboratory at CAES, Southeast Idaho Public Health, and others
    - Exhibition Hall
    - An Award session for best posters (students/other researchers)
    - The conference received sponsorships and exhibition fees from many different entities which helped to keep the conference registration cost very affordable to everyone
- Discussions, meetings, and tours of the DRC were held to explore and build research collaboration with INL, CAES, ISU, law enforcement, office of emergency management, Southeast Idaho Public Health (SIPH), local fire departments, and private companies.
- The project personnel reached out to several researchers and faculty at ISU from different units, inviting them to explore collaboration on research and curriculum with the DRC.
- Tours of the DRC were held for dignitaries from CAES, INL, ISU, Idaho State Board of Education, and the Idaho Speaker of the House, Mr.Scott Bedke (Figure 5).
- Invitations to tour the DRC has been extended to Members of Congress representing Idaho.

Figure 4. DPRC 2022, DRC Armory April 8-9,2022

Figure 5. Idaho Speaker of the House Mr. Scott Bedke touring the DRC Armory

B. Curriculum and Certification Pillar

- The DRC has partnered with Qal-Tek Associates in Idaho Falls to offer an emergency response curriculum. Seven courses in various topics (e.g. HazMat, confined space rescue technician, etc.) have been selected for offering through the DRC in the fall 2022. The courses are offered for a fee to the participants. The DRC is working with the Continuing Education Workforce Training at ISU for the advertisement and registration for these courses.
- The DRC, in collaboration with INL, CAES, SIPH, local fire departments, local medical doctors, healthcare professionals, ISU's Continuing Education Workforce Training, and ISU's Department of Public Health, hosted a one-day seminar on "Acute Disaster Response Training" on August 24, 2021 (Figure 6). The seminar was free for the participants (Appendix 1). Based on the participant

feedback, the seminar was a success. The curriculum for the seminar was prepared by researchers and healthcare professionals. The curriculum is expected to be utilized for the follow-up training and educational events through the DRC.

- The project personnel have had discussions and tours of the outdoor DRC with potential instructors/partners from local fire departments and the private industry to develop a curriculum for emergency responders in the military, law enforcement, emergency management, and fire departments.

Figure 6. Acute Disaster Response Training in the indoor DRC

C. Training and Exercise Pillar

In the final year, the project personnel were able to continue training at the DRC while it has continued to add additional training lanes and improvements. More than 650 individuals excluding instructors and role players have participated in exercises and trainings offered through the DRC since July 1st, 2021. Of these individuals, about 420 were civilian responders and the rest were military responders, primarily Civil Support Teams from the National Guard representing multiple states.

- Between July 1st – December 31st, 2021, 13 training events were held for the Civil Support Teams from the National Guard and civilian responders. The majority of these training events were conducted in the indoor DRC (Armory building) in collaboration with INL. Some of the training events were highlighted by media outlets (Appendix 1).

Sample Training Events:

- In August 2021, 35 individuals participated in a two-day training event. This was organized by the Idaho Regional HazMat Response Team Exercise through Radiological Assistance Program (RAP) (Figure 7 The training included demos by the private industry (e.g. Qal-Tek Associates and other vendors).

Figure 7. Training by the Pocatello Fire Department's Urban Search and Rescue team

- In September 2021, 25 members of the Idaho and Oregon National Guard Civil Support Teams conducted a simulated Radiological Dispersal Device Exercise (Figure 8). This training was in collaboration with National and Homeland Security at INL. The event marked the return of the Idaho National Guard to the Armory building after more than 50 years. The event brought in much sense of pride and excitement to ISU and the community. ISU and INL are working on a media article about the history of the Armory building. Students at ISU conducted interviews with

members of the community who remembered the Armory building to gather stories for this article. The students were also able to find documents and other information regarding the building when the National Guard was stationed there between 1939 to 1960s. The article is expected to be published in early 2022.

- Every November and April the ISU Emergency Medical Technician (EMT) Program conducts a workshop at the DRC. This exercise serves at the EMT's mass casualty capstone workshop and takes place every fall and spring. The DRC has been able to host the course for 3 years running, with plans to continue the collaboration. A typical workshop is held for 15 to 30 students along with 6 instructors and various numbers of roll players. The exercises have included the participation of the local hospitals and fire departments (Figure 9).
- In November 2021, there was a "Death Investigator Course" presented through Bannock County Coroner's Office in the DRC.
- In July 2021, the Local Emergency Planning Committee (LEPC) for Pocatello had their kickoff meeting in the indoor DRC (Figure 10). There were 42 participants from the businesses and public entities in Southeast Idaho.
- Starting in April of 2022 the DRC hosted Incident Command System 300 and 400 courses as a part of the upcoming Regional EOC efforts between ISU DRC and Bannock County.
- In May of 2022 the DRC hosted a Regions CISM Training and Support course which had 77 participants for a 3-day course.
- In June of 2022 the DRC hosted the 101st Weapons of Mass Destruction Civil Support Team at the DRC outdoor facility for an exercise (Figure 11).

Figure 8. Members of the Idaho and Oregon National Guard training in the indoor DRC

Figure 9. EMT Workshop simulating a mass casualty event in the indoor DRC

Figure 10. LEPC meeting in the indoor DRC

Figure 11. 101st Weapons of Mass Destruction Civil Support exercise outdoor DRC

- Other updates from the third year of the project includes, but not limited to:
    - Design and construction of new training lanes at outdoor and indoor facility (Figure 12).
    - Improved the indoor DRC (Armory building), set up new research space, classrooms, meeting rooms, building signs etc. Purchased furniture, desks, educational equipment and accessories (e.g. projector screens).
    - Development of a draft business plan for the long-term sustainability of the DRC.
    - Development of a one-year marketing plan for the DRC.
    - Development of marketing details, including trifolds, brochures, banners, websites etc. for the DRC.

Figure 12. Simulated Subway Car training lane located in DRC Armory Basement

4.0 Plans for the Upcoming Reporting Period

Not applicable. The project ended on June 30, 2022 and this is the last year final report. ISU has plans and initiatives to support the DRC and make it sustainable in the upcoming years.

5.0 Expenditure Report

The project expenditure until December 2021 is presented in Table 1. The project exhausted $270,631.10 for the third year. A breakdown of the budget and expenditure report is provided in Appendix 3.

Table 1. Summary of Budget Expenditures

Salaries & Fringes (faculty, personnel, student employees, research engineer/lab manager)	$197,208.30
Travel	$0
Capital Expense	$31,820.57
Services and Supplies	$41,602.23
Total	**$270,631.10**

6.0 Partnerships

Since 2019, the project personnel have had discussions with the interested individuals and entities listed in Table 2 on this project with one or more pillars of the DRC project. The impact of the partnership with some of the entities named in Table 2 has created opportunities for students and faculty at ISU as well as the collaborators.

A full-time Research Engineer/Lab Manager position was created for this project. The position was filled and the Research Engineer/Lab Manager started on November 4, 2019. The Research Engineer/Manager helps with all three pillars of the DRC project, including business plan, marketing, design/construction of training lanes, and supervision of several students working on the DRC project.

Table 2. Entities that have toured/visited/briefed/or collaborated on the DRC project

No	Entity Name
1	Idaho National Laboratory • National and Homeland Security Directorate • Energy and Environment Science and Technology • Nuclear Science and Technology
2	The Center for Advanced Energy Studies
3	Department of Energy • Idaho Operations Office
4	Idaho Department of Environmental Quality • INL Oversight Program
5	Idaho Office of Emergency Management • Southeast Idaho • East Idaho • Boise Area
6	Idaho National Guard • Homeland Response Force • Civil Support Team
7	Idaho Falls Fire Department

8	Pocatello Fire Department
9	Pocatello Police Department
10	Idaho State Police
11	Qal-Tek Associates, LLC
12	Technical Resources Group, Inc.
13	Snake River Search and Rescue, Inc.
14	Argon Electronics
15	Preparedness Innovations
16	Eastern Idaho Fire Chiefs Association
17	Eastern Idaho Safety Consultants
18	Bannock County Emergency Services
20	Caribou County Public Safety and LEPC
21	Idaho State University • College of Technology - Nuclear Operations Technology - Continuing Education/Workforce Training) • Kasiska Division of Health Sciences - Institute of Emergency Management - Emergency Services Department - Department of Community and Public Health • College of Science and Engineering - Department of Mechanical Engineering - Department of Computer Science - Health Physics - Physics - Department of Chemistry - Electrical and Computer Engineering - Environmental Monitoring Laboratory • College of Arts and Letters - Department of Political Science • Department of Public Safety • Emergency Management • GIS Center • Idaho Accelerator Center

7.0 Economic Impact

Excluding the research and curriculum pillars, and considering only the training & exercise pillar for the DRC, as of June 2022, more than 1,000 individuals from across the United States have used the DRC for the world-class and unique training. If a regional multiplier[1] model is used to measure the economic impact, and a conservative estimate of $500 per participant who trained at the DRC is used, the regional multipliers

[1]A multiplier model uses an approach to measure how important one industry is to other industries in the region. For instance, a multiplier of 1.5 means that for every dollar spent on that industry, the regional economy will be affected by 1.5 times the original investment.

for Southeastern Idaho based on Idaho's Department of Labor's most recent data from June 2021 for "Professional and Management Development Training" would be as follows:

- Sales Multiplier = 1.48
- Jobs Multiplier = 1.12
- Earnings Multiplier = 1.31
- Regional Economy Impact (Sales) = 1,000 x $500 x 1.48 = $740,000
- Regional Economy Impact (Jobs) = 1,000 x $500 x 1.12 = $560,000
- Regional Economy Impact (Earnings) = 1,000 x $500 x 1.31 = $655,000
- Total Economy Impact (Sales + Jobs + Earnings) = $1,955,000

In summary, it is estimated that the total economy impact of the DRC by the end of the project (June 30, 2022) was almost twice of the total original funding received from HERC-IGEM in 2019 ($1,083,600).

8.0 Faculty and Student Participation

Through June 30, 2022, the numbers of faculty, students, and other researchers who participated in one or more areas on the DRC project at ISU are listed in Table 3. Appendix 2 provides sample student activities for some of the students working on the project.

Table 3. Participating Researchers

Position	**Numbers**
Faculty	9 (including the PIs)
Graduate Students	9
Undergraduate Students	15
Researchers	6
Total	**39**

9.0 Metrics for Establishing Project Success

Table 4 presents a summary of the metrics for establishing project success. Despite the challenges imposed by the global pandemic, the project made good progress toward the original metrics and mostly achieved its goals.

Table 4. Summary of the Criteria for Measuring Success for Year 3

Criteria	Pillars of the Disaster Response Complex		
	Research	Curriculum & Certification	Training & Exercise
Original Proposal	1. Publication of 3-4 papers. 2. Presenting research findings in a national conference. 3. Hiring two additional graduate students (MS or PhD level). 4. Hiring a permanent receptionist and coordinator. 5. Hiring 1-2 new research/teaching faculty.	1. Development of two additional classes in emergency training in collaboration with INL/CAES. 2. Providing certification to first responders. 3. Offering training courses to 150 students/first responders.	1. Training of 800 responders. 2. Expanded local fire departments and emergency response customers, all hazards including natural disasters.
Actual Performance	1 & 2. The project personnel published several papers and presented in multiple conference. 3. Additional graduate students were hired to assist with different aspects of the project. 4. Due to budget constraints, part-time student employees were utilized to help with administrative and logistical items for the project. 5. This did not happen due to budget constraints.	1. The DRC partnered with Qal Tek and others and developed/advertised more than two classes. 2 &3. The DRC provided CEU's to more than 100 participants from across the emergency responders community who attended the 2022 DPRC in Pocatello.	1. More than 650 responders were trained. Additional training events was hosted beyond June 30, 2022. 2. Progress was made towards housing a Regional EOC in the DRC. In late August 2022, ISU was notified that the County elected to go in a different direction for the physical location of the EOC. The DRC and the County are expected to continue their on-going collaboration on the EOC and other initiatives.

10.0 Future Plans

Multiple training and exercise events at the DRC were hosted in 2022. In addition, work is on-going to offer several courses in collaboration with Qal-Tek Associates and develop new curriculum with INL and other collaborators. There is on-going research in the use of AR/VR, Robotics, Public Health, and other areas. The DRC hosted the "Disaster Preparedness and Response Conference" in the spring of 2022. The conference was the first of its kind in Southeast Idaho and attracted more than 100 participants with world-class and national/state expert speakers.

One of the milestones for the third year of the project was to work with the elected officials in the region to host the Regional EOC in the indoor DRC. ISU and Bannock County were in the final stages of signing an MoU for the Regional EOC. Bannock County was considering using approximately $1.6M from its American Rescue Plan Act of 2021 (ARPA) allocation to renovate the indoor DRC (e.g. add ADA compliance). However, in late August 2022, ISU was notified that the County has decided to step away from the MoU and go in a different direction for the physical location of the EOC that fits their needs better.

The intent of the DRC was originally to be a self-sustaining entity by the end of three years of funding. However, the pandemic has placed severe limitations on hosting training events in Pocatello and at ISU between February 2020 – May 2021. Several planned training events for 2020 had to be canceled. Additionally, the sizable demand for an indoor training space was unexpected. While the project personnel have responded to the identified changing market demands, in reality, the Armory building has been functional for less than one and half years. ISU leadership has shown strong support for the DRC and has

been working with the project personnel to finalize a business plan for the long-term sustainment of the DRC.

Future improvements and renovations of the Armory building such as: adding ADA compliance, renovating the building and its utilities, introducing new training lanes in the indoor/outdoor facility, partnerships with the private and public industry, hiring new researchers and students to work on different pillars of the project, training more emergency responders, arranging tours for potential partners and stakeholders, and spreading the word about the DRC in Idaho and the Pacific Northwest. Funding opportunities such as the NSF Engine Type I and BRIC are actively being pursued/considered to further develop the facilities for project continuation and expansion. In addition, there are several on-going collaborations funded by CAES for the DRC in 2022-23.

11.0 Commercialization Revenue

The project principal investigator (Dr. Mashal) was notified on November 23, 2021 that the US Patent Application Entitled: “Ductile Connections for Pre-Formed Construction Elements”, Application No.: 16/817,042, will be issued by the U.S. Patent and Trademark Office in early 2022. The patent is not directly connected to the DRC project; however, it aims to reduce and eliminate earthquake damage in concrete structures and make the built environment resilient to disasters such as earthquakes. The patent was issued in March 2022 and the inventor is planning to commercialize it in North America.

Appendix 1. Sample Media Articles

Disaster Response Complex to Host Acute Disaster Response Training Workshop Aug. 24

August 19, 2021

The Disaster Response Complex in the Department of Civil and Environmental Engineering in the College of Science and Engineering, in collaboration with the Department of Community and Public Health in the College of Health, and the ISU Continuing Education and Workforce Training, is offering a one-day training workshop Aug. 24 to prepare ISU students and interested health care professionals to respond in an acute disaster setting.

Speakers from Southeastern Idaho Public Health will train the participants to develop resilience to disasters before they strike and identify the communication needs and challenges during a disaster. Other presenters include expert local physicians who will also train participants to perform triage on the scene and provide field care and casualty management, also focusing on the prevention and management of infectious disease outbreaks amidst disasters.

Researchers from the Idaho National Laboratory will also be presenting and demonstrating augmented reality/ virtual reality for disaster response as an emerging technology for training emergency responders when travel is restricted such as during a pandemic.

Article Link: https://www.isu.edu/news/2021-fall/disaster-response-complex-to-host-acute-disaster-response-training-workshop-aug-24.html

ISU, INL host disaster response training for Oregon, Idaho National Guard

Kalama Hines, EastIdahoNews.com

Local Published at 2:16 pm, September 30, 2021 | Updated at 4:36 pm, September 30, 2021

Members of the National Guard Civil Support Teams (CST) train in responding to an apparent explosion involving radiation exposure during an exercise at the Idaho State University Disaster Response Complex on Wednesday, Sept. 29, 2021. This training program will continue all week, including some exercises at Idaho National Laboratory. | Kalama Hines, EastIdahoNews.com

POCATELLO — More than a dozen men and women dressed in radiation suits converged on a building that, until 2020, had been a warehouse serving the Idaho State University diesel tech program.

Those men and women, representing the Idaho and Oregon National Guard Civil Support Teams (CST), underwent disaster response training Wednesday afternoon at ISU's Disaster Response Complex.

The training put the teams through different mass-casualty scenarios, including what Mustafa Mashal called a "dirty bomb" response.

Mashal, an associate professor in ISU's civil and environmental engineering department, said CST teams are trained to respond to all types of manmade and natural disasters, to "control the situation and, at the same time, provide the assistance to civilians."

"Their mission is to save life and property during events that can affect many people," Mashal told EastIdahoNews.com.

CST team members scan a bus for radiation levels using a Geiger counter. | Kalama Hines, EastIdahoNews.com

CST team members scan a mannequin for potential radiation exposure using a Geiger counter. | Kalama Hines, EastIdahoNews.com

This particular training exercise is part of a week-long training program led by the Idaho National Laboratory Homeland Security group. Similar training exercises are run through INL 15 to 20 times per year, according to INL spokeswoman Michelle Farrell.

“We have a program that works with the National Guard Bureau CST teams,” she said. “We run them through this training throughout the year.”

The training is standard. What is unique is the site.

According to Mashal, the Idaho National Guard has not conducted a similar training exercise on the ISU campus in over 50 years.

An intentionally damaged bus and a mannequin, prepared for one of Wednesday's training exercises. | Kalama Hines, EastIdahoNews.com

The building, now serving as the university's Disaster Response Complex, was originally constructed in 1939, Mashal explained, with the purpose of serving the National Guard in mind. But in 1970, the facility was taken over for diesel tech classes.

Then, in 2020, it was vacated. The civil engineering department was prepared for the change and has spent the last four years developing a training facility that will bring events like Wednesday's back to the campus.

Katie Hogarth, a graduate student in civil engineering department, has been part of that entire process.

"We first came up with the idea with INL and in 2017 we started developing concepts," she told EastIdahoNews.com.

Members of the CST team continue to check a mannequin while other remove their radiation suits. | Kalama Hines, EastIdahoNews.com

Standing in the facility, watching trainers and trainees work through different scenarios, Hogarth was proud of the work she and her colleagues have completed. But she was also excited about the opportunity.

Earlier this week, she said, she met a woman who assisted in the response to massive floods in the 1960s. The woman told Hogarth that members of the National Guard and area first responders sandbagged the city while working out of the same building that now houses the Disaster Response Complex.

The complex is more than 25,000-square feet, around 75 yards long and wide enough to mimic a two-lane road with space on either side.

“We can constantly change (the layout) to do different scenarios and different mock situations, and train different levels of emergency response,” said Jared Cantrell, ISU Disaster Response Complex Project Manager.

The simulated city block includes false storefronts and, for Wednesday’s training, a bus damaged — in a controlled environment — to mimic an explosion.

CST team members transport the mannequin from location of the incident to their safe zone. | Kalama Hines, EastIdahoNews.com

Both Mashal and Cantrell are hopeful that the complex will see constant training exercises similar to Wednesday’s. Both brought up the facility’s usefulness as it pertains to training programs for police and fire units.

“We’re very blessed to see today, the U.S. flag is hanging again (in here) and the National Guard utilizing the facility,” Mashal said.

The inside of the ISU Disaster Response Complex. | Kalama Hines, EastIdahoNews.com

Article Link = https://www.eastidahonews.com/2021/09/isu-inl-host-disaster-response-training-for-oregon-idaho-national-guard/

ISU host disaster training

September 29, 2021 6:31 PM

POCATELLO, Idaho (KIFI) - Idaho State University partnered with the Idaho National Laboratory to host a joint training exercise between the Idaho 101st and Oregon 102nd Civil Support Teams.

The collaborative training prepares local first responders for major events and disasters with realistic scenarios.

"The scenario is to replicate a terrorist incident where a device was detonated on the bus creating casualties and causing radiological contamination," said INL Program Manager Bryon Marsh.

Medical Operations Officer Erica Bermensolo says the simulation training has been a real lesson on saving lives.

"I don't get a lot of experience with radiological exposures and to do it in a simulated environment has really broadened my knowledge," Bermensolo said.

It's training that Bermensolo values greatly.

"For us being five or so hours away, I mean that's not something we can get every day," Bermensolo said. "We can simulate it, but to be here and having professional train us. I just think is immeasurable."

The training took place at ISU's Disaster Response Complex

Article link = https://localnews8.com/news/2021/09/29/isu-hosts-disaster-training/

Link for Another Article about the training on Idaho State Journal = https://www.idahostatejournal.com/news/local/isu-hosts-disaster-response-training-exercise-in-repurposed-facility/article_f98d41ec-09cc-514d-873a-17ad35cf8dce.html

Idaho State, INL Host Disaster Response Training

October 4, 2021

Idaho State University and the Idaho National Laboratory are working together to make sure disaster relief teams are prepared for anything that comes their way.

On Wednesday, teams from the Idaho National Guard's 101st and Oregon National Guard's 102nd Civil Support teams worked together on a practice scenario simulating the aftermath of a bomb explosion on a bus on a busy street.

The teams used radiation detectors and protective gear, and practiced extricating and providing treatment to trapped life-like dummies, or "passengers."

The training was one of many that Idaho State has hosted at its Disaster Response Complex. The complex has room for both indoor and outdoor scenarios. At its outdoor location, teams can practice on scenarios such as earthquakes, rubble pile rescues and more. Indoor trainings, such as Wednesdays, are hosted at the Armory Building on South Second Avenue. There, they can simulate manmade and indoor disasters.

Since opening in 2020, the Complex has hosted hundreds of first responders, who previously had to travel from as far away as Texas, said Director Mustafa Mashal.

"We saw a gap and we wanted to fill it and make sure that we have a long-term asset for our community of first responders in this part of the country," he said.

Article Link = https://www.isu.edu/news/2021-fall/idaho-state-inl-host-disaster-response-training.html

CAES-Funded Project Aims to Help Modernize, Optimize Physical Security at Nuclear Power Plants

Physical security at nuclear power plants has traditionally been heavily labor-intensive, requiring multiple shifts of staff per day. A team of researchers from Idaho National Laboratory (INL) and Idaho State University (ISU) is examining the feasibility of using robots to enhance and modernize security operations at these plants.

The project, one of 13 to receive CAES Collaboration Funds this year, aims to develop a "research roadmap" on the use of robots for security purposes at nuclear power plants. The project is led by Vaibhav Yadav, an instrument controls and data science researcher with INL's Nuclear Science & Technology Directorate, and ISU's Mustafa Mashal, a CAES Fellow and associate professor in the Department of Civil and Environmental Engineering, with assistance from Uma Shankar Medasetti, a PhD student at ISU.

The team plans to publish a paper on the topic, exploring issues such as the technical feasibility of using robots to conduct security operations – how do they perform in adverse weather conditions, for example, and what are the limitations associated with performance characteristics such as battery life. An important question being considered is: How can a currently operating plant or a future reactor site demonstrate that it meets the performance and regulatory requirements of physical security in using a fleet of four-legged robots? The first step of the team's research is to gain an understanding of the technology utilized by robot manufacturers and how that technology impacts performance. To accomplish this, they are conducting comparative analysis of the different robot offerings and have engaged with several robot vendors as part of this effort.

"We're wrapping up our review soon and will get a preliminary paper out," Yadav said, adding that "the goal is to create a research roadmap" that will pave the way for future research in use of dog robots for security applications such as intrusion detection, patrolling, inspection and communication, as well as other nuclear applications including industrial inspection, maintenance and radiation measurements. Eventually, the research team plans to utilize ISU's Disaster Response Complex for conducting experiments in assessment of performance effectiveness of the robots. The outdoor DRC site spans approximately three acres on ISU's business park in Pocatello. It accommodates research, curriculum development and training/exercises for emergency responders from across the region. CAES provided seed funding for the DRC project, which involves INL and dates to 2018, when its director, Mashal, met INL researcher Bryon Marsh at the CAES Security Collaborative Research Planning Meeting. Later that year, the project received CAES Collaboration Funds. In 2019, Idaho's Higher Education Research Council awarded the project nearly $1.1 million through the Idaho Global Entrepreneurial Mission initiative. CAES Collaboration Funds are awarded to projects led by INL researchers in partnership with faculty members/researchers from the CAES universities. The goal is to establish and foster relationships between the CAES entities in research, education and innovation. Details can be found here.

Idaho State University PhD student Uma Shankar Medasetti (left) and Idaho National Laboratory researcher Vaibhav Yadav pose with robots during a recent demonstration by a robot vendor at INL. Yadav and Medasetti are working on a CAES-funded project studying the ways in which robots can help optimize and modernize physical security operations at nuclear power plants.

Article Link = https://caes.org/caes-funded-project-aims-to-help-modernize-optimize-physical-security-at-nuclear-power-plants/

Appendix 2: Sample Student Activities

Dates	Uma Shankar Medasetti	Sindi Banda	Jack Dunker	Zack Free
6/28/2021	Attended Meeting with Logan and INL folks about the project		Refactored dose rate code. Implemented placeholder model for dose rate meter. Attended INL RDD survey training. Attended DRC meeting and presented WIP of VR system. Implemented locomotion in VR	
7/5/2021			Setup Virtual reality control scheme allowing for objects to be physically carried. Investigated tools to reduce motion sickness in VR. Researched implementation of necassary AR software and toolkits	
7/12/2021			Finalized implemenation of VR controller. Began setup of second training scenario/VR orientation area. Attended DRC seminar and bi-weekly meeting. Met with INL to demo VR project.	
7/19/2021	Worked with Ellen to get property tag for Microsoft Hololens		Met with John Koudelka and INL VR team. Researched continuous redirected movement for VR. Updated VR landscape with higher resolution textures and more environment detail. Refactored shielding calculation in radiation simulation	
7/26/2021	fininished working on additional papers for the Journal.		Met with DRC visualization team to discuss weekly plans. Met with CAES visualization team. Updated movement system to make smooth accelerated movement. Helped implement teleportation movement	
8/2/2021	We went to Merdiain to bring the equipment		Met with CAES visualization team. Stayed on to assist/spectate blender tutorial. AR/VR weekly meeting	
8/9/2021	Sent the desktops to COSE IT to see if they are working or not		AR/VR weekly meeting started. Adjusted VR pickup physics and fixed teleportation issue	
8/16/2021	Worked on a presentation for the lab equipment to INL folks		AR/VR weekly meeting started. Started working with Grab interactors to create "tool belt" effect	
8/23/2021	Helped with a workshop at Armory building		AR/VR weekly meeting. Started on RDD project abstract. Fixed Grab interactors. Started on adjusted bomb dispersal and wind pattern. Attended INL training detonation and demoed Argon RF equipment. DRC sync up meeting	
8/30/2021	Updated CAES progress report. Sent the list of new equipment and their description to Jared		AR/VR weekly meetings. Met with Bryan from Argon Electronics to syncronize simulated plumes.	
9/6/2021	created a poster for the lab, Worked on abstract for the CAAV conference		Updated visual assets for RDD project (windows and cars). Ran debugging check for upcoming demo. Met with INL/CAES visualization team. Met with DRC to discuss demo and white paper deliverables. Uploaded white paper deliverables to Mustafa	
9/13/2021	Helped Shishir on the discussion part of the journal		Presented VR RDD demo. Researched trench collapses, particle systems, destructible meshes as they relate to trench collpase. Set out goals for VR and AR projects. Met with INL/CAES visualiztion team.	
9/20/2021	Had a chat with John regarding need for additional development from INL side		Set up AR soil simulation. Started on power point presentation for CAAV. Attended DRC bi-weekly meeting, discussing plans for AR project. Moved ADMS equipment	
9/27/2021	I had a meeting with shishir related to journal paper. He asked for more information like source, type and keywords for each paper		Completed frist phase of soil simulation in Unity. Drafting out thesis proposal. Looking into capabilities of Unity to do destructible objects to simulate trench collapse. Attened INL meeting	
10/4/2021	Updated the poster and sent to Jared for the review		Attended INL meeting. Researching destructible meshes for Unity for trench collapse. Worked on setting up demo in Hololens. Started outline story boards for phase II RDD project.	
10/11/2021	Worked on starting the new "Gaming and Visualization Club" with ASISU. the finished Application process for CAAV Presentation			
10/18/2021	Worked on a quote for upgrades and new equipment		Drafted CAAV presentation. Retooled AR shaders to run on Hololens. Working on RDD phase 2 white paper. Attended INL meeting discussing INL assistance with environment modeling	
10/25/2021	Dr.Farjana and I worked together over the weekend to finish the draft		Met with INL discussing GIS data import into project. Reworked CAAV presentation based on white paper draft. Attend DRC sync up. Working on AR controller integration	
11/1/2021	Dropped the both the concordia machines for upgrades. Ordered two new coolers for the machines.		Prepared VR project for demonstration for CAAV. Put together video for CAAV. Fixed Hololens app deployment. Met with INL planning for CAAV	
11/8/2021	worked on the presentation for the CAAV. Had some discussion with INL folks regarding using Blender.		Met with John Koudlelka to review presentation slides Presented at CAAV. Rewriting RDD white paper draft. . Attended DRC meeting	
11/15/2021	Gave access to sindi banda. Attended a meeting for the GVL club. Attended the CMS training for the website.			
11/22/2021	Did a load testing on the concordia machines. They are failing. Bascailly, I found an issue with the graphic cards on the machines. Need new graphic cards for the machine.		Updated and streamlined VR RDD demo. Met with CAES team about improving cell fracture performance. Attended DRC meeting. Planning on EOC paper. Met with Bryon Marsh on RDD phase 2	
11/29/2021	Worked with Sindi on the website. I provided him a layout of it.		Met with INL discussing trench collapse. Researched blender cell fracturing. Added to RDD outline. Updated AR project with collapsing wall	
12/6/2021	ollowed up with Jack on the Concordia machines status. The concordia originally had 13 computers and we have only 4 of those. We should be able to work with them as long as we have facilitator or instructor computers.		Researching plume models, trench failure modes and AR/VR optimization. Starting on outline of EOC document	
12/13/2021	Met with the prof. Caryn Evila. Discussed with her about the possibilities of using VR/AR in her class			
12/20/2021			Met with CAES team. Received documentation of turning physics calculations into animations. Presented Phase 2 RDD outline to Bryon Marsh, working on assigned improvements. Attended DRC weekly meeting. Received trench rescue document from Dr Savage.	
12/27/2021				
1/7/2022	Mostly focusing on working on a new conference paper with shishir.	Worked on the website	Attended INL/CAES meeting. Attended VR Journal Research paper meeting. Working on fixing error with GIS plugin.	Off for break
1/14/2022	Followed up with Jack Bradley on the ADMS. He let me know that we need joysticks. I asked him to shoot an email to Dr.Mashal. An order for four joysticks has been placed. Had chat with the John and his team regarding a conference paper for the VR project. After some discussion, we relaized that we need to some course from CITI training and also submit a report on what we are doing to IRB department. We intent to finish the course next week and come up with a single page proposal to submit to IRB.	made changes to website	Attended INL/CAES meeting. Completed basic IRB training. Continuing to investigate GIS error. Researching netcode for Unity.	UI interaction screen. Continuing work from end of last semester looking at the canvas screen and button functionalities. Buttons work, but can only be triggered by an object held in the hand. There is no interation with the hand directly. I spent the week researching a solution. Current solution is to set a table next to the screen with a "wand" to touch the buttons
1/21/2022	updated the inventory list in the excel sheet. We got the joysticks. I took them from ellen and gave it to the COSE IT folks.	made changes to website	Attended INL/CAES meeting. Working on IRB research proposal. Learning and integrating ARC GIS plugin. Assisted in inventory	Continued work on "Netcode". There is documentation for this at the following link: https://docs-multiplayer.unity3d.com/docs/tutorials/goldenpath_series/goldenpath_foundation_module. I spent my hours creating a non-VR 3D game to practice implementing these multi-player functionalities. Not an easy task
1/28/2022	Finished CITI traning. Working with Jack on getting the documentation done with IRB.		Attended INL/CAES meeting. Finished and submitted IRB research proposal. Integrated ARCGIS plugin. Helped setup occulus for club demo.	More Netcode, following tutorials. The "player" instantiates, but I am unsure how to implement the game build on another machine.
2/4/2022	Worked on preparation for the Spring Organisation fair. Worked with Grad school in getting a TV for the the fair. Worked with Jack on how to plan for the fair. Worked with Laura on returning the Joysticks. I had to go to UPS a couple of times to return them. They didnt accept the return due to wrong return form. Worked on the setting up the tables for the new extension part of the lab	Helped arrange desks in lab	Attended INL meeting. Updated GIS background model to blend with area better. Integrated GIS updated in GITHUB storage. Helped setup side lab. Finished CITI Benign Behavior Intervention training.	Began working on the poster for the upcoming DPRC thing
2/11/2022	Retuned the joy sticks. Got the website ready for the GVL lab. Conducted the first event for the GVL club Spring organisation fair event. Worked on setting up the machines in the new extension part of the lab	student fair/ learning github and unity	Attended INL/CAES meeting. Continued editing GIS model. Added foundation for human AI actors in scene.	This week I was give a task for another project by Dr. Mashal that took all of my work hours

Appendix 2: Sample Student Activities

Dates	Uma Shankar Medasetti	Sindi Banda	Jack Dunker	Zack Free
2/18/2022		Practicing on unity to gain familiarity on how it works. Went through assigned videos on youtube.	Attended INL/CAES meeting. Finished CITI Behavioral Intervention Training. Researching how to handle crowds of people in Unity.	This week I worked fewer hours to study for some midterm tests
2/25/2022		Practicing on unity (gaining familiarity with VR And AR how it works on unity	Attended INL/CAES meeting. Finished DPRC poster draft. Working on Unity animations and AI	Continued researching the Netcode issue. Not much progress made.
3/4/2022		Practicing on unity learning how to create 3d objects and how to interact with them / assigned vides by Jack	Attended INL/CAES meeting. Attended DRC meeting. Researching explosive aerosol dispersal. Resubmitted IRB proposal. Finalised DPRC poster draft	Focused on school projects
3/11/2022		Practicing on unity, learning C# basics using a demo game / assigned vides by Jack	Submitted DPRC poster. Attended INL/CAES meeting. Working on extending crowd animations. Distributed DPRC flyers. Researching NARAC dispersion modeling.	Busy with school projects due
3/18/2022	In India. Worked on the certification for the IRB	working on research paper	Attended INL/CAES meeting. Reviewing HOTSPOT modeling radiation modeling program. Fixed errors in GIS landscape. Resubmitted IRB review request	Tried to catch up on CITI trainings. Completed 2. Researched relevent Unity topics. No pushes to repository though
3/25/2022	In India, worked on the website. Worked on the certification for the IRB		Attended INL/CAES meeting. Fixed error in AI pathfinding. Working on final draft of DPRC poster. Continued fixing GIS errors	No hours worked during Spring break
4/1/2022	Worked on the poster.	Practicing on unity (worked on scripting using C#, / assigned vides by Jack	Submitted final draft of DPRC poster. Studying current environmental dispersion models for comparsion.	Preparations for DPRC Conference
4/8/2022	Mostly helped with the conference on those two days. Presented the poster. Had a meeting about the IRB reseasrch proposal	attended the DPRC Conference	Drafting research problems. Reviewing VR tasks for volunteers	DPRC Conference
4/15/2022		Doing task given by Dr Mashal (Scaaned business Cards into pdf document)	Attended INL meeting. Scheduling student volunteers. Helping Nirajian with lab setup. Prepping evaluation questions	Task assigned for another project
4/22/2022		Was getting ready for exams	Attended INL meeting. Running student volunteers through research scenario and collecting surveys.	Focused on school projects; came in briefly to update Github and stay familiar with new changes to repository
4/29/2022		I had eaxms, did not work on anything	Reviewing first wave research data and assessing future performance changes	Came in to lab to clean up before end of semester;
5/6/2022		learning how to package the project	Continuing research review. Attended INL meeting. Attended DRC monthly meeting. Reviewing draft for RDD white paper	
5/13/2022	Meeting with Dr.Farjana and her team regarding the collaboration. Getting data/questions ready for the study. Send emails to professors for inviting the students.	Wrote the research report / learming on how to package the project into an exe file for easy launching and sharing.	Working on RDD white paper and VR research paper	
5/20/2022		Made the build for windows ,	Work on getting project packaged into standalone exe. Gathering VR research material.	
5/27/2022		learning on how to make a build for the oculus	Finished reviewing VR research material. Looking for novel research questions	
6/3/2022	not much. Just met couple of students who took our survey. Finished the website work for Dr.Mustaf Mashal. The functionaloty didn't work as expected for some reason. I will take a look at it next week.	added user interface button so the that user can exit the game	Bug fixing standalone project. Submitted white paper for review by Bryon	
6/10/2022		building an apk for the quest, build was not to run requested help form Jack.	Reviewed and edited white paper to smaller more focused length. Continue bug fixes for VR project.	
6/17/2022		Worked on the Quest build, it dlid not work. Jack helped to figure what could be the problem.	Working deploying VR project to Occulus. Updating white paper. Attending CAES meeting.	
7/8/2022	Reviewed some papers and came up bunch of keywords. Had our first meeting with the Dr.Vanjulav. He gave me a task to read by next week. I will be working	Made a demo with Photon Network and added Network Player. Creating network player private and debugging errors in the scripts . Creating room so that both		

Appendix 3: Expenditure Report

Data_Description				Accounted Budget	Year-to-Date													Encumbrances	Reservations	Total by ROWS
Fiscal_Month				Temporary Budget	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Subtotal	YTD	YTD	
				Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount	Amount
Index Only	Account			Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
AHRC48_APPR IGEM Response Complex for Eme	Labor			244,000.00	(9,975.88)	(29,067.68)	(17,526.50)	(16,274.93)	(12,599.57)	(12,406.89)	(13,754.92)	(11,829.83)	(15,127.96)	(23,761.59)	(14,029.76)	(20,852.79)	(197,208.30)	0.00	0.00	46,791.70
		610_Salaries		198,600.00	(2,046.16)	(5,846.16)	(5,846.16)	(10,700.91)	(7,133.94)	(7,133.94)	(6,490.05)	(7,777.79)	(9,709.42)	(14,564.13)	(9,709.42)	(8,769.24)	(95,727.32)	0.00	0.00	102,872.68
		620_Irregular Help		0.00	(6,864.45)	(20,108.27)	(8,971.64)	(2,186.75)	(3,089.62)	(2,903.82)	(4,918.84)	(1,744.36)	(2,866.52)	(5,331.28)	(1,807.52)	(9,497.58)	(70,290.65)	0.00	0.00	(70,290.65)
		630_Fringe Benefits		45,400.00	(1,065.27)	(3,113.25)	(2,708.70)	(3,387.27)	(2,376.01)	(2,369.13)	(2,346.03)	(2,307.68)	(2,552.02)	(3,866.18)	(2,512.82)	(2,585.97)	(31,190.33)	(0.00)	0.00	14,209.67
	Direct Expenditures			39,100.00	(313.54)	(9,029.76)	(11,333.96)	(10,262.34)	(2,947.73)	(59.33)	(12,361.84)	(1,523.12)	(817.00)	(1,506.66)	(4,576.93)	(18,690.59)	(73,422.80)	0.00	0.00	(34,322.80)
		700_Travel		6,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6,000.00
		720_Services		33,100.00	(93.50)	(1,971.85)	(1,927.96)	(854.00)	(187.00)	(32.05)	(187.00)	(93.50)	(817.00)	(510.20)	(1,625.15)	(8,838.54)	(17,137.75)	0.00	0.00	15,962.25
			721_Employee Development Services	0.00	0.00	0.00	0.00	(400.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(400.00)	0.00	0.00	(400.00)
			724_Professional Services	0.00	0.00	(355.24)	(1,474.46)	0.00	0.00	0.00	0.00	0.00	(630.00)	0.00	(1,312.61)	(8,675.04)	(12,447.35)	0.00	0.00	(12,447.35)
			727_Administrative Services	0.00	0.00	(948.11)	(310.00)	(310.50)	0.00	(32.05)	0.00	0.00	0.00	(31.20)	(219.04)	(48.00)	(1,898.90)	0.00	0.00	(1,898.90)
			729_Repair and Maintenance Services	0.00	0.00	0.00	(50.00)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(50.00)	0.00	0.00	(50.00)
			741_Rentals and Operating Leases	0.00	(93.50)	(668.50)	(93.50)	(143.50)	(187.00)	0.00	(187.00)	(93.50)	(187.00)	(418.50)	(93.50)	(115.50)	(2,281.00)	0.00	0.00	(2,281.00)
			761_Utility Charges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(60.50)	0.00	0.00	(60.50)	0.00	0.00	(60.50)
		730_Supplies		0.00	(220.04)	(7,057.91)	(4,095.23)	(901.92)	(957.99)	(27.28)	(4,586.84)	(540.95)	0.00	(996.46)	(2,951.78)	(2,128.08)	(24,464.48)	0.00	0.00	(24,464.48)
			731_Administrative Supplies	0.00	(70.70)	(1,449.95)	(2,397.91)	0.00	0.00	0.00	0.00	(119.99)	0.00	0.00	(883.79)	(647.64)	(5,569.98)	0.00	0.00	(5,569.98)
			732_Fuel and Lubricants	0.00	(96.97)	(68.68)	(20.30)	0.00	(114.31)	0.00	(140.10)	(160.13)	0.00	0.00	(189.85)	0.00	(790.34)	0.00	0.00	(790.34)
			733_Computer Supplies	0.00	0.00	(84.79)	(139.96)	0.00	0.00	0.00	0.00	(114.49)	0.00	0.00	0.00	0.00	(339.24)	0.00	0.00	(339.24)
			734_Repair and Maintenance Supplies	0.00	0.00	(105.00)	0.00	0.00	0.00	0.00	(42.01)	0.00	0.00	0.00	(443.69)	(90.00)	(680.70)	0.00	0.00	(680.70)
			736_Institutional/Specific Use	0.00	(52.37)	(5,349.49)	(1,537.06)	(901.92)	(843.68)	(27.28)	(4,404.73)	(146.34)	0.00	(996.46)	(1,434.45)	(1,390.44)	(17,084.22)	0.00	0.00	(17,084.22)
		800_Capital Expense		0.00	0.00	0.00	(5,310.77)	(8,506.42)	(1,802.74)	0.00	(7,588.00)	(888.67)	0.00	0.00	0.00	(7,723.97)	(31,820.57)	0.00	0.00	(31,820.57)
			820C_> $5K Buildings and Improvements	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(6,700.00)	0.00	0.00	0.00	0.00	0.00	(6,700.00)	0.00	0.00	(6,700.00)
			830_Computer Equipment	0.00	0.00	0.00	0.00	(8,506.42)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(8,506.42)	0.00	0.00	(8,506.42)
			845_Office Equipment	0.00	0.00	0.00	(3,620.80)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(3,620.80)	0.00	0.00	(3,620.80)
			850_Specific Use Equipment	0.00	0.00	0.00	(1,689.97)	0.00	(1,802.74)	0.00	(888.00)	(888.67)	0.00	0.00	0.00	0.00	(5,269.38)	0.00	0.00	(5,269.38)
			850C_> $5K Specific Use Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(7,723.97)	(7,723.97)	0.00	0.00	(7,723.97)
	Subtotal			283,100.00	(10,289.42)	(38,097.44)	(28,860.46)	(26,537.27)	(15,547.30)	(12,466.22)	(26,116.76)	(13,352.95)	(15,944.96)	(25,268.25)	(18,606.69)	(39,543.38)	(270,631.10)	0.00	0.00	12,468.90
Total by COLUMNS				283,100.00	(10,289.42)	(38,097.44)	(28,860.46)	(26,537.27)	(15,547.30)	(12,466.22)	(26,116.76)	(13,352.95)	(15,944.96)	(25,268.25)	(18,606.69)	(39,543.38)	(270,631.10)	0.00	0.00	12,468.90

Appendix 4

Disaster Preparedness & Response Conference, Spring 2022

The Idaho State University hosted a two-day Disaster Preparedness and Response Conference on April 8-9, 2022. The conference covered a variety of emergency management topics by guest speakers geared towards both students and professionals. A portion of the conference was dedicated to showcasing the innovation of ISU students/research. Workshops and a demonstration of an outdoor rescue highlighted the capabilities of the Disaster Response Complex

Feedback was obtained from the participants of the conference for future improvement (n=30). Table 1 demonstrates the quality of the conference, if it met the audiences' expectations and if the participants would recommend it to others.

Table 1: The quality of the conference, audiences' expectations, recommendation to others (n=30 responses).

	N=30 (%)
Did the conference content meet your expectations?	
Yes	27 (90)
No	0
Maybe	3 (10)
How would you rate the quality of the conference?	
Excellent	11 (36.6)
Good	16 (53.3)
Acceptable	2 (6.6)
Needs improvement	1 (3.3)
Would you recommend this conference to others?	
Yes	29 (96.6)
Maybe	1 (3.3)

Comments were also taken from the participants regarding training and equipment material, speakers and improving the conference in future. Their comments are organized into the following themes, and sub-themes:

Table 2: Themes, sub-themes and codes

Themes	**Sub-themes**	**Number of coded segments (n=30 feedback forms)**
General comments about the conference		6
Comments about the speakers	Positive comments	25
	Negative comments	2
Training, drill material and equipment	Positive comments	7
	Negative comments	1

Benefits of the conference	Training related to disaster response & management	1
	Showcasing student research	1
	Showcasing ISU department & DRC	2
	Increase in disaster response & management	17
	Networking	16
Recommendations	Partnerships	3
	College journal	1
	Topics	2
	Making sessions more engaging	2
	Conference logistics	18
	Marketing	1
	Group focused sessions	4

The audience gave positive comments about the conference (n=6 comments). The comments about the speakers were also welcoming (n=25 comments), however, some participants felt there was a need for improvement (n=2 comments):

"Loved the wide variety of trainers..(P1)….Great instructors. High passion and energy for the industry…(P28)…..They were all very learned and had a good grasp of the subject. They shared their personal experiences, which were very insightful…(P15)…Some were good, some were not! Some did not offer any good ideas or concepts that I can use in my work. Just stories…(P10).. Some were highly involved in their discipline and vocabulary which made following their presentations more difficult… (P5)"

Another issue raised was the lack of clarity on certain topics: *"Some instructors mentioned they were not certain if they were supposed to cover certain things or even what they were supposed to talk about..(P9)"*

The participants also applauded the equipment, training and drill material. Increase in disaster related knowledge (n= 17 comments), and networking with relevant people in the field (n=16 comments) were major benefits narrated by the participants.

"This gave me a great deal of information that I can take back to work to use in advancing our emergency management…(P9)…Great networking opportunities …!!! (P22)….It was a good mix of different topics……(P4)…Increased knowledge and awareness. How "my" part in an emergency fits with others. How I can better help others recognize the value my contribution could be (voluntary organizations)…(P11).."

It was clear that the audience wanted to have another similar conference after a year. A prominent recommendation was to improve the logistic arrangements at the DRC: including improving the restrooms, chairs for the audience, mics and speakers (n= 18 comments). People also recommended to have focused sessions for specific target audiences e.g., students, healthcare professionals, emergency managers etc. One of the thought-provoking questions was:

"Who was the target audience? (P17)"

Figure 1 shows the word cloud of the comments received from the participants.

Figure 1: Word Cloud

Thus, our analysis shows that the conference was successful in meeting the expectations of the audience. We hope to incorporate the participants suggestions and recommendations in improving the conference in future.