EMERGENCY REMOTE DELIVERY—RAPID RESILIENCE AT A TRADE SCHOOL IN THE UTILITY INDUSTRY

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This case describes the move to emergency remote delivery of classroom instruction at Northwest Lineman College (NLC), a private trade school focusing on educating the utility industry workforce. In particular, this case will describe the artifacts developed and critical design decisions the ad-hoc project team made to continue educating students in the Electrical Lineworker Programs at four locations across the USA at the start of the coronavirus crisis.

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INTRODUCTION

Northwest Lineman College (NLC) provides educational services related to the utility industry, particularly the natural gas, telecom, and power delivery industries. NLC offers both on-campus career training for students who want to start a career in the utility industry and company training for apprentice-level programs, continuing education, and advanced specializations and certifications. Company training happens at NLC facilities, company training sites, or with mobile training teams at work locations. In 2019, NLC trained more than 8,000 students across all these programs.

In 1993, NLC was founded in Meridian, Idaho. Currently, NLC has campuses in Idaho, California, Texas, and Florida. In 2018, Quanta Services, one of the largest utility construction businesses in the United States, acquired NLC to continue to build the future utility workforce (Quanta Services, 2018).

This case addresses NLC's most extensive on-campus program, the Electrical Lineworker Program (ELP). The ELP is a 15-week program that prepares students for a career in the power delivery industry. The program aims to graduate students that are highly qualified for initial employment and highly successful in completing future training programs (Northwest Lineman College, 2020a.) This program is offered at all four NLC campuses and combines classroom instruction with field training in purpose-built training yards on campus.

Students participate in equal-length classroom and field learning activities each day of the school week (Monday through Thursday). Classes are not typically in session Friday; NLC reserves this time for preparation and study. To maintain a high-quality training environment, NLC keeps faculty-to-student ratios to a maximum of 16:1 in the field and 76:1 in the classroom across all campuses.

Instructors at all locations consistently teach the same curriculum. Materials are developed in-house by the Curriculum, Instruction, and Assessment department in collaboration with subject-matter experts.

Classroom courses always include a syllabus, textbook, slide decks, instructor notes, and a 25-question multiple-choice exam. Often there are also handouts, such as activity sheets. For consistency, NLC does not allow instructors to change slide decks but does expect them to augment the lessons with stories and examples from personal industry experience.

Essential Critical Infrastructure Workers

When the novel coronavirus (COVID-19) pandemic resulted in more and more state governments regulating the closure of businesses and initiating stay-at-home or lockdown orders for the inhabitants, the communication and energy industries were among those deemed essential for the "federal critical infrastructure sectors" as defined by the Department of Homeland Security's Cybersecurity & Infrastructure Security Agency (CISA, 2020). NLC leadership, in constant contact with relevant local and state governments, was able to design a business model that allowed campuses to stay open while adhering to the strictest CDC guidelines for cleanliness and social distancing. There was enough space at NLC campus training yards to have smaller groups train farther apart (see Figure 1.) But for the program with the largest number of students, the Electrical Lineworker Program,

classroom space would not be big enough to maintain a six-foot distance between students nor adhere to maximum group sizes.

Project Resilience

On March 18, NLC started *Project Resilience* to "establish effective but temporary educational solutions for our campus programs." The deadline for starting with these solutions was March 23 at 8 am EST.

The project leader named the effort Project Resilience out of a desire to put a positive spin on the unfortunate pandemic circumstances. During press briefings at the White House, many of the folks on the Coronavirus Pandemic Response Team would comment on the American people's resilience. They said that while situation and response efforts were difficult, Americans would pull through because of our ability to persevere. Wanting to tap into that national spirit, the project leader decided to name the project team after one of the American people's most defining characteristics.

Project Resilience would do the following:

FIGURE 1. NLC California training yard with enough space and workstations (for example, poles and bucket trucks) to spread smaller groups out far enough to adhere to group-size and social distancing regulations.

- Help NLC implement educational solutions quickly to deal with the challenges of the novel coronavirus (COVID-19).
- Allow NLC to go back to pre-pandemic methods quickly when possible.

All of this set the stage for the project's strategic plan. The project leader used the definitions of resilience (Collins English Dictionary, 2012) to define the mission statement:

- The capacity to recover quickly from difficulties; toughness—translated into the ability for NLC to recover quickly from difficulties; the toughness of NLC.
- The ability of a substance or object to spring back into shape; elasticity—as in the capacity of NLC to bounce back into shape.

The project team consisted of a project lead with an extensive background in the design and development of educational programs, materials, and procedures, two instructional designers from NLC's Curriculum, Instruction, and Assessment team, three media specialists from NLC's media production subsidiary (NLC Creative), two coordinators, and a communications specialist. Further, there were representatives from the following functions: campus operations, training specialists, IT, and NLC's Department of Education. The project lead reported to a small group of leaders, including the president of NLC, the chief operations officer, and the Covid-19 response team. They managed all COVID-related procedures at NLC. Where needed, the team received support from other staff members at all locations.

The team first got together on a Wednesday and had to have students up and running fully remote for academic classes by the following Monday. The lone goal or objective was to slow the spread of the coronavirus by preventing massive gatherings of students. The team's strategic plan focused on dispersing students across all of NLC's subject areas: knowledge, skill, and behavior (Northwest Lineman College, 2020b). The conceptual objectives for what the team would accomplish are as follows:

Project Resilience will:

- Take current classroom training and turn it into a webinar that students access. Instructors will teach as usual but without a face-to-face student audience.
- Identify alternatives to paper testing.
- Identify alternatives to the current student to instructor ratios. Students WILL maintain their hands-on training, but ratios and schedules may need to adjust due to increasing regulatory demands on group sizes.
- Ensure that all solutions and communications set the expectation for appropriate and educationally-focused behavior during these temporary measures.

The entire project group would only meet twice. The project leader had clearly defined tasks for each of the members. So, most of the work happened in subgroups. For example, the media specialists worked with IT and instructional designers to set up the online learning environment, the instructional designers worked with technical communicators to update the curriculum, and one coordinator worked with campus staff on scheduling. Representation from the different campuses, particularly involving the training staff, was essential for creating buy-in for the project if staying afloat was not motivation enough.

In the rest of this case, we describe the design decisions, materials, and processes the team created to quickly prepare the classroom portion of NLC's Electrical Lineworker Program for emergency remote delivery.

CRITICAL DECISIONS

In this section of the design case, we will discuss the design decisions the project team made. We will discuss selecting the tool for the emergency remote delivery of classroom instruction, accessibility, the criteria and constraints for the development of educational materials, and the moderator, instructor, and monitor's roles.

Tool Selection

The first hurdle in the project was determining how we were going to move everyone online. Initially, the team planned to purchase GoToWebinar or GoToMeeting for webinar-like academic sessions. However, after a quick chat with staff from NLC Creative, we decided to explore Zoom. One of the creative team's members had been using Zoom in a large-scale setting. Zoom had worked nicely for virtual discussions with a large group of professionals. Plus, NLC already used Zoom for corporate meetings.

A small team of media, IT, and instructional design specialists assembled to test Zoom. They looked at the software's settings, requirements, and options. The team built a digital Zoom room for every physical classroom on every campus—about 15 rooms in total. The team tested the difference between Zoom Meeting and Zoom Webinar (Zoom, 2020). Zoom Meeting provided access for up to 300 participants for an unlimited time, and we could share a single link for all of our classrooms. Zoom Webinar allowed access for up to 1,000 participants for an indefinite time, but we had to register each user for each session. Because our class sizes were no more than 75, the Zoom Meeting would accommodate our needs nicely.

Researchers report concerns around failing to plan for technology and infrastructure demands, leading to a poor user experience in education (Fishman & Zhang, 2003; Hartman et al., 2007). The need for a reliable experience was at the forefront of the project leader's mind. Therefore, the

first project day's focus was on vetting the Zoom software and testing it out. Along with this testing, we intentionally planned a dry run on Friday, March 20, 2020. If the system failed, we could simply adjust the first day of planned implementation.

Access

One area of planning that the project leader took into account, which the research did not cover, was student access to technology tools. Because NLC did not require students to bring technology tools with them to school, the project team needed to see what technology students had available to them. We assumed most students had access to smartphones and most students would not have a laptop. Therefore, the intended solution would have to work on a smartphone. A crucial piece to planning was understanding the landscape of student devices. The latest statistics from the Pew Research Center (2019) suggested that 72% of all high school graduates have smartphones. It is interesting to note that while many students will have access to some device, Welsh et al. (2018) indicated that 21% of students who bring their device to class would be reluctant to use it for a classroom or field setting. Because we had no idea how many students would have viable devices, the project leader determined a student survey was necessary before getting too far into implementation. Results showed that all but a few students have access to internet-ready devices. The campuses made arrangements with a few individual students to get equipment on a loan basis. Also, given the fact that students would still attend field training on campus for half the day and might live too far away to get there on time if they were at home for the online classroom portion of training, NLC extended their Wi-Fi networks to cover the parking lots, so students could opt to attend class while sitting in their cars if needed.

First, Focus On The Basics

Some research argues that cycles to plan for online learning should be approximately five to seven years (Picciano, 2015). The project leader's time frame in planning Project Resilience was not years but hours. The project leader had about six hours of planning time before meeting with the project team to go through the plans. Due to this project's emergency nature, the project leader prioritized a focus on getting the materials adequate for online delivery. NLC leadership instructed the project team to toss anything cumbersome out and minimally adapt application activities to work through Zoom. If an application activity required a significant change to fit the online format, leadership told the project team to omit it from the slide deck. "First, focus on getting the presentation of the vital information ready, worry about more complex interactivity later." Leadership and the project leader made this decision because of the need to implement online delivery in five days. The short timeline required a focus on the basics, knowing that we would have an opportunity to improve the materials over time.

Moderator Role

The project team decided to add a moderator to each online classroom. This decision was grounded in one of the instructional designer's experiences related to online content delivery through synchronous methods such as a webinar. In webinars, a presenter often focuses on delivering content, while a moderator guides the process and focuses on technology.

In webinars, moderators support the live conference in various ways (BigMarker, 2017; Cook, 2017). In our case, moderators started the Zoom meeting around ten minutes before the start of class. The moderators would customize and display a welcome slide with course title, instructor name, moderator name, and Zoom setup information. Moderators welcomed students upon entry, and every two or three minutes re-introduced the Zoom setup. At the class's start time, the moderators showed a second slide with expected classroom behavior (see Figure 2.) Moderators explained this slide and then introduced the instructor for the course.

Once the class started, the moderators reminded the instructor two or three times about taking attendance. The moderator then recorded the result on a roster. They continued to support the instructor by solving technical problems for students, posting poll questions, monitoring the chat for students' questions, and summarizing students' answers to activities and questions that the instructor introduced. As Ley (2019) suggests as best practice, the moderators facilitated two-way communication rather than having just one speaker presenting the whole time.

Moderators also pasted links to videos used in the presentation in the chat. Doing so was necessary because a bandwidth issue prevented videos from playing in the Zoom session without interference. For technical support, the IT department had support staff available at each of the four campuses. These were the regular IT support staff that every campus already had. Finally, the moderator recorded the sessions for students to view later or for absent students to make up the lesson.

Initially, NLC chose tech-savvy staff from the media production department to serve as moderators. After a few weeks, as workloads required them in their regular roles again, colleagues who had shown interest in supporting the effort replaced them. And, as the pandemic continued, NLC has since recruited seven virtual classroom moderators.

Instructor Role

NLC's instructors, also known as training specialists, are all second-career educators. Applicants for training specialist
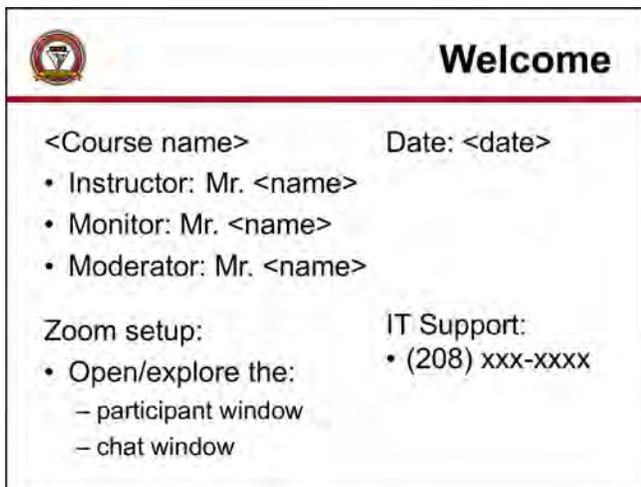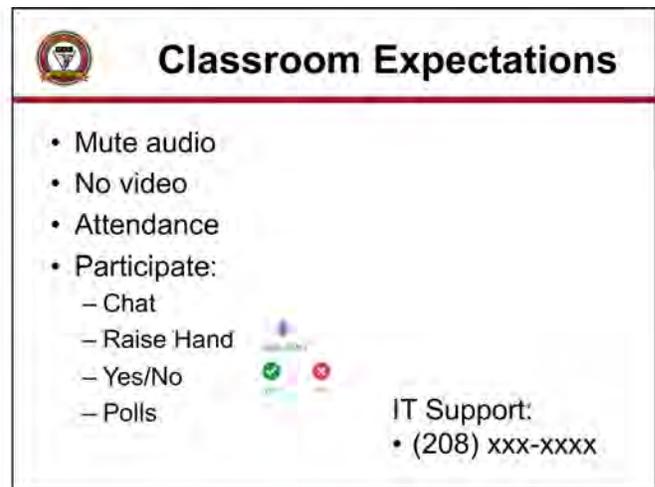
FIGURE 2. Customizable welcome slides. Moderators prepared these slides for each lesson so students would know they entered the correct Zoom room. Especially in the early days, it was important to remind students about features, available support, and expected behavior.

positions first and foremost need to be experienced journeyman lineworkers to qualify for an instructor role in the Electrical Lineworker Program, which means they have completed a four-year apprenticeship program. Beyond that, they will have worked at least eight years in the linework trade. When NLC hires a new training specialist, the training specialist receives thorough initial training in NLC's educational model and delivery approaches. The use of technology in the classroom used to be limited to using a tablet, PowerPoint, and online quizzing applications. Training specialists' experience with technology, in general, varies greatly. This variance was one reason why the project team decided to add moderators to the Zoom classrooms. Instructors could focus 100% on content delivery, while moderators took care of any technical issues that students encountered.

The project team first selected instructors from training specialists who were confined to their homes because of the novel coronavirus outbreak. The training specialists either belonged to one of the high-risk groups themselves or someone in their household was high risk. Or, the training specialist used to travel to clients to deliver training and because of restrictions could not travel.

Monitor Role

On campuses with larger groups of students, two groups of students attend lectures in two classrooms concurrently. For example, one group would attend an Electrical Grid lecture and the other a Rigging lecture. After one hour and 45 minutes and a short break, instructors would change classrooms and teach the same subjects to the other groups.

At one of NLC's campuses leadership decided it was easier to teach one class at a time to a combined group of 120 students. In those cases, instructors requested the support

of a second training specialist. The second training specialist served as a monitor who focused on content-related questions in the chat. As a subject matter expert, the monitor was better able to judge the pertinence of student questions and pass them on to the instructor immediately, save them for a later moment, or answer them directly in the chat. In these sessions the moderator focused on technical questions from students and provided all the other support as described earlier.

After the first group of students completed their program, the large class size was one of the most listed evaluation survey complaints. After receiving this feedback, the campus decided to go back to breaking the classes into two groups and eliminated the monitor position.

ARTIFACTS

Based on a shortlist of guidelines and driven by a concise timeline, the project team made plans for emergency remote delivery of all the classes for the first two days of classes at the Florida, Texas, and Idaho campuses—the Monday and Tuesday after the start of the project. California was on a three-week break between terms of the program. While the emergency remote delivery instruction was underway, the team continued to adapt the rest of the 15-week curriculum to the new situation. In this section, we describe the artifacts used in, and developed for, the emergency remote delivery of classroom training at NLC. We include the Zoom environment, presentation slides and notes, the moderator guide, instructor and moderator training, and a student portal.

Zoom

NLC training specialists delivered lessons through synchronous Zoom meetings to between 20 and 120 students at a time with the moderator's support and, in some cases, the monitor. The moderators start the session and take

attendance. Then they hand it over to the instructor. The instructors use the share screen feature to run through a slide deck presentation with built-in activities and formative assessment. Moderators use Zoom's poll feature to engage students in activities and formative assessments. Moderators also use the chat feature to share links to videos. Students use the share screen feature to demonstrate topics in the lesson, the chat feature to answer questions, and the raise hand feature to ask questions. The project team chose the Zoom platform because NLC already held licenses for the software, and several team members had some experience with it. The project leader was satisfied with the features the platform offered.

Presentation Slides and Notes

A team of instructional designers and technical communicators prepared unique versions of the existing slide decks to support online delivery. They inserted blank slides every four to five slides for the instructors to use as whiteboards and added attendance slides to remind instructors to take attendance at the beginning of the lesson and again at the end. Some slides involved application activities that the designers could not adapt to the online format. The team omitted those activities from the slide deck. For example, activities where students would get out of their chairs to use whiteboards around the classroom for a group activity.

Designers modified other activities to make them more suitable in the Zoom environment. For example, in the classroom, instructors would call on random students to answer a question. At the beginning of the project, the project team chose not to have students unmute and interact with the instructor and fellow students using audio, as we were concerned about bandwidth. Instructor notes were adapted to reflect alternative interaction methods with students. For example, notes that had previously told the instructor to call on a random student now suggested instructors ask students to type their answers in the chat (see Figure 3.)

In the classroom setting, instructors often passed objects around in the classroom. For example, they might pass around different tools lineworkers use to construct power lines and samples of different sizes of electrical conductors on power lines. Designers removed these elements from the slides and instead added the showing and demonstration of such props to the field training portion of the classes.

Moderator Guide

Staff members selected for the moderator roles had little to no knowledge of the content of the coursework. One of the instructional designers suggested developing a moderator guide. The guide was loosely based on a Webinar Facilitator's Guide by Cook (2020). The instructional designers, supported by two technical communicators, developed moderator
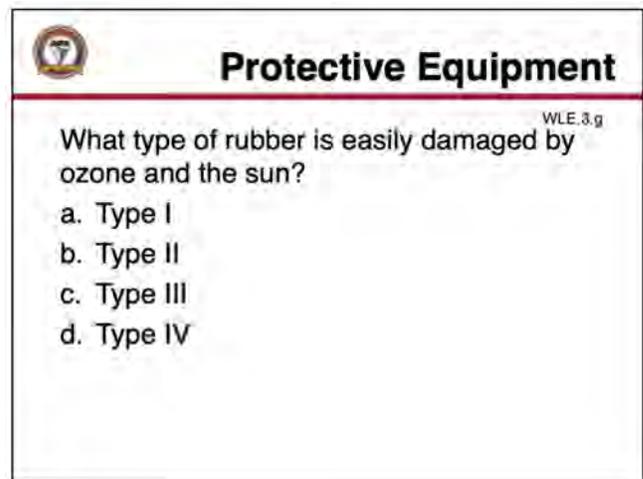
FIGURE 3. Revised instructor notes in the slide deck with a redesigned activity that works better in Zoom.

guides for each lesson. The guides provide detailed instructions on what to do before, during, and at the lesson's end. The guides also provide general information about Zoom and the roles of the instructor and the moderator.

In the guide, instructions appear next to a thumbnail of the slide where the moderator would have to act. Figure 4 (next page) shows examples of the types of instructions the moderator would see.

Instructor and moderator training

On short notice, the project team prepared a training on the use of Zoom for the first instructors and moderators. On Friday, before classes would move online the next week, the team offered the Zoom training three times, once for each of the campuses in Florida, Texas, and Idaho where the Electrical Lineworker Program was in session. One of NLC's educational media experts, a member of the project team, took the lead in the training, focusing on Zoom's functionality. The project leader, an instructional designer, and an IT representative were available to explain the proposed educational process and answer questions. The media expert taught training specialists how to show the PowerPoint presentations, turn on video, turn on audio, interact in the chat, and see key information via the participant window. All of our training specialists have a Microsoft Surface Pro. The training session also included instruction on using
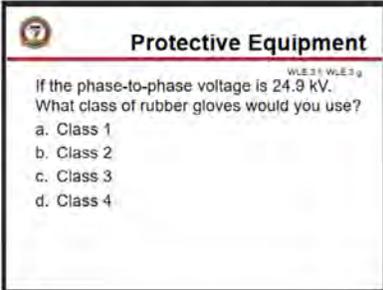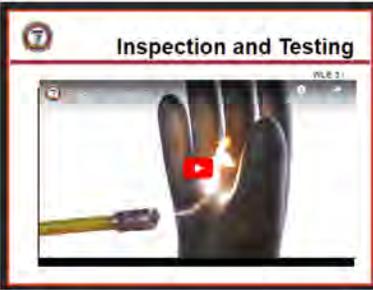
4 ATTENDANCE	Instructor will ask students to type their name in the chat. Record attendance on register.
5 Protective Equipment WLE 3.f	Instructor asks one or more questions. Students answer in chat. Where needed, feel free to support the monitor and instructor to summarize and highlight elements from the chat.
14 Protective Equipment WLE 3.f WLE 3.g If the phase-to-phase voltage is 24.9 kV. What class of rubber gloves would you use? a. Class 1 b. Class 2 c. Class 3 d. Class 4	Instructor asks one or more questions. Students answer in chat. Where needed, feel free to support the monitor and instructor to summarize and highlight elements from the chat.
16 Inspection and Testing WLE 3.i	Put the link for the video in the chat https://www.linemanchannel.com/media/rubber-glove-inspection/7637?rq=rubber%20glove Instructor asks one or more questions. Students answer in chat. Where needed, feel free to support the monitor and instructor to summarize and highlight elements from the chat.

FIGURE 4. Instructions in the guide to support our moderators, none of whom were educators, had lineworker experience, or extensive knowledge of NLC's curriculum and classroom delivery methods. This figure highlights four different situations that a moderator might encounter.

features like the Surface Pro pen inside the Zoom interface. The sessions also included some one-on-one time between training specialists and the moderators that would work together. The training specialists and moderators exchanged phone numbers and made necessary arrangements for the first day of online class. They were then able to communicate and agree on logistics like when they would join the Zoom classroom prior to the beginning of class.

Gay (2016) investigated characteristics around instructor readiness for online learning. The survey suggested that a well-prepared online instructor should have adequate hardware such as a dedicated network connection. Additionally, these instructors should routinely communicate with other people via online platforms and also be self-motivated learners themselves (Gay, 2016). During our rushed timeline, we did not consider any of these variables for our training specialists. We simply put someone into the situation so they could continue to teach.

To get the moderators ready, we hosted a collaborative session with team members from NLC Creative. The same media expert who delivered training specialist training also taught moderators how to use the Zoom interface. This training included how to log into the system, communicate with students, take attendance, post recordings, and communicate with campuses. During the training, we shared the welcome slides that moderators would use to explain to students how to participate in the Zoom software. The instructional designers also introduced the Moderator's Guide during this training.

In the following weeks, the project team repeated training as needed. More and more classes were ready to be delivered online, involving more training specialists and moderators. After six weeks, the project team organized a best practices webinar to share experiences, tips, and tricks. The project leader and a member of NLC's Learning and Development team (who specializes in delivering NLC professional technical educator courses) moderated this webinar. The webinar featured three training specialists who shared their tips and tricks for smooth online delivery and discussed topics such as "motivation and engagement in the online classroom" and "strategies for delivering the course activities in an online environment."

It became clear that some training specialists feel more comfortable in the Zoom environment than others. For example, one instructor shared how he happily included students in conversations, allowing them to unmute, and how he worked together with the moderator to make sure all students got turns. Another instructor working from home shared how he set up his workstation with technology such as a high-end microphone and multiple computers to support a quality online presentation. And a third instructor shared his tip asking students to use the private chat between students and instructor to send their answers to questions. That way, everyone had an opportunity to think about a question without seeing the quick responses in the general chat.

Student Portal

At the start of this project, NLC was not using online learning technology for on-campus career programs. In the first few weeks, program administrators on campuses sent a large volume of emails and texts to many students informing them about schedules, Zoom room links, and providing handouts. Zoom meeting links did not always work, and the students were confused by all the information sent to them. Additionally, not all emails and text messages were being delivered due to some spam filters. The program administrators expressed the need to get information out to the students in a timely, single-location manner. To streamline student communication, one member of the project team built a student portal using an existing admissions platform that all students could already access.

This admissions platform is an implementation of the TargetX recruitment suite (https://www.targetx.com/), which facilitates the enrollment process and synchronizes information with the customer-relation management software Salesforce that NLC uses for its different programs (https://www.salesforce.com/). Before COVID, the admissions platform's use ended as soon as students entered their first day of school. There was simply no need to log in again. However, the platform was the one digital system that all students already had a username and password for, and it was easy to add a page to the existing system for information, links, and handouts. This platform became the student portal.

All campuses have their own landing page on the portal.

The portal includes seven areas:

- **Announcements.** The first page that opens up when a student logs in. It presents all the new information for students.
- **Class schedule.** This section includes a full term calendar and a detailed weekly schedule, including Zoom classroom links that—when clicked—take students directly to the classroom. Also included are office hour schedules and schedules of optional courses throughout the term.
- **Documents**. This section includes all the term documents and general documents that students need to use, hand in, or have access to during their 15-week program. This page has all the information laid out with clickable links and either takes students to a cloud-based filing system or directly to the document (Figure 5 shows a sample documents page).
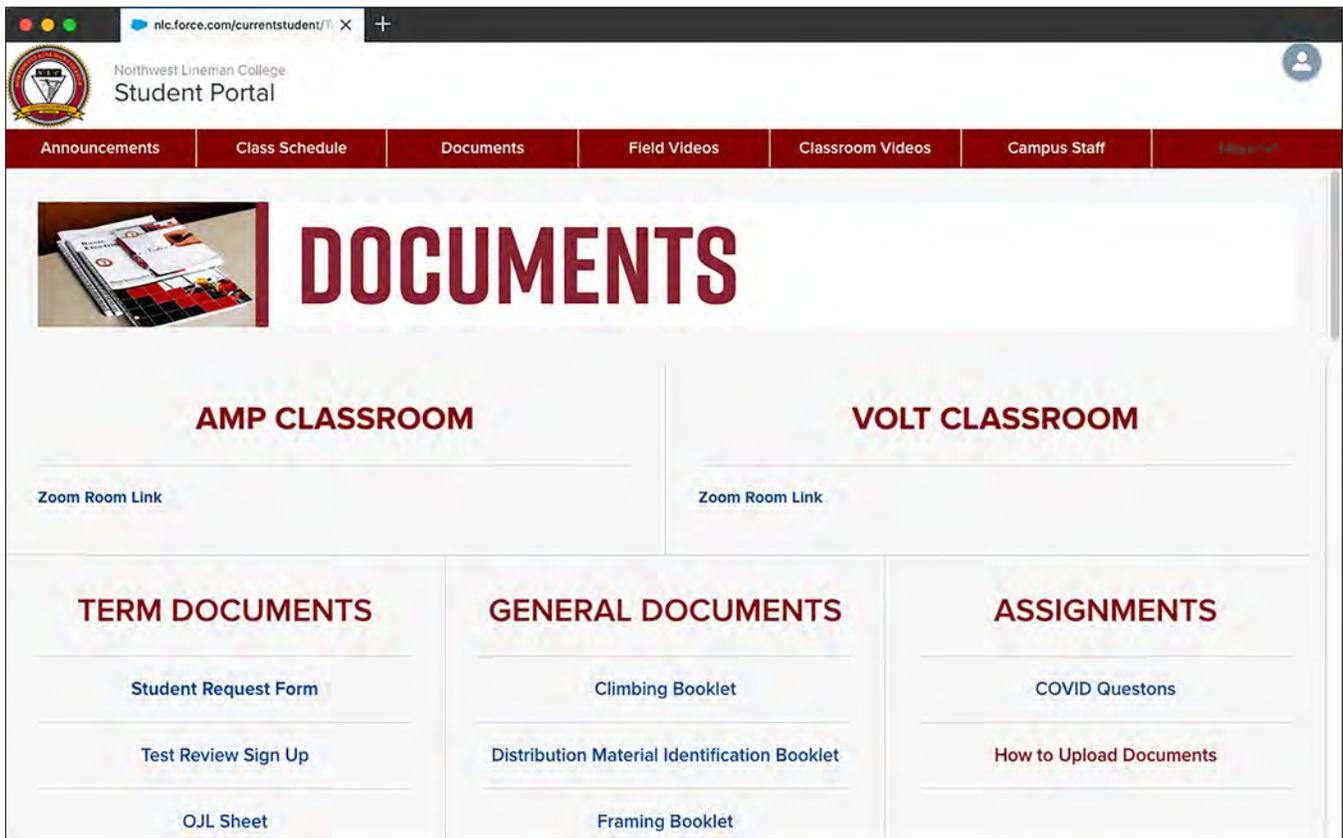
FIGURE 5. Example of the documents page on the student portal for NLC's California campus. The portal alleviated the administrative staff from sending mass emails and prevented mistakes that happened with such mailings.

- **Field videos.** In this section campus staff store locally-produced instructional videos that students can view to prepare them for field training.
- **Classroom videos.** Classroom sessions are recorded and made available to the students for two weeks. In that period, students can review classes anytime and as many times as they would like. NLC keeps all class recordings beyond the two weeks in an archive.
- **Campus staff.** This page is a list of campus staff with pictures, names, and titles to support putting faces to names in the remote learning environment.
- **COVID-19.** This section has up-to-date policies related to the pandemic that are relevant for the students.

One central point of contact in Idaho updates the portals for the campuses. Administrative staff at each campus send their announcements and documents to this point of contact. The central contact person also coordinates the pool of moderators who send in the recordings from the lectures every day for uploading.

Students must use the portal to check their schedules and to find the Zoom links for class. Feedback from students who completed the program shows that they particularly appreciate the ability to review lectures. And instructors refer students to the portal frequently to find documents or announcements.

CONCLUSION

In five days, the project team developed lesson plans and moderator guides for the first two days of six different courses, trained five instructors and six moderators, and informed several hundred students about the new procedures for the emergency remote delivery of the Electrical Lineworker Program's classroom component. Instructors subsequently delivered these lessons first at three, and later at four, campuses while continuing to prepare the following lessons until the team transformed the entire curriculum of the 15-week program for online delivery. Sharing of experiences between training specialists, moderators, and the project team continues to be important. As the pandemic continues, NLC continues to deliver the classroom portion of ELP online and continues to graduate the future workforce for one of the country's essential industries.

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