Reinventing Military Science in Higher Education: Using Service Learning and Cloud Computing to Develop Future Leaders

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Introduction

The Army Reserve Officers' Training Corps (ROTC) is an elective program available at many colleges and universities that offers students both scholarship opportunities and leadership training for those interested in continuing to Armed Forces service. Historically, the ROTC courses and training prepare candidates for a career as an officer in the military. Courses in leadership, military history, and physical fitness are some of the key components of these programs. Taught by battalion leaders who are generally officers in a corresponding military branch, military science courses give students a chance to wear a uniform, push themselves physically, and learn critical thinking and problem-solving skills while learning about the branch of the military they are considering as a career. The rise of the digital age and the increasing number of online courses available at post-secondary institutions have inspired academic technology and pedagogy researchers to explore how these changes in our learning environments influence shifts in traditional pedagogy and teaching and learning preferences within ROTC and military science courses. The following design case describes one such meeting of digital technology and traditional pedagogy through the lens of two massive service-learning projects.

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Design Scenario

Curriculum Model

Benedictine University (BenU) at Mesa, a small branch campus of a Catholic institution based in the Midwest, opened in Fall 2013 with a small group of students interested in participating in the Army Reserve Officers' Training Corps (ROTC). It is unusual that an ROTC affiliation would begin at a startup satellite campus during its opening year; however, the BenU Mesa campus is a unique one in that the entire campus is lecture-free and that the objectives of this campus are closely aligned with the objectives of Cadet Command, the organizational unit that oversees ROTC programming. The student interest combined with the curriculum model made it an appealing exception to the rule, and a small cohort was created under the Sun Devil Battalion stationed at Arizona State University, a large research institution in a neighboring city from the BenU Mesa campus. The courses offered were military science (MIS) 101, *introduction to the military*, MIS 102, *land navigation, first aid, and survival*.

The curriculum at BenU Mesa relies on a combination of the flipped classroom model and problem-based learning to promote critical thinking skills and active learning. Incoming Fall 2013 students participated in regular technology workshops to familiarize themselves with the most cutting-edge tools and technologies available. This technology-enhanced campus supports the kind of collaborative learning and critical thinking skills that are requisite to the development of great Army officers and leaders, and this idea is the catalyst that created such a quick and effective partnership between BenU Mesa and the ROTC Department at Arizona State University (ASU).

The ROTC curriculum is largely focused on personal development, teamwork, and understanding the function of the Army (Fig. 1). The course objectives are broad, and some are difficult to teach through traditional lecture, *Explain the importance of being a model citizen as an Army officer,* for example. An instructor could try to teach this through case study or lecture, but a far more effective method is to get students out of the classroom and be seen by the community as model citizens (Johnson, 2010).

In the summer prior to the inaugural term at BenU, the university held a workshop for incoming faculty that introduced the fundamentals of problem-based learning (PBL), given by the authors of the book *The Practice of Problem-based Learning*, José Amador, Libby Miles, and C.B. Peters. During the workshop, faculty members practiced designing and implementing curriculum using the PBL model. Following the workshop, the ROTC instructor began to consider how he might develop a syllabus following the PBL methodology that also meets the course objectives required by Cadet Command. The instructor realized that the personal development, teamwork, and officership objectives could be met by solving one big "problem": the planning and execution of a service project. As part of education in the Benedictine tradition, students at Benedictine University must complete

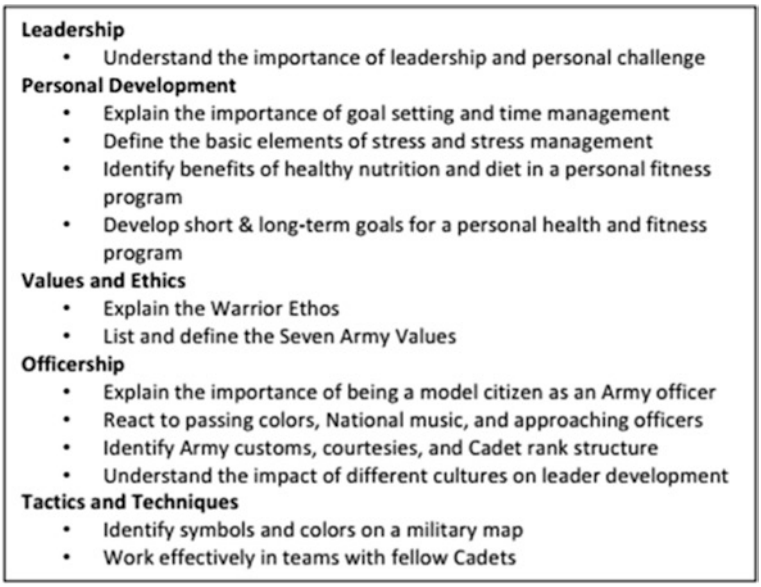

Fig. 1 MIS 101 course objectives from Cadet Command

service-learning hours every academic year. It was this program element that led to an innovative, service-based leadership training using Cloud technology to collaborate, coordinate, train, and plan for a large-scale service-learning project.

Working with an instructional designer as a pedagogical resource and technology guide, the ROTC instructor created an organized framework for material delivery and cadet collaboration using Google Sites and Google Docs. The students would design, propose, and execute a large-scale service-learning project in the city of Mesa, near the BenU campus.

Design Elements

Service Learning

Service learning is an instruction method that combines civic service in the community with academic instruction in a reflective and responsible manner. Going beyond volunteer work, service learning adds a content-related component and requires the student to connect what they are learning in class to what they are doing to serve their community at large (Heiselt & Wolverton, 2009). Many instructors cooperatively build service-learning projects with their students and civic or community leaders to provide the most authentic learning experience that emphasizes elements of the curriculum or topic being studied (Dymond, Neeper, & Fones,

2010). Benedictine University's long history of community service coupled with their commitment for developing problem-based learning environments for students set the stage for the development of a novel, community service project for a military science course aimed at teaching leadership and project management skills.

Studies have shown that students who participate in service-learning curriculum demonstrate higher levels of civic responsibility, social involvement, and awareness of social injustice (Dooley, 2007; Myers-Lipton, 1998). Effective service-learning experiences do require planning on the part of the instructor. In addition to careful project and site selection for the service-learning experience, instructors must be cognizant of their students' affective preparation for the experience, in addition to their cognitive preparation (Dooley, 2007). To encourage course fidelity and higher learning, it was important for the students to have opportunities for reflective practice and safe spaces in order for them to process the information they gained from the service-learning experience. In addition, the service-learning experience tied into the military curriculum in a meaningful way, providing students with a way to authentically practice the skills, knowledge, or behaviors that the course intended them to achieve.

Problem-Based Learning

The United States (U.S.) Army, and combat situations in particular, are amazing problem-generating machines and, therefore, provide many problem-solving opportunities for officers. From an Army officer's first day on the job, there is an expectation that the officer is capable of researching, critical thinking, and problem-solving. Officers in the field quickly learn that they are no longer in college where they simply receive a block of instruction and recite the answers on an exam to be successful. Once in the field, they are in an environment where they are expected to figure out solutions to problems, make mistakes, and learn from them. In the field, there are an endless stream of problems that are triaged and solved daily, sometimes with life and death consequences at stake. Whether the student is a young lieutenant (entry-level commissioned officer), a senior non-commissioned officer (an enlisted officer that has moved up the ranks by promotion, lower in rank to a lieutenant), or a brand new private (lowest Army rank, held by newly enlisted recruits), giving a learner guidance and then sending them off to succeed or fail develop their wisdom quickly.

Veterans who exit service and enter higher education are often classified as self-directed, adult learners who demonstrate managerial or leadership skills, who may have intercultural expertise, who exhibit high levels of intrinsic motivation, who have a strong organizational commitment and sense of community, and who are able to adapt to changing situations (Starr-Glass, 2011). These characteristics, although general, speak to the level of problem-solving and just-in-time PBL military personnel receive during their time of service. By incorporating PBL into premilitary service programs, such as ROTC, it better prepares cadets to perform well and succeed during their time of service and beyond.

Because PBL was a mandate for the BenU campus courses and because PBL and problem-solving are integral parts of the Army experience and the ROTC curriculum, the instructor chose PBL as the driving force behind the service-learning experience. The instructor wanted the students to solve a real-life problem while providing a service to the community.

Traditional PBL in academics requires the use of an ill-structured problem that allows students to explore the content through the solving of that problem. The instructor acts as a "guide-on-the-side" to answer questions and redirect students when necessary (Amador, Miles, & Peters, 2006). As an active learning technique, PBL can quickly engage students with the respective content in addition to creating opportunities for students to practice critical thinking skills. However, novel teaching methods that account for generational pedagogy shifts do not come without their limitations. One such limitation of PBL is acclimating students to having less structure and reliance on the instructor, compared to the more traditionally designed courses (Miller, 2016). In the case presented here, the instructor felt that the students completing this service-learning project had to have structure to complete the project successfully. In addition, they needed to familiarize themselves with the military structures, methods, and policies that being part of the ROTC program entailed. The instructor decided that the problem-based learning used in combination with the service-learning project could not follow traditional PBL methods with the "ill-structured" problem. In this case, the instructor still acted as a "guide-on-the-side," and the students were provided with a framework within which they would operate and choose their service-learning project, although the instructor was more directly involved with mentoring and providing interventions than he would have been under a more traditional PBL model.

Service-Learning Project Design and Learning Outcomes

Service Project Design

Since the military science courses at both universities were representative of traditional ROTC curriculum, service projects were desired that would allow students to develop the core principles of personal development, teamwork, and officership. In addition, to incorporate the Benedictine principle of community (e.g., call for service to the common good and respect for the individual), service projects within the community that housed BenU Mesa were considered ideal by the instructor. Since the student audience for this project consisted of incoming freshman students new to the ROTC program, one intended benefit from the chosen methods of PBL and service learning involved increasing cadet confidence as they successfully solved problems and participated in a successful, large-scale community service project. Another intentional design objective was successful collaboration between diverse groups of students, similar to actual military operations. To simulate real military

experience, students would have to coordinate cadet deployment, movement, responsibilities, and work at a distance, working together to insure project success. As the instructor had direct experience with this type of project management in military operations, he felt confident that the service-learning project would be ideal for helping the students develop the needed skills.

In order to give students ownership over their service-learning experience and yet still develop the core ROTC principles, the instructor constructed project guidelines and constraints but left the choice and implementation of the project to the students. The groups of freshman cadets were split into three sections by the instructor: two larger sections held at ASU and had between 12 and 40 students, five students at BenU, and 50 cadets enrolled in freshman MIS 101.

As dictated by Cadet Command, first semester outcomes focused largely on basic Army values and concepts, while the second semester covered more technical aspects of the Army, such as Army writing styles and the Army Operations Order process (OPORD), a formal plan given to subordinates that divides a military operation into a summary of the situation, the mission of the military unit responsible for the operation, and the supporting activities that the unit will conduct. Each of the two semesters aimed to achieve different outcomes, which allowed the instructor to design two differing service project concepts in addition to making design changes based on reflections from the previous semester. As planned, the success of the first semester's project instilled confidence and experience in the student's ability to plan and work together. These outcomes enabled the second semester project to surpass the first in terms of complexity and autonomy of the student leadership. Both service projects varied in scope, complexity, and desired learning outcomes.

Technology Tool Decisions

According to a recent Pew research poll, the use of social media and technology, in general, has seen stark increases over the past decade (Lenhart, Smith, Anderson, Duggan, & Perrin, 2015), occasioning an opportunity for instructional designers and higher education faculty to integrate technology in their course design, with the aim to encourage collaboration and engagement among learners. The use of digital technologies to transform collaborative learning experiences opens the door for students to learn from each other as well as from their instructor, in a truly social constructivist environment (Rowe, Bozalek, & Frantz, 2013).

One challenge for the instructor, as it related to the ROTC curriculum, was uniting cadet units at two different campuses and providing a structure for them to work collaboratively on one large service project. Because both campuses used different email and learning management platforms, the instructional designer suggested that Google products in combination with a common LMS might be the best fit for creating an open, collaborative structure to provide course materials and organize the project.

BenU and ASU both use separate and unique learning management systems (Desire2Learn and Blackboard, respectively). This made posting information to both classes and collaboration between schools both time-consuming and challenging for the instructor. The instructor solved this challenge by using Edmodo (a third-party free learning management system suggested by the instructional designer) and Google collaboration tools (Google Drive and Google Sites) as systems to coordinate student efforts and post assignments outside of the regular in-class meetings.

Students from both campuses were able to review the semester assignments and quiz study guides for the semester in the shared Google Drive. A file in the shared Google Drive also showed students a breakdown of all available points for the semester and their current grade (available anonymously using Google Sheets).

The majority of student assignments were completed online and submitted to the instructor via Google Forms. In addition to assignments and quizzes, Google Forms were also used to conduct anonymous peer evaluations and after-action reviews (lessons learned). These evaluations helped the instructor to individualize feedback to each cadet regarding their perceived contributions to the class and the overall project.

Fall 2013: Mesa Community Revitalization

A service-learning project designed by the instructor using both PBL and service-learning theories along with objectives of Cadet Command was introduced to the students enrolled in MIS 101 at both universities in the Fall 2013 semester. The students would find, plan, organize, and execute the project by the end of the semester using standard military planning and operations procedures. Through the planning and execution of the project, the ROTC students spent time experiencing fundamentals of the following course objectives:

- Leadership – by working as team supervisors and project managers.
- Personal development – by soliciting self- and peer feedback throughout the process.
- Values and ethics – by researching needs within the community and committing to help.
- Officership – by practicing command and control and decision-making.

At the beginning of the first semester, the majority of the classes were broken up into groups of between four and five students, with one large team of seven. The instructor chose these team sizes because the Army arranges teams of soldiers in similar sizes to maintain an effective span of control. When practical, the instructor tried to replicate the conditions that soldiers generally experience in the Army.

Each group was given the following broad guidance: “As a group, develop a Service Project Proposal Video. Your video will outline your project proposal idea and demonstrate how your proposal successfully meets [at least half of] the course objectives and [all of] the constraints [listed below].”

Teams were provided with four project parameters, which included:

1. The project must benefit more than 100 community members.
2. The project will occur near the Downtown Mesa area [near the BenU campus].
3. The project will occur sometime between December 2 and 10, 2013.
4. The project must include some local leaders (government or organization).

The instructor chose these parameters for various reasons. The first requirement, to benefit 100 community members, was made to ensure that the scope of the project was large enough to necessitate sufficient planning, resourcing, involvement of community leaders, and so that upon successful completion, the cadets would feel a greater sense of accomplishment than if the project had a smaller scope. The second requirement, to hold the project near the BenU campus, was implemented in an effort to ensure that the larger ASU cadet population would be motivated to work with the smaller BenU population who were more familiar with the needs and opportunities in the Mesa area. The instructor was concerned that holding the first project near the ASU campus might marginalize the smaller BenU team. Holding the first project near the BenU campus would make it more likely that the ASU team would involve and include the BenU cadets. The third requirement, to hold the project during the first full week of December, was made to ensure that there would be maximum time for planning and preparation. The final requirement, to involve local community and government leaders, was intended to help the cadets gain confidence working with leaders from outside agencies. Throughout a military officer's career, it is likely that they will be paired with leaders in various government agencies or with peers from other militaries or nations. The instructor felt that this would be a helpful first step to build confidence. A more tangible and underestimated benefit from this requirement was the help that local leaders provided in the form of resources and ideas. These requirements were a very important part of the project framework. All of the requirements chosen, except the date range, did result in a very positive outcome.

Freshman students went out into the community, looked for project opportunities, and then developed proposals that they posted on YouTube for the class to watch. Once the class members reviewed each submission, they selected the best projects. To guide the class in making their decision, the instructor demonstrated how the Army uses the seven-step Military Decision-Making Process (MDMP), and then he developed an exercise for the class to follow the same methodology to select the best plans. The MDMP is used by the military in both active and training operations and is viewed as a problem-solving tool for almost any situation requiring action. Heiselt and Wolverton (2009) and Reese (2019) explains, "The MDMP facilitates interaction among the commander, staff, and subordinate headquarters throughout the operations process. It provides a structure for the staff to work collectively and produce a coordinated plan" (p. iii).

After students from the MIS 101 class researched local concerns and developed proposals, the winning proposals were sent to local community leaders via email to be voted on. Local leaders picked the Mesa Community Revitalization Project, and

the students began work on setting goals and developing a plan as soon as they received the notification emails.

Once the winning proposal was selected, that team was appointed as the management team, and through various other exercises, the class was divided into nine teams each with specific planning and execution responsibilities. Each week project progress, challenges, and plans were discussed and revised.

The ROTC students met with the city council of Mesa, Arizona, as part of the project discovery process. In the Mesa area, a number of low-income neighborhoods were in need of painting, graffiti and trash removal, and basic landscape maintenance. The scope of the project area was defined to seven blocks in a high-need area of Downtown Mesa.

An example of how the students were able to use real Army planning methods to facilitate the project is shown below (Fig. 2). The format of the figure below was adopted from the plan that the instructor actually used to prepare a military transportation company for deployment to Afghanistan. The instructor worked with the management team in pre-class meetings to give them guidance and then watched them brief their plan to the rest of the classes and their subordinate team leaders.

The freshman students met with a city councilman on a regular basis throughout the project for resources and guidance, attended a town hall meeting to raise awareness in the community and recruit local volunteers, held three fundraising events to raise money for supplies, and solicited help from local businesses for donations and

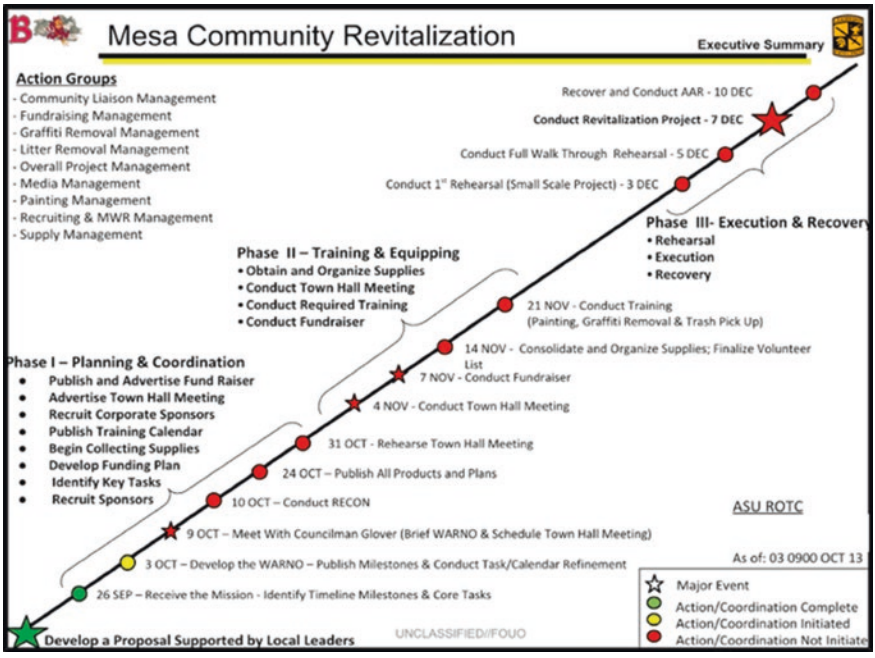

Fig. 2 Mesa Community Revitalization Project planning document

services such as trash removal. They also worked with the city of Mesa volunteer management division to coordinate tools and supplies loaned by the city and to gain guidance on contacting the residents of the target neighborhoods. Just like young lieutenants in the military, these cadets learned by jumping right in. They hit many roadblocks; some groups failed to meet their milestones, but in the end, they came together to make the mission happen. Through solving the problem and completing the service-learning project, the cadets practiced the ROTC core principles of personal development, teamwork, and officership.

On the day of the event, the freshman students managed more than 100 volunteers. They ran a command post (CP), a central base for mission operations. In the military, the CP is the main hub of information and operations to any mission. The CP maintains communication, a flow of information, and control of assets vital to mission completion. Generally, the CP is located in a central location to the mission that is protected yet maintains a line of sight for communication. It is the central nervous system of any operation. In this service-learning scenario, the freshman students used the CP to manage the painting of an entire home, the painting of more than 200 curbs, and the removal of more than 20 truckloads of debris and trash from several homes throughout the community.

In the months leading up to the event, the students also learned how to use various Google collaboration tools and techniques to synchronize the three separate classes. The instructor and teams used both Google products and the Edmodo site to communicate with each other outside of regular class meetings. The individual classes had face-to-face meeting times to communicate with the instructor and each other, but not the other teams. This communication had to be done electronically.

More than achieving the course objectives, this group of civilian freshman students grew into a cohesive military unit. They understood military terms like "leadership, goal setting, time management, values, and officership" to a degree that couldn't quite be reached from only sitting in a classroom. Figures 3 and 4 show the storyboard summaries of each project.

Spring 2014: Operation Smoke the Kids

The Spring 2014 semester mission was to conduct a service project recruiting event that would (1) raise awareness of the ROTC program among high school students and (2) raise awareness and funds for a military affiliated charity. The name of the second project, selected by the cadets, is a nod to the Army's common use of the term "smoke" when referring to exhausting and strenuous workouts. By the time that the second project was beginning, the class had a huge success behind them and an optimistic and eager challenge ahead.

For this second project, the instructor began with a different approach when designing the management scheme. During the first iteration, both the student and faculty were new to each other and to the idea of a service project. By the end of the first term, the instructor had a better idea of which students might be best suited to

Fig. 3 Summary of the Mesa Community Revitalization Project

Fig. 4 Summary of the Operation Smoke the Kids project

act as upper management (like Army commissioned officers). Just prior to the start of the term, the instructor asked his first-choice project manager if they would take on the role and the student agreed. The instructor worked with the new student project manager to build a management team of four people. The size of the man-

agement team was chosen to replicate the instructor's experience in a typical Army unit structured to maximize span of control. This way of structuring teams (as opposed to having a few large teams) also results in more leadership opportunities for students in the class.

Additionally, based on feedback from the previous project, the instructor assigned an upperclassman cadet officer to each team to act as a mentor and to ensure that the upperclassmen in the ROTC program were aware of what the freshman class was planning. The intent with the mentoring element was to increase communication and oversight from the upperclassmen as well as to bring more experienced cadets into the project to demonstrate leadership and collaboration techniques, similar to the instructor's experience when deployed and on military operations. This pairing with a mentor greatly increased oversight and helped to facilitate the project as cadets then had both role models and additional avenues of communicating with the command structure.

Once the management team was set, the instructor outlined their mission and gave them time to organize their thoughts and prepare a presentation to the class. After the management team presented the class mission, the instructor dismissed the majority of the class and asked for anyone interested in a team leadership role to stay behind.

The volunteer team leaders worked with the management team for the remainder of the class period to exchange contact information and to establish a convenient meeting time for the management team and team leaders. These meetings usually occurred a day before class, and it was a very helpful time for preparing the agenda and priorities for the upcoming class.

Another interesting decision that the management team made was to disband the finance team and move their team leader into the management group. The cadets decided to make this change because the finance team had a few significant manpower requirements, but the majority of the time, they only required one person to make the arrangements. Once the finance team leader was added to the management team, they were able easily get support from the team leaders when full class support was required. This decision was of particular interest, because it showed that the cadets were paying attention to the efficiency of their organization and that they identified the need to reorganize and shift resources. This kind of organizational assessment and management is something that Army officers do on a regular basis, but it is not something that the instructor had taught or that he was anticipating. This restructuring was a smart move that improved overall efficiency and demonstrated that service learning can lead to skill development beyond the scope of the main course objectives.

The instructor noticed a big difference in the type of involvement required between semesters. During the first semester, the instructor dealt much more in the plan details and team management. During the second semester, the MIS 102 class was much more autonomous and more capable of identifying and solving problems without needing as much instructor guidance or intervention. During the second project, the instructor would pass observations and concerns to the management team with less direct supervision required.

The final project result was a "Leadership and Warrior Skills Challenge Event." During the planning of the project, the freshman class contacted more than 100 school administrators to invite high school students from across the valley to attend

the competition. They developed competition standards and sent training videos to participating students in order to prepare them for the challenge. In addition to high school students and VIPs from the Veterans Center, students also coordinated for the Maricopa County Attorney Bill Montgomery to speak and officiate the competition.

The purpose of this service-learning project was to demonstrate and exercise the fundamentals of leadership and teamwork as the cadets collaborated, planned, and executed a project that was a great win for the Army, the Arizona State University, the Pat Tillman Veterans Center, and the dozens of high school students that learned about each of those organizations.

The freshman class organized into 14 teams and managed several planning sessions to ensure mission success. Each team made contributions to the overall success of the project. Through the class' hard work and the generosity of local companies and leaders, the majority of food and water was donated to the cause. Chick-fil-A, in particular, donated more than 100 meals at no cost. The class also invited Fox 10 news to provide live coverage during the competition.

Throughout the semester, cadets developed an Army Operations Order (OPORD) totaling more than 100 pages with all included maps and diagrams. Each team was responsible for a particular Annex or Appendix. The teams briefed the instructor on their progress during four separate In-Progress Review (IPRs) and finished by conducting a Concept of Operations (CONOP) brief, a common military procedure used to synchronize several military units prior to large and complex operations, prior to the event.

Not only did the cadets exceed the curriculum requirements, but they also introduced dozens of high school students to ROTC while raising more than $4800 and awareness for a local military charity. On the day of the event after the competition was complete, the cadet project manager publicly handed a check for more than $4800 to the director of the Pat Tillman Veterans Center on behalf of the students of the Sun Devil Battalion.

Project Feasibility and Over-/Underestimating Capabilities

A critical concern and consideration from the beginning of either project was the ultimate feasibility of completing the project on time and in a satisfactory manner. The instructor and students were trying something new inspired by the principles of problem-based learning and service learning. There was no guarantee that the project would be successful, but even if the class didn't achieve all of its goals, there would have been many lessons learned along the way.

In an attempt to mitigate the possibility that students might over- or underestimate their capabilities, the instructor asked questions of feasibility often or when plans seemed vague or not fully thought-out and made interventions when necessary.

An example intervention was implemented during the first project with the "litter removal team." The initial plan was for the students to send out a flyer stating that the group would be conducting free, junk, and debris removal for any homeowners

that requested it. There were more than 300 homes in our project area. While the group had planned for a lot of volunteer labor, there were not many vehicles (trucks or trailers) available for debris removal, and the instructor wanted to avoid the risk and control challenges that would occur with such a large vehicular operation. The management team was advised to consider focusing all of their effort on a few large debris removal projects as opposed to many smaller projects at dozens of residences. By working with the contacts at the city of Mesa, the students were able to select a few high-need resident homes on which the group could focus.

An example of underestimating the outcomes the students could reach that almost occurred took place during the second project. When the instructor learned that the management team planned to raise $4200 for the Pat Tillman Veterans Center, he was initially concerned. Raising $4200 in 3 months seemed to be a high goal. The finance manager and management team were familiar with the technique that they planned to use, and they were confident in their abilities. The instructor told them to aim for $4200 but to make sure that the Pat Tillman Veterans Center understood that the money was not guaranteed. The instructor was concerned that the students would fall short of their ultimate goal, but everyone was pleasantly surprised when the students raised $4800 coming in $600 over the goal.

Span of Control

Another challenge during the first project that benefited from faculty intervention was a personnel conflict within the "supply team." After a few weeks into the project, one of the student team leaders came to the instructor with frustrations about their group. The complaint was that "no one on his team was doing anything." When the instructor spoke with the team members, their consensus was that their team leader did everything and didn't trust them with anything important. Over the course of the next few weeks, the instructor worked with that manager and his team to try and make them more functional. While part of the problem within that team was personality driven, the instructor felt that the problems were exacerbated by the size of the team. When the team was established, it was initially assigned seven members (the most of any team). This decision was made because their mission was expected to require more cadets that the other teams. Three years of experience conducting these service-learning projects has taught the instructor that teams are most functional at sizes of between two to four.

In the later projects, the students were introduced to the concept of span and control as a consideration when building teams. Below is how the Army defines span and control in Field Manual 6–0:

> Span of control refers to the number of subordinate units under a single commander. This number depends on the situation and may vary. As a rule, commanders can effectively command two to six subordinate units. Allocating subordinate commanders to more units gives them greater flexibility and increases options and combinations. However, increasing the number of subordinate units increases the number of decisions commanders have to make. This slows down the reaction time among decision makers. (Department of the Army, 2014).

Initially, the instructor did not give much thought to span of control, but as the projects grew in complexity, it turned out to be a significant consideration in project planning. When setting the teams, if the instructor noticed five or more people in a group, he would question if it was necessary. For example, during initial planning, if a task seemed like it required an eight-member team to complete, the instructor would ask for students to think of a way to break the task down into two sub-tasks and then form two teams each with a leader. This reduced span of control not only helps each leader better control their teams, but it also opens up another leadership position within the class. Whenever able, maximizing the number of leaders adds to the ability of the students to learn and demonstrate leadership skills in support of the course learning objectives.

Outcomes

Fall 2013 Mesa Community Service Project

The desired learning outcomes of the first project included exposing students to leadership opportunities and familiarizing them with the Army values through community service and partnership with community organizations. The class was able to partner with the city of Mesa and many other organizations to help achieve this objective. These partnerships provided students with logistics and training support. The city of Mesa, in particular, has a volunteer management office that supplied the class with tools, training, and access to a town meeting to recruit community volunteers. Initially the instructor encouraged student partnership with local leaders with the idea of exposing students to civil leadership, but the partnership turned out to be an extremely helpful and fruitful venture for both the city of Mesa and the ROTC students.

Spring 2014 Operation Smoke the Kids

The desired learning outcomes for the second project were more focused on military planning, communication, and small group leadership as directed by Cadet Command. During the first project, the instructor was much more engaged assisting in the planning and resourcing of the project. During the second project, students were much more independent and were able to solve many more problems on their own. The instructor noticed a shift in the type of input that they provided had changed from a more hands-on coaching role into more of a mentorship role. This shift is reminiscent of a shift that often happens for new leaders in the military. As superior officers feel more confident in their subordinate leaders' capabilities, their leadership style tends to evolve from a coaching style to a style that is closer to mentorship.

Service-Learning Project Revision

Reflections on the Project

1. *Project Timing* – This was an oversight during the first project. When the instructor initially gave a timeline for the project, he scheduled it for the week between students last class and their final exams. This was particularly bad timing for first-term freshman students. Many students complained that they had major project responsibilities during the week that they should be studying for their first ever college finals. This also led to the instructor being required to clean and turn in all of the supplies back to the city. Once the instructor learned how disruptive it was for students to help during finals week, he worked hard to ensure that after the project, no students had anything left to take care of. In subsequent projects, the instructor scheduled the project with sufficient time to be fully completed before the last class of the semester, so that class could be spent reviewing the lessons learned and beginning initial plans for the following semester.
2. *Assign Upperclassman Mentors* – During the first project the instructor did not assign any mentors and he acted as lead mentor for all groups. Student feedback from the after-action review of the first project was clear: they felt lost and unsure of what to do and where to go at many times. The project was successful, but during a student's first semester in ROTC and oftentimes first exposure to leadership roles, it turned out to be very helpful to have mentorship assistance. During the second semester, the instructor assigned a senior cadet to each team. The senior was meant to help provide ideas and resources to the underclassmen cadets. With each team having a mentor, it greatly increased the instructor's flexibility and increased the capabilities and knowledge of the teams and was a valuable experience for the seniors offering to help.
3. *Small Team Sizes* – A design conclusion reached by the instructor for these types of service-learning projects is to use smaller, more structured teams. Whenever possible, the more teams, the better. Particularly, if you have enough upperclassman mentors to give every team one, the opportunity for mentorship increases. As was seen in the second semester project, the more team leaders that you have, the more leadership opportunities that exist. The ultimate goal of both projects was to produce leaders, which was more effectively done when there was a leadership role model in the form of the upperclassman in the group. Additionally, establishing a "chain of command" is fundamental to how the military works and is fundamental to these types of service projects with widespread groups of students. Practicing command and control in a controlled environment where failure is an acceptable method of learning is invaluable. The more levels of leadership and opportunities to lead that you can produce, the better. Finally, span of control is an important factor for new leaders in the ROTC programs. Setting the tasks and managing more than four people at time can be overwhelming for a new leader. Bringing in more experienced leaders, such as the upperclassmen, was a great solution to both keep the freshman students from becoming overwhelmed and to provide examples of leadership techniques.

Future of ROTC and Instructional Design

The combination of the ROTC/instructional design collaboration, the strong organization using Google products by the instructor, and the unique element of a service-learning project completed across multiple universities should make it an interesting design case for both faculty and instructional designers. The potential for research on the scholarship of teaching and learning with this design case and framework is immense.

There are many similarities between the logistics and planning strategies seen in the military and the process with which an instructional designer approaches a design project. From this collaboration in planning, organization, and execution of a service-learning experience that relied heavily on Cloud technology, the instructional designer learned many techniques that could be applied to her own organizational setting. The ideas of considering *span of control* or of completing *after-action reports* are not concepts instructional designers generally find in service-learning literature. However, controlling group size and creating opportunities for reflective practice are often built into learning experiences by instructional designers on a regular basis. Opening up a collaborative opportunity between an instructional designer and an ROTC instructor broadened both of our vocabulary and our design practice by the exchange of techniques and ideas.

Through the design and completion of this project, both instructor and instructional designer concluded that service learning is a valuable and effective method in increasing involvement within a community and in developing leadership and teamwork skills. The use of technology was critical to the success of these projects, and the instructional designer continues to use the artifacts built by the ROTC instructor as models of collaboration and coordination of service-learning projects and problem-based learning activities.

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