

## **Shaping Experiential Research for Veteran Education (SERVE), A Multi-University Summer Research Exchange Program for Veterans**

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## **Abstract**

Shaping Experiential Research for Veteran Education (SERVE), is a multi-university research experience program for undergraduate student veterans. This work in progress paper details the program development, assessment, and program challenges through the first two years. The overall goal of SERVE is to provide unique experiences for veterans to motivate them to continue to graduate school or pursue a career in Naval STEM research. A mentor program was implemented to provide research faculty mentors, Navy engineering mentors and an expanded mentor network to support the student veterans. The program is well received at both universities and has demonstrated a positive impact on the undergraduate student veterans. Several program challenges are presented along with methods used to overcome those challenges to provide a better experience for both the veteran students and faculty mentors.

## **Introduction**

This paper discusses the development and execution of a multi-year veteran research exchange program between the University of Tennessee and the University of North Carolina at Charlotte that is currently in its third year. Shaping Experiential Research for Veteran Education (SERVE) program is a partnership between the University of Tennessee (UTK) and the University of North Carolina at Charlotte (UNCC) that provides US military veterans an opportunity to receive undergraduate research experience in a science, technology, engineering, and math (STEM) field at a partner university. The University of Tennessee is also referred to as the lead university.

The University of Tennessee is a large public land-grant research university which is also known as the flagship campus of the system. The University of Tennessee has over 33,805 students, ~4,000 of which are considered non-traditional or adult students [1]. As of Fall 2019, the University of Tennessee has over 910 military affiliated students (veteran, active, reserve and family member) enrolled utilizing veterans' benefits. The University of North Carolina at Charlotte is a large urban public research institution with over 30,488 students, 7,500 of which are considered non-traditional or adult students [2]. During the 2019 veteran service needs assessment, it was determined that the university had seen a 21.5% growth in military enrollments between 2013 and 2019 [3]. This growth has resulted in over 1180 military affiliated students enrolled in Fall 2021 utilizing veteran benefits [4]. Both universities have active Veteran Service Offices/ Success Centers and provide a large suite of veteran programs.

It has been shown that students who participate in undergraduate research experiences (URE) are more likely to attend graduate school [5] and that participation gives the student a deeper understanding of the topic, confidence in their research skills and confirmation of their chosen STEM career [6]. These experiences also expand the participants academic credentials, establish relationship with professionals as well as expand critical thinking and problem-solving skills [7, 8]. Beyond UREs, it has been suggested by the Boyer Commission that every undergraduate student should be provided a mentor and research opportunity as early as their first year [9].

SERVE was established to provide U.S. military veterans initially with an opportunity to receive undergraduate research experience, and later, scholarships to assist them in pursuing a graduate degree in a STEM (science, technology, engineering, and math) field, while also providing a way for them to continue serving our country. The SERVE program is differentiated from other URE programs by the fact that the veteran participants are offered the opportunity to travel to a partner university to conduct their research, in a lab that they would not normally have access to.

Through SERVE, veterans explore research vital to national security while building off the leadership skills they gained in the military, preparing them for a career in the research and development (R&D) workforce or defense industry. SERVE has three major goals: 1) increase enrollment and retention of veteran students in STEM degree paths, 2) heighten the interest of veteran students through engaging research opportunities relevant to the Navy and Department of Defense (DOD), and 3) increase the number of veteran graduates interested in Navy science and technology employment. To reach these goals, and providing additional transition support to student Veterans, SERVE also implemented a variety of social events and mentoring programs. The combination of defense relevant research projects and veteran support infrastructure was designed to provide participating veterans with the motivation and knowledge needed to consider either graduate school at one of the participating universities, or the option of returning to service as a civilian in the DoD STEM research workforce. Faculty members are able to leverage SERVE to further their DoD funded research by using veteran students, who can support their various programs and bring their military experience. The prior military experience and maturity is often celebrated by faculty [10].

### **Program Development**

The SERVE Research Experience for Undergraduate (REU) students' program was initiated as a summer program where veteran students from the two program universities spent ten weeks at the opposite university paired with faculty research mentors. The students were also assigned a project co-mentor from the Naval Research Lab (NRL) who provided additional guidance on the topic and its direct naval applications. The projects were chosen to provide hands-on STEM research experiences in defense relevant research areas and to teach the participants about career opportunities in the Naval civilian research enterprise, as well as other research career paths within the defense industry. In addition to gaining hands-on research experience and mentoring, the students received training from each university's Office of Undergraduate Research in topics related to the nature of research, the ethics of researchers, and the mechanics of writing and publishing research.

Initially the program also included travel for both the student veterans and their faculty mentors to the Naval Research Laboratory in Washington D.C., to meet their NRL mentors in person, and to present on their summer research. COVID-19 prevented these trips during the first two years of the program.

The program was administered by a team of university leadership, faculty, and graduate students. The team included two military family members, three veteran faculty mentors and four veteran graduate students. The program evaluation was conducted by National Institute for STEM Evaluation and Research (NISER).

Challenges and shortcomings were addressed and used to update the program prior to year two and then again prior to the start of year 3. COVID-19 added additional challenges with

scheduling, travel, veteran student recruiting and faculty participation, all of which are discussed in the results section.

### *Research Topics*

Project requests were sent out to faculty with known DOD funded projects across the STEM disciplines. Those faculty and labs that were interested in participating submitted project descriptions, which were then advertised during the student recruiting events. The first-year projects included:

- a. Synthesis and characterization of novel high entropy oxides
- b. Engineering superconductivity on semiconductors device platforms \*3
- c. Experimental Hypersonic Wind Tunnel Flow Quality\*3
- d. Carbon Fiber composites and sandwich structures in harsh marine environments\*2
- e. Collaborative Marine Robot Autonomy
- f. Turbulence and transition modeling for hypersonic vehicles at flight conditions
- g. Microbial interactions at the ocean surface

The second -year projects included:

- a. Fibers and Composites Manufacturing
- b. Human Physiology Modeling with Biogears of Hyper- and Hypo-Baric Environments \*2

### *Mentoring*

This program has three different levels and types of mentoring for student participants. The first level is the faculty mentor who supervises the lab and the research conducted in the lab. The second level is from the NRL co-mentor who provided project guidance and highlighted its direct naval applications. The NRL co-mentor was in contact with the faculty mentor and student veteran between one to three times during the duration of the experience.

The third level of mentorship was a “mentoring network” which was developed to promulgate through the entire program to increase graduation rates, improve research experiences and outcomes, and develop better leaders with lifelong mentors. Research has shown that rather than trying to identify one person that can fulfill the multiple roles of a mentor, "it is important to include a variety of individuals in a support network” [11]. The veteran students are both mentors of junior veteran students and mentees of senior veteran students, graduate students, and faculty. The designed network consists of (1) veteran faculty members who mentor veteran graduate and undergraduate students, (2) existing “university experienced” veteran graduate students who mentor newly enrolled veteran graduate students, and (3) veteran graduate students and undergraduate upperclassmen mentor underclassmen.

### *Social Activities*

Research has shown that veteran students often have difficulty in connecting with other students and are typically only comfortable with other veterans [12]. These difficulties expand into struggles in communicating with non-veteran peers and developing trust [13]. To build a strong community and provide long term benefits to participants, a robust social program was developed at both universities. These events were planned to bring visiting veterans into the host

university veteran’s groups and provide support during the program. Example events included group meetings and outings with veteran and university leadership and outdoor activities (whitewater rafting, hiking, running). The graduate research assistant at each university was responsible for scheduling and promoting the events with the visiting veterans, as well as host university veteran organizations.

### Scholarships

To promote graduate school to REU participants, scholarships were set aside each year for those student veterans who applied for graduate school. As the number of REU exchanges were decreased, the number of scholarships increased.

### Methods

The evaluation of the program was a mixed methods assessment that was focused to provide information to the program leadership to make continuous improvements to the program. The evaluation included multiple types of data, such as surveys and interviews with student veteran participants, graduate student mentors, faculty mentors and program directors. The veteran student participants were interviewed, and surveys were conducted at pre-, mid- and post experience intervals. A comparison of the pre- and post-survey results provided information on the degree of which the research knowledge was increased in courses (or experiences) [14]. To compare the resources available at both universities, program documentation collected was assessed from publicly available websites, discussions with graduate student research assistants and program leadership. Focus group interviews were held at the end of the summer.

The surveys consisted of questions on how SERVE impacted their research skills and their understanding of ethics. All questions were based on a five-level Likert scale from 1 (Very Poor) to 5 (Very Good). All the collected data was averaged over the number of participants and presented in the annual assessment report.

The participant population at the end of year consists of 15 undergraduate student veterans, seven faculty members who served as project mentors and six program staff, including three graduate student assistants. Out of the 15 undergraduate students, 13 were male student veterans and 12 of the student participants identified as Caucasian. The sample included two Asian American/ Pacific Islanders and one Hispanic American student veteran. The veteran student population represented the Army, Navy, Airforce, and Marines as seen in Figure 1. Participant information for both years can be seen in Table 1.

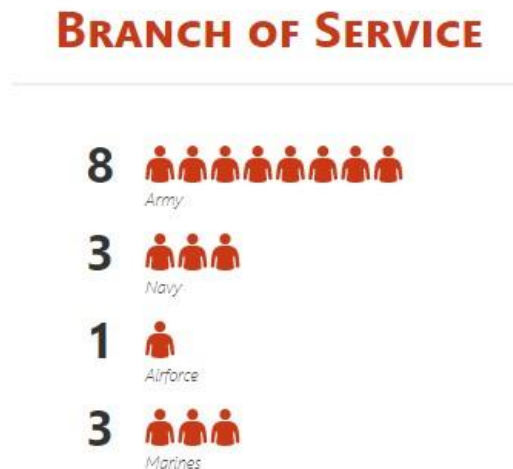


Figure 1: Branch of Service for Participating Veterans

*Table 1: Participant Demographics*

**Student Participants Year 1**

Student	Branch of Service	Major	University	Gender	Race	Exchange or Home
1	Army	Mechanical Engineering	1	M	Caucasian	Exchange
2	Army	Aerospace Engineering	1	F	Caucasian	Exchange
3	Army	Computer Science	1	M	Caucasian	Exchange
4	Marine Corp	Fire Safety Technology	2	M	Hispanic	Exchange
5	Army	Electrical Engineering and Physics	2	M	Caucasian	Exchange
6	Army	Computer Engineering	2	M	Caucasian	Exchange
7	Air Force	Electrical Engineering	1	M	Caucasian	Home
8	Navy	Physics	1	M	Caucasian	Home
9	Navy	Mechanical Engineering	1	M	Caucasian	Home
10	Army	Microbiology	1	F	Caucasian	Home
11	Marine Corp	Chemistry	1	M	Caucasian	Home
12	Navy	Electrical Engineering	2	M	Pacific Islander	Home

**Student Participants Year 2**

Student	Branch of Service	Major	University	Gender	Race	Exchange or Home
1	Army	Neuroscience	1	M	Caucasian	Exchange
2	Marine Corp	Electrical Engineering	2	M	Asian	Exchange
3	Army	Mechanical Engineering	2	M	Caucasian	Home

Two faculty member mentors were female and six were male. Six out of the eight faculty members mentors were Caucasian, one was Asian, and one was Pacific Islander. The program staff includes four male university administrators or faculty, and five graduate students. The administrators/faculty were all males, two of whom identify as Caucasian, one as African American, and one as Pacific Islander. The graduate students include one African American female and four males, three of whom identify as Caucasian, and one as Pacific Islander.

All interviews lasted approximately 30-60 minutes and were carried out via Zoom meetings. All interviews and surveys were conducted, transcribed, and evaluated by NISER, and a report of the findings provided to the leadership team.

**Results**

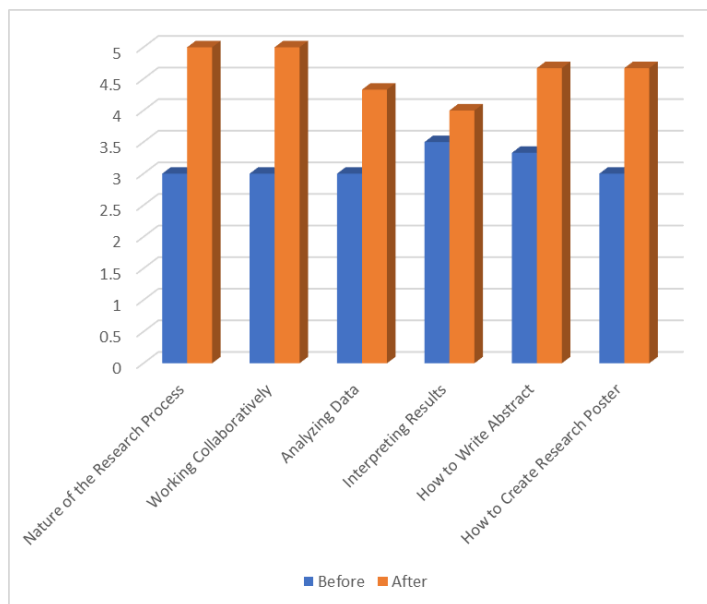
During the summer of 2021, three veteran students from the University of Tennessee and three veteran students from the University of North Carolina at Charlotte participated in the SERVE REU exchange. The partnering universities REU offices provided experiences for an additional six veterans at their home universities. In 2022, one veteran student from each university

participated in the exchange program and one additional student conducted a home university research experience.

### *Other results and statements.*

Overall, the students had a positive learning experience throughout the program and built new mentorship networks. 100% of the participants stated that they would recommend SERVE to other veterans and seven of nine traveling students indicated that they were satisfied or very satisfied with the overall experience. All the participants believed that the experience provided growth in their research skills and helped refine their long-term goals.

One of the largest positive outcomes from year 1 was that after the research experience, 43% of the students believed that they would continue to graduate school, and 43% would choose to pursue a career in the DOD ecosystem as a contractor or at a research lab. 71% stated that they planned to go to graduate school at some time in the future. Year 2 assessment showed that 33%



**Figure 2: Impact on Veteran Research Skills Before and After SERVE**

expressed an interest in continuing to graduate school immediately, and none of the participants considered working for the DOD. All three participants did state that they planned to eventually return to graduate school to pursue a Doctoral degree.

All the students agreed that SERVE was instrumental in building their networking opportunities and that the program set them apart from their peers.

Results from the pre- and post-surveys, showed a marked increase in understanding and knowledge at the end of the research experiences. Figure 2 shows results from six of the questions over the two years combined.

### *Program Challenges*

Even with the many successes and positive feedback from participants and faculty, there were also several challenges. The success of the first year recruiting efforts was not shared with the second year. The universities REU offices had different schedules for recruiting and placing students which lead the program to follow the recruiting timeline of the lead university. This decision resulted in a lack of non-travel opportunities for the second university since their program was already full before the first recruiting event took place.

As other research has described, student veterans, like many non-traditional students, are older adults with real-life responsibilities [15] and, moreover, are often challenged by physical and/or invisible disabilities [13]. This was obvious during the first year of recruiting, with approximately 40% of those who attended information sessions not completing an application after being informed that the exchange program had priority, with home university experiences

being limited. The second-year effort had the same percentage withdrawing applications because they weren't guaranteed home university research experiences. The team continues to work to provide additional home university experiences along side the exchange program.

Additionally, National Guard and Reserve members applying to the program had additional challenges. During the first year, a letter from the program administration allowed one Army National Guard member to participate in the program, with limited absence for "drills", while a Navy Reservist was required to be absent for over half of the program, resulting in non-selection to the program.

Other challenges resulted from different administrative requirements and procedures for each university, which affected the way the participants were compensated, communications and levels of support. This resulted in one participant not receiving compensation for the entire event due to an outstanding tuition bill. Communications after recruitment processes were handed over the graduate research assistants and the faculty mentors, which lead to different levels of communication and research experience. Lastly, the University of North Carolina at Charlotte had a well-developed social program for veteran students in engineering, which the partner university was unable to be quickly replicate; this resulted in more events at UNCC during both year one and year two.

## **Discussions and Implications**

Through the first two years, several recommendations were made by the assessment team to improve the program. There were frustrations during the first year with respect to logistical challenges, communications, finances and different expectations and procedures for each university. To overcome some of these frustrations, students suggested inviting prior participants to act as resources and additional social support during the events. Additionally, students requested the management host pre-summer meetings to introduce faculty mentors and the students before the travel occurred to facilitate earlier communication and better understanding of the individual lab expectations. Most logistical issues, to include pay scheduling were improved for year two.

### *Changes to the program following assessment*

At the end of year two, three major changes were made to the SERVE program at the lead university.

- 1) Remove graduate student scholarships;
- 2) Add in semester research experiences at the lead university; and
- 3) Change project selection process.

During year one it was challenging to find veterans who would accept scholarships set aside for rising graduate students. It was determined that all the veterans who were accepted to graduate school already had full research or teaching assistantships and could not accept an additional scholarship. This funding was reallocated to sponsor more research experiences.

The largest change to the program was adding research experiences during the semester. Two factors drove this change. The first was the reallocated funding due to lack of scholarships, and the other was a lower-than-expected number of veterans wishing to travel as part of their



experience. For Fall 2023, this led to starting seven in semester research experiences and ten experiences in Spring 2023 (seven continuations from Fall 2023). The assessment from these in semester experiences was not available at the time of this publication.

The final adjustment was a fundamental change in the project and veteran student selection process. As originally described, the program drew projects from faculty with DOD funding and then placed veteran applicant students on those projects. This led to a mismatch of skills based on student applicants and often lead to frustrations for the faculty mentor and the student. At the end of year 2 and at the beginning of in-semester research experiences, the selection process was reversed. Moving into Fall 22, recruiting events focused on veteran knowledge and research area interests, which should give the individuals more ownership and a better experience [8]. Once those interests were identified, the program administration team approached faculty who were focused in those areas, whether they had DOD funding or not. The process took significantly longer to implement than the original process and the first student veteran began their research experience in November 2022, while the majority of those recruited did not start until Spring 23. The new process also led to difficulties in pairing NRL mentors on projects. The assessment results of this change will be reviewed in the year 3 assessment report.

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