BATTLE 2018: Preparation of Future Cyber Technologists

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Abstract – This research presents Battle, an effort by the Bowie State University Department of Technology and Security to develop and implement a program to assist average students in enhancing their academic and social credentials. In addition to technical skills a heavy emphasis was placed on further development of soft skills. They learned how to navigate corporate cultures and environments. The fifteen students recruited were sophomores, juniors, and seniors. Another facet was further development of communication skills and technical documentation. Over the 5 week period, the technical and social growth was very evident. Interns have gained a higher level of technical maturity.

Keywords: internship, operating systems, network administration, server hardening, workforce development

1 Introduction

BATTLE is an acronym for The Bowie Applied Technology Training Laboratory Exercise. BATTLE is an effort by the Bowie State University Department of Technology and Security (DTS) to develop and implement a program to assist students in enhancing their academic and social credentials. The fifteen students recruited were sophomores, juniors, and seniors. The program was a great success. Four students (25%) did not finish the program because they were hired by government agencies and commercial organizations. This paper covers the overall vision, the tasks before and after the project change, and results of the project.

2 Project Vision

There has been an abundance of programs for students whose credentials indicate that they are high achievers. Under the standard normal curve they would be the “A” and “B” students. Yet the vast majority of our students do not fall into those categories. Instead they are to the right of “B” students under the curve. DTS sought to develop a program that would focus on students in the 2.0-3.0 GPA range. We believed that there were gems there waiting to be mined/discovered. Our contention was that given the appropriate exposure these students would excel [2][3].

The use of the concepts and methods learned in CTEC courses, from 1st through 3rd year, with a few enhancements, and added communication (both oral and written) and other soft skills to the mixture and we have a well-rounded recipe to apply to real world problems [4].

3 Project Components

The initial idea was to recruit a group of interns to remove legacy hardware, and install and configure new hardware and software for two labs/sandboxes. Network drops in the rooms needed to be tested due to the failure of a number of them from sustained wear and tear. This changed due to reasons in Evolution of the Project.

3.1 Personnel

Two faculty served as project lead and assistant.

3.2 Staff Roles

The project lead’s duties were to develop project tasks and assist/direct students in completing/implementing those tasks. Another faculty member was assigned as an assistant to add structure from a documentation perspective. In addition to documenting the task development, several papers were required.

3.3 Interns

A group of interns was recruited to remove legacy hardware, and install and configure new hardware and software for the two sandboxes. The number of interns ranged from a high of 15 to 11 at the end of the project.

The interns were divided into 5 groups. Each group selected a leader. Leaders were briefed on the duties and responsibilities of their position. They were accountable for maintaining adherence to timelines, due dates, and above all, content. Group leaders were provided with 6 hard drives.

The project duration was 5 weeks with a 4 day week (Mon-Thu). Thursday afternoons were devoted to group presentations led by the group leaders followed by a question and answer session. The presentations on the last week were
formal presentations where students were dressed as professionals.

3.4 Project Tasks

The initial tasks as shown in Table 1 included: (a) Create a communication link separate from the campus network, (b) procure new hardware for lab upgrade in 2 classroom labs/sandboxes, (c) receive new hardware from university shipping and receiving and storage until deployment (d) removal of old hardware, (e) position new hardware in labs, (f) configure hardware, (g) prepare bootable DVDs and USB drives to test functionality of new hardware and network drops, and h) install software to test hardware

3.5 Stumbling Block

Prior to the start of the project, the faculty was informed that the hardware would not be available for the start of BATTLE. The equipment would arrive a week after the planned start date. The date was delayed a week, but the equipment was not on site.

3.6 Evolution of the Project

Since the delivery of the new hardware was delayed. The project focus was changed to use old hardware which left a lot to be desired. The Project Lead made the decision to start with the old hardware. This meant a major shift in mindset. It demonstrated the professional and technical agility of the faculty. See Table 1 below.

Table 1. Tasks before and after project change

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Initial Project Vision</th>
<th>Final Project Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create connection separate from campus network</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Freedom to test and develop in sandboxes without putting the campus net at risk</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Network Functionality</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>See Remove Old hardware</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Procure new hardware</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Procure hardware for lab upgrade in 2 classroom labs/sandboxes</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Receive new hardware</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Acceptance from university shipping and receiving and storage</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

until deployment

Remove old hardware Test network functionality prior to removable of each workstation

X

Put new hardware in place Set hardware components in place

X

Configure hardware Make changes to hardware configuration as needed

X

Install software to test hardware Prepare bootable DVDs and USB drives to test functionality of new hardware and network drops

X

Workstation functionality

X

4 Final Project

4.1 New Project Vision

Tasks a-e in Project Tasks above were discarded since there was no new equipment. Tasks f-h were done along with additional research and hands-on projects.

4.2 Workstation Standalone Functionality

The first task was an inventory and determination of the functionality of each workstation in the lab to determine which could be recycled. Others were trashed or used for parts.

4.3 Network Functionality

The network drops were identified both physically and logically to determine network connectivity. After which Department of Information Technology (DIT) came in to repair the network drops. After testing and taking inventory, the groups were ready to start the first assignment.

4.4 BATTLE Folder on Google Drive

The Project assistant chose Google Drive as the medium to create the BATTLE folder. Each participant (faculty and intern) was provided access to the folder. The folder was renamed BATTLE2018 to reflect the timeframe.
The BATTLE folder contains all the documents created during the program. Documents were daily reports, weekly reports, final paper Powerpoint presentations, assignments and articles of topics of interest for interns.

4.5 Final Paper and Reports

“Document as you go” was the defacto slogan of the program. Each group prepared a detailed report of each day’s activities to document progress. These reports were summarized to develop weekly reports. Daily reports and weekly reports were used as input to the final group paper.

4.5.1 Daily Reports

The daily reports documented the daily activities of each group. These activities included strategies for research, step by step installs, group discussions, and direction from faculty. Each day started with a discussion of the assignment for the day. The Group leaders led the discussion to determine the tasks which would achieve the objective for the day. In case work for the previous day was not completed attempts were made to integrate it with the current day assignment.

4.5.2 Weekly Reports

Weekly reports were done outside the normal hours of the program. Activities were summarized. These reports were used as inputs to the final paper.

4.5.3 Final Report/Paper

This paper summarized the weekly reports which described the technical tasks accomplished. Selected sections of weekly reports were included as needed. Other parts of the paper covered the groups impressions of their accomplishments, i.e., technical, social, communication. The paper was a formal bound document suitable for display and use of subsequent BATTLE interns. Each member of a group received a copy to be used as a credential in a portfolio for interview purposes [1].

4.6 Powerpoint Presentations

For weeks 1-4 each week on Thursday afternoon the weekly report was presented to the group as a Powerpoint presentation. The final presentation was done on Thursday of week 5. Interns were dressed as professionals. The audience was Dean of College of Arts and Sciences, Department Chair, faculty leads, other interns and other guests.

4.7 Research and Hands-on Assignments

All assignments for weeks 1-5 required research and were designed to provide students with problems that professionals encounter on a regular basis and a number of which rarely occur. Tasks were provided daily [6].

Assignment 1
Research, install and document a Windows Server 2016 lifecycle. From Project design, document a migration plan, a training plan, and a support and maintenance plan.

Assignment 2
Perform an unattended Windows 10 installation. Use Hyper-V to create a VM to install a read-only domain controller. Setup active directory domain services and global groups and universal groups. Setup organizational units.

Assignment 3
Further understand Group Design and Policy; Integrate entities such as Internet Information Services, Integrated Firewall, Group Policy Management Console, etc. How to protect the network from unauthorized access. Setup a Windows Server 2012 cluster.

Assignment 4
Week 4 dealt with protecting the organization’s information data assets, eg., hardware and software (network, OS, and application). Concepts such as fault tolerant servers, failover clusters (backup, restore, and load balancing) were implemented.

Assignment 5
This was the final week. It required the groups to create a private cloud with connected servers, used as a data store, a link from which to launch user desktop productivity applications, e.g., word processing, music, mail, calendar, contacts.

5 Soft Skills

Soft skills such as good work ethic, problem solving, time management, communication skills, and teamwork ability are all skills that are in demand by employers. When it comes to succeeding in the workplace, a college degree isn’t necessarily enough. Nor are years of experience on the job. These skills are intangible but important qualities which enable one to work and interact with their co-workers.

There were round table discussions each week. Week 1 covered time management. Week 2 covered work ethic. Week 3 dealt with appropriate dress for success mixed with a discussion on inappropriate sexual conduct, Week 4 covered personal financial management. Students in the CTEC major upon graduation are typically hired for jobs which normally pay more than they are accustomed. The faculty thought that it was important to touch on this for the benefit of the interns [5].

6 Research Results/Outcome

The program ended on the afternoon of Thursday of week 5 with the delivery of a presentation and formal papers from each group. The presentations were led by the group leaders.
with each member participating. There were copies of the formal bound papers for each member and the faculty.

During the 5 weeks the interns completed 5 projects which covered the following areas:

- Network (Hardware and software firewall and antivirus),
- Operating system Installation (Windows Clients, Servers and Linux),
- Windows and Linux hardening (involves identifying and remediating security vulnerabilities),
- Active Directory security measures, and
- Virtual Computing (Configure antivirus, Firewall, and intrusion detection software within virtual machines as appropriate based on the virtual machine role).

Table 2 shows the GPAs and increase/decrease of each of the interns except the four that were hired before the end of the program.

Table 2. GPAs and Increase/Decrease

<table>
<thead>
<tr>
<th>Student #</th>
<th>Spring 2018 GPA</th>
<th>Fall 2018 GPA</th>
<th>+/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>3.359</td>
<td>3.454</td>
<td>+0.095</td>
</tr>
<tr>
<td>Student 2</td>
<td>3.144</td>
<td>3.179</td>
<td>+0.035</td>
</tr>
<tr>
<td>Student 3</td>
<td>3.237</td>
<td>3.321</td>
<td>+0.084</td>
</tr>
<tr>
<td>Student 4</td>
<td>3.480</td>
<td>3.483</td>
<td>+0.003</td>
</tr>
<tr>
<td>Student 5</td>
<td>3.347</td>
<td>3.262</td>
<td>-0.085</td>
</tr>
<tr>
<td>Student 6</td>
<td>3.231</td>
<td>3.238</td>
<td>+0.007</td>
</tr>
<tr>
<td>Student 7</td>
<td>2.872</td>
<td>2.759</td>
<td>-0.113</td>
</tr>
<tr>
<td>Student 8</td>
<td>Unavailable</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>Student 9</td>
<td>3.582</td>
<td>3.634</td>
<td>+0.052</td>
</tr>
<tr>
<td>Student 10</td>
<td>Unavailable</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>Student 11</td>
<td>2.935</td>
<td>2.878</td>
<td>-0.057</td>
</tr>
<tr>
<td>Student 12</td>
<td>2.944</td>
<td>3.102</td>
<td>+0.076</td>
</tr>
<tr>
<td>Student 13</td>
<td>3.063</td>
<td>3.016</td>
<td>-0.047</td>
</tr>
<tr>
<td>Student 14</td>
<td>Unavailable</td>
<td>Unavailable</td>
<td></td>
</tr>
<tr>
<td>Student 15</td>
<td>Unavailable</td>
<td>Unavailable</td>
<td></td>
</tr>
</tbody>
</table>

Four (27% of total) students were hired before the end of the program. Their GPAs are not included in the sample.

Four (36%) of the remaining eleven students’ GPAs decreased. Seven (64%) of the remaining eleven students’ GPAs increased. Four of them by almost one percentage point. The eleven interns that finished the program were polished socially, management oriented, more responsible students and ready to become excellent cyber technologists.

7 Conclusion

This research has shown that students with average credentials who participated in the BATTLE given the environment, exposure, and high expectations will rise to the occasion.

Given the shortage of computing professionals predicted by the Department of Labor across the computing disciplines through the 2020s, BATTLE can help mediate that problem.

8 References


