A Program to Prepare Engineering Students to Obtain High-Quality Employment

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Abstract

The development of employment search skills is critical for engineering students to obtain high-quality employment. Most schools offer resources to assist in this skill development through their career centers, and a few schools offer either required or elective courses which focus on the main employment search skills of resume development, interviewing, etc. However, engineering students often do not recognize the importance of developing employment search skills or may procrastinate their search for internships and full-time employment. These students may fail to utilize career-center services, and such career-center services may not be focused specifically on obtaining engineering jobs. Moreover, many schools do not have space in their engineering curricula to add courses or the resources to offer engineering-focused courses to assist their students in the development of employment search skills. If engineering students do not develop the necessary skills to obtain employment, they may struggle to obtain their first job or obtain a subpar position that is not conducive to a strong start to their career. Additionally, the placement rate of the engineering program may suffer. The College of Engineering at Valparaiso University has developed an employment search skill development program to help students develop the necessary skills to obtain high-quality employment. Once deployed, this program requires minimal resources to administer and no new courses in the engineering curriculum. The program consists of stand-alone online learning modules for sophomore, junior, and senior engineering students in all disciplines. These Blackboard modules are administered by one person and associated with required courses in each discipline. The modules are comprehensive, consisting of multiple skill development sessions in each skill area, and each session consists of video instruction, a Blackboard quiz, and potentially an assignment. Upon completion of each of the Blackboard modules, each student's grades for the program contribute to the final grades in the associated discipline courses, thus providing the students with the required motivation to complete the employment search skill development program. Student surveys and focus groups were completed to assess the employment search skill development program and to determine suggestions for improvement.

1.0 Introduction

A myriad of books [e.g., 1-3] exist that instruct students on how to develop the required skills to be successful when searching for a job, skills such as employment search strategies, networking, resume construction, interviewing, career fair preparation, cover letters and written correspondence, etc. And almost every school through their career center [e.g., 4, 5] offers content, workshops, and mentoring to help students secure quality employment. In terms of employment search skill development and training created specifically for engineering students,

the Vanderbilt University School of Engineering has offered a voluntary, one credit-hour course [6]. Additionally, Villanova University has created an intensive professional development program for engineers [7] consisting of six required half-credit courses presented over three years that incorporates the following skill instruction: resume creation, interviewing, internship and job search strategies, and the Handshake College Career Network [8]. Many schools have integrated specific employment search skills such as interviewing [9], [10], resume development [11], and engineering job sites [12] into required or elective courses.

However, many engineering programs do not have the resources or space in their curriculum to offer required or elective courses to assist students in the development of employment search skills. Moreover, many of the students will not enroll in elective courses, and even in the required courses, the course offerings may not cover the full breadth of required employment search skills. If courses are not available, many engineering students may not use available resources such as university career centers. The students may lack incentive to begin developing employment search skills, lack knowledge that the skills are important or required, may be busy with coursework and extra-curricular activities which they prioritize, may be disconnected from the career center which is often located on campus at a different location than the location of the engineering college, or may simply procrastinate their career preparation and job search until they near graduation. These traits are especially common among sophomore and junior engineering students who may not realize the importance of gaining work experience through an engineering internship or research experience for undergraduates in relation to their career prospects. Additionally, employment search skill training may be general in nature and not focused on specific disciplines such as engineering.

The cost of students not participating in employment search skill development activities is high. In regard to the students, they may not find employment immediately upon graduation or may not find optimum employment in an engineering related discipline, leading to a sub-optimal start to their career that can have significant effects in regard to future opportunities. Moreover, the overall university and engineering program job placement rates can suffer, affecting the ability of the university to attract new students to the program.

This paper describes the employment search skill development program at the Valparaiso University College of Engineering. Once deployed, the program requires minimal resources to administer and is required for all sophomore, junior, and senior college of engineering students. The paper will first provide an overview of the employment search program and its implementation and provide specifics on the program content. Student survey results and focus group results will be provided to assist in the assessment of the program. The paper will end with discussion and recommendations for a broader implementation and future work.

2.0 Background

The Valparaiso University College of Engineering [13] graduates approximately 100 engineering students per year in the following disciplines: bioengineering, civil engineering, computer engineering, electrical engineering, environmental engineering, and mechanical engineering. Although placement rates at Valparaiso University for engineering students six months after graduation annually were in the 97 to 100 percent range, feedback from employers highlighted many areas of potential improvement for the students in regard to the quality of their resumes and their interviewing skills. Moreover, many students were frequently seeking assistance from engineering faculty to develop the necessary strategies and skills required to obtain engineering internships and full-time employment, and not all underclassman were able to obtain engineering internships related to their disciplines. Finally, participation levels in career center activities and offerings were at low levels for engineering students. Therefore, the Valparaiso University College of Engineering decided to develop for all engineering students a required program to assist them in the development of the necessary skills to obtain quality full-time employment upon graduation and engineering internships during their underclassman years.

3.0 Employment Search Skill Program Implementation

In this section, the implementation logistics for the Employment Search Skill Program (ESSP) at the Valparaiso University College of Engineering are presented. The ESSP is implemented in Blackboard [14] as separate modules for sophomore, junior, and senior engineering students. Within each module are a required number of lessons which vary depending on the student's location in their program. Seniors are required to complete ten lessons, juniors are required to complete four lessons, and sophomores are required to complete five lessons. Required courses within the sophomore, junior, and senior engineering curriculum are selected from each degree track and assigned the associated ESSP module. Students in each of these courses receive a portion of their final grade based upon their performance in the ESSP assignments. For example, all students in the required senior design course must complete the assigned ESSP module for seniors, which counts for approximately 5% of their final grade. By selecting required courses in the sophomore, junior and senior year curriculum, all engineering students are required to participate in the ESSP, and the students are incentivized by a grade to complete the work. At the start of the fall semester, the ESSP administrator is granted instructor access in Blackboard for all courses where ESSP content will be deployed. The administrator imports students into the appropriate ESSP modules and creates separate Blackboard groups based on which disciplinary course in which they are enrolled. Using the group feature in Blackboard is not necessary, but streamlines grade reporting to discipline course instructors for final grade calculation. All ESSP content is disseminated to students by the ESSP administrator via Blackboard. An email is sent at the start of each week to all students within a given module that outlines the required work, and seven days is provided for completion. Once all lessons in a module are complete, the ESSP

administrator provides the grades to the appropriate discipline course instructors. Therefore, the amount of work for the associated discipline course instructors is minimal. They are only required to: 1) make the ESSP a required portion of the course grade, 2) allow the ESSP administrator access to their Blackboard course, and 3) enter the final ESSP grades into their course gradebook.

4.0 Employment Search Skill Program Content

The ESSP content is disseminated to students in a distance learning format via Valparaiso University's learning management system, Blackboard. Students begin each lesson by watching a 10 to 15 minute video. The students are then required to complete a quiz on the video content that is incorporated into the Blackboard module. The quiz is graded automatically by Blackboard and is designed as a check for understanding and to provide incentive for students to carefully watch the video. The students are required to upload their assignments (e.g., resumes, interview practice videos, etc.) in Blackboard. Due to resource constraints, the students only receive feedback during the program in two ways. First, Blackboard provides the correct answer to any quiz questions where the students selected the incorrect answer. Second, career center personnel review every resume prior to their publication on the Handshake College Career Network [8]. If the resume is deemed unacceptable, the student must meet with career center personnel for suggestions and upgrade their resume prior to publication.

The quality of the video instruction has been improved significantly over the two years of the program. The first revision of session videos was produced in Explain Everything software [15] and consisted of PowerPoint slides with voice-over instruction provided by one faculty member. To make the video sessions more engaging and personal to students from all the disciplines, the current revision of the video sessions include faculty from each discipline. Moreover, the video sessions interweave video of the faculty speaking with the PowerPoint slides, providing a more engaging format than simple voice-over narration.

4.0.1 Sophomore ESSP Module

Table 1 shows the ESSP lesson schedule that all engineering sophomores are required to complete. Lesson 1 focuses on the importance of securing an internship or Research Experience for Undergraduates (REU) and provides general strategies for obtaining these positions such as beginning the search early in the year, networking, applying to many positions, and the advantage of performing a broad geographic search. Lesson 2 provides instruction on how to create a professional resume, and the students are required to upload their resume to Blackboard. The ESSP administrator only confirms that the resume has been uploaded and records a yes/no score. The resume instruction lesson is particularly important for sophomores as it not only helps the students prepare a professional resume for the purpose of obtaining an internship, the

students are also able to see areas on the resume where they have gaps in their career development. For example, the students will realize that they need to begin participating in activities if that section of their resume is blank. Lesson 3 prepares the students for the career fair by providing instruction on attire, how to develop an elevator pitch, and how to develop a career fair strategy. The Lesson 3 assignment requires all students to attend the career fair (attendance is recorded by the Valparaiso University Career Center) and upload a short summary of their conversations with at least four companies to Blackboard. Again, the administrator only records a yes/no score. Lesson 4 provides instruction on how to create a Handshake profile and upload a resume to the Valparaiso University Handshake Career College Network software [8]. The assignment requires the students to complete both tasks. At this stage, Career Center personnel provide specific feedback to the students on their resumes as all resumes must be approved by career center personnel before they are visible on Handshake. Finally, Lesson 5 provides students with instructions on how to use online resources such as engineersjobs.com [16] or the REU site [17] to search for and apply to internships and REUs. All lessons that are provided to senior students such as interviewing, phone interviewing, etc. are available to sophomores; however, they are optional viewing and have no required associated assignments at this stage. The ESSP content development team felt that it was optimal to focus on the most important skills the students needed at each point in their academic career versus overwhelming them with too much information at a point too early in the program.

Table 1: Sophomore ESSP Lessons

Lesson	Session Title	Assignment
1	Strategy to Find an Internship or Research Experience for Undergraduates	
2	An Effective Resume	Create Professional Resume
3	Career Fair Preparation	Attend Career Fair and Speak to Four Companies Minimum
4	Handshake Career College Network	Create Profile in Handshake and Upload Resume to Handshake
5	Engineering Internship Online Sites	

4.0.2 Junior ESSP Module

Table 2 shows the ESSP lessons that all engineering juniors are required to complete. Lesson 1 consists of the only required video for junior level students, and the video provides a review of

the sophomore year lessons. The ESSP faculty development team did not want the students to repeat all the material from the sophomore year instruction but felt that a review was necessary, especially considering that the students were at a different point in their development. The remaining lessons require the students to revise work from the previous year. Lesson 2 requires that the students revise their resume and upload it to Blackboard. Similar to the sophomore year assignment, the ESSP administrator only confirms that the resume has been uploaded and records a yes/no score. Lesson 3 again requires the students prepare for and attend the career fair. Attendance is recorded by the Valparaiso University Career Center, and students upload a short summary of their conversations with at least four companies to Blackboard. Again, the administrator only records a yes/no score. Lesson 4 requires the students to upload their revised resume to the Valparaiso University Handshake Career College Network software and update their Handshake profile. All modules that are provided to sophomore and senior students such as interviewing, phone interviewing, etc. are available to juniors; however, they are optional viewing.

Table 2: Junior ESSP Lessons

Lesson	Session Title	Assignment
1	Strategy to Find an Internship or Research Experience for Undergraduates: Review	
2	An Effective Resume (no required video)	Update Professional Resume
3	Career Fair Preparation (no required video)	Attend Career Fair and Speak to Four Companies Minimum
4	Handshake Career College Network (no required video)	Update Profile in Handshake and Upload Resume to Handshake

4.0.3 Senior ESSP Module

Table 3 shows the ESSP lessons that all engineering seniors are required to complete. Lesson 2 on resumes, Lesson 3 on the career fair, and Lesson 6 on the Handshake College Career Network (listed as Module 4 in Tables 1 and 2) use the same video instruction as the sessions that the sophomores complete. However, the students are required to watch these videos again for review purposes and also because the goal is that the students will address the instructional material more carefully at this later point in their academic career. In terms of assignments for these lessons, the students are again required to revise and upload their resume to Blackboard,

attend the career fair and upload to Blackboard conversations with four companies, and update their Handshake profile and upload their revised resume to Handshake.

Table 3 also shows the new lessons that all engineering seniors are required to complete. Lesson 1 provides general strategies for obtaining full-time employment such as beginning the search early in the year, networking, applying to many positions, and the advantage of performing a broad geographic search. Lesson 4 prepares the students for face-to-face interviews, and the completion of this lesson is scheduled prior to the career fair because many students receive interviews after attending the career fair. For this lesson, students receive instruction on preparing for an interview, behavioral interview questions, and the STAR technique [18] for answering interview questions. The lesson 4 assignment requires the students to answer a set of interviewing questions that are being asked by an interviewer (classmate) that is video recording the session with a cellphone. Both the interviewer and interviewee then watch the video together and fill out an evaluation form. The interview session is then repeated and recorded a second time, and both videos are uploaded to the ESSP Blackboard module. The ESSP administrator verifies that the assignment has been completed and records a yes/no score.

Descriptions of the final lessons shown in Table 3 are as follows. Lesson 5 provides instruction on the creation of cover letters and thank you emails. Lesson 7 provides instruction on the importance of networking, techniques to network, and how to use LinkedIn [19]. Lesson 8 provides instruction on how to use online engineering job sites and recruiter job sites to search for full-time employment, and lesson 9 provides phone interviewing instruction. Lesson 10 provides the students with techniques to evaluate a job offer, and lesson 11 is an optional session that provides information on graduate school opportunities for engineers.

Table 3: Senior ESSP Lessons

Lesson	Session Title	Assignment
1	Strategy to Find Full-Time Employment	
2	An Effective Resume (Same as Sophomore Video)	Update Professional Resume
3	Career Fair Preparation (Same as Sophomore Video)	Attend Career Fair and Speak to Four Companies Minimum
4	Interviewing	Complete, Evaluate, and Upload Interview Session with Peer
5	Written Correspondence	

6	Handshake Career College Network	Update Profile in Handshake and Upload Resume to Handshake
7	Networking	
8	Online Engineering Job Sites	
9	Phone Interviewing	
10	Evaluating an Offer	
11	Graduate School (Optional)	

5.0 ESSP Program Participation

In Year 1 (2017-18 academic year) of the ESSP deployment, all seniors from every discipline (111 students) completed the program. In addition, all sophomores (97 students) and juniors (94 students) from mechanical, electrical, and computer engineering completed the program. In Year 2 of the program (2018-19 academic year), all sophomore, junior, and senior engineering students enrolled in the Valparaiso University College of Engineering are required to complete the ESSP program.

6.0 Student Survey Assessment

A student survey was performed to assess the effectiveness of the ESSP among senior mechanical, electrical, and computer engineering students. Seventy-seven out of 79 students returned their surveys. The pertinent survey questions, rating scale for each question, and results are shown in Table 4. Overall, the survey results show that students believe that they have developed strong employment search skills. This is supported by the fact that each of the 12 skill-related survey questions received an average rating of "agree" or higher signifying that students believe their employment search skills in multiple areas are acceptable after their participation in the program.

The survey results provide additional information for the ESSP faculty development team. The two skill areas that the students rated the lowest were their ability to develop an elevator pitch for the career fair (question 9) and their ability to describe and employ the STAR technique when answering interview questions (question 11). These are two areas that will be the focus of improvement in upcoming years.

The student groups completing the surveys will be expanded in the current academic year to include sophomores, juniors, and seniors of all disciplines, including civil engineering which is

currently only represented at the senior level. The surveys will be administered on a yearly basis to track longitudinal development throughout the three-year ESSP curriculum.

Table 4: Student Survey Results

Survey Questions					**Results**	
					Average	**Standard Deviation**
Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**		
5	4	3	2	1		
1) I am able to describe at least three strategies for a successful job search.					4.40	0.73
2) I am able to describe the purpose of a cover letter, resume, and thank you note.					4.59	.69
3) I am able to construct a cover letter, resume, and thank you note that are concise and free of errors, professionally formatted, and highlight abilities, skills, and experiences relevant to a specific position, company, or industry.					4.36	0.72
4) I am able to explain and leverage the benefits of Handshake and Linkedin to facilitate a job search.					4.42	0.69
5) I am able to explain and leverage the benefits of engineering job sites to facilitate a job search.					4.35	0.72
6) I am able to explain the benefits of networking to facilitate a job search.					4.44	0.69
7) I am able to explain the benefits of attending the X University Engineering Career Fair.					4.54	0.64
8) I am able to explain the benefits of researching companies prior to attending a career fair.					4.65	0.66
9) I am able to construct a career fair elevator pitch that is concise, displays knowledge of the company/position, conveys employment goals, and highlights abilities, skills, and experiences relevant to a specific position/company/industry.					4.08	0.85

10) I am able to describe at least four strategies to prepare for a job interview.	4.35	0.77
11) I am able to describe and employ the STAR technique when answering interview questions.	4.01	0.96
12) I am able to describe and employ appropriate techniques for a telephone or on-site job interview.	4.37	0.72

7.0 Focus Group Results

At the conclusion of Year 1 of the ESSP, two focus group sessions with mechanical, electrical, and computer engineering seniors were completed. One group included five students, and the second group in included four students. The goal of the sessions was to better understand how students received and implemented the ESSP program, and how to improve the program for future cohorts. The questions which were asked during the focus group are shown in Table 5.

Table 5: Focus Group Questions

Number	Questions
1	Describe your employment search process.
2	What do you believe was your most effective employment search technique?
3	Where did you learn about that technique?
4	Was there anything you'd like to try that you haven't already?
5	Did you find the employment search technique modules (videos, assignments, etc.) helpful in your employment search? Why or why not?
6	Did you use the resume instruction video to help improve your resume?
7	Did you write cover letters and thank you emails based on the written correspondence video instruction and sample materials?
8	Did you use Handshake after receiving the video instruction?
9	Did the video instruction help you prepare for the career fair?
10	Did the instruction help you prepare for in-face interviews?
11	Did you use the internet job sites that were provided to you in the instruction

	video?
12	Which ones?
13	Did you receive interviews from the internet job sites?
14	Did the phone interview video instruction help you prepare for your phone interviews?
15	What would you like to say that we have not asked you?

The students provided the following general feedback on their employment search techniques and the ESSP lessons.

- Most students recognized the importance of networking and beginning networking from the start of their academic careers.
- Most students recognized the importance of obtaining relevant work experience through engineering related internships.
- Some students wish they would have reached out more to professors and professionals for assistance in their employment search.
- Some students recognized the importance of having professors, professionals, and career center personnel review their resumes.
- Many students recommended LinkedIn as a valuable resource for finding employment.
- Many students recognized the success of an employment search strategy of applying to a large multitude of positions.

The students identified the following positives in regard the employment search skill development program.

- The program provided motivation and incentive for them to begin searching for a full-time position earlier in their senior year.
- The students felt the program was generally helpful.
- Although the students believed that they already possessed some of the required skills, they all identified new skills which they developed.

The students identified the following areas for improvement in regard the ESSP and its implementation. Changes to the program based upon these suggestions are also identified below.

- Some students requested an employment search timeline to provide them with more information on where they should be in their employment search during the year. A timeline has been added to the introductory session.

- Some students requested a lesson on how to evaluate an offer. This lesson has been added to the ESSP.
- Some students requested a lesson on graduate school opportunities for engineers. This lesson has been added to the ESSP.
- Many students found the mock interviewing assignment to be uncomfortable and did not take the assignment seriously. Additional instruction has been provided to the assignment to highlight the importance of the assignment for developing good interviewing skills.
- Some students did not find the Handshake College Career Network useful and some students said that almost no engineering jobs were available on Handshake. To address this concern, significant content was added to the Handshake lesson, including additional instruction on how to use the software. And to increase student motivation to use Handshake, an example search for each engineering discipline was shown which resulted in hundreds of potential employment opportunities.
- Some students requested that the PowerPoint slides be posted after the videos have been viewed so they could be used for a quick reference. The slides will be posted after the lesson completion in Year 2of the program.

8.0 Summary of Findings and Future Work

Overall the findings from student surveys and focus groups were positive, and gave evidence that the ESSP is providing the necessary resources for students to develop confidence in their employment search skills. By distributing ESPP content across the sophomore, junior, and senior year, students are encouraged to consistently engage in searches for employment and career research throughout their academic progress, which will better prepare them to establish their career post-graduation.

The student survey was administered to participants at the end of Year 1. While the results were favorable, they did not provide information on growth that may have occurred. Thus in the future, the student survey will be administered at the beginning and conclusion of the ESSP to provide pre/post evaluation of the curriculum.

In addition to new content (e.g., how to evaluate offers, and searching for graduate school opportunities), there are also plans to further improve the video content by adding interviews with alumni on what companies are seeking in resumes, interviews, etc. and their own stories of what made their employment searches successful. The goal is to add a level of credibility to the lessons by having the students hear messages from professionals in industry who graduated from Valparaiso University engineering programs, and to keep the ESSP content current by highlighting hiring practices and networking software used in practice.

9.0 Summary

The College of Engineering at X University has developed the ESSP to help students develop the necessary skills to find excellent jobs in their desired fields of study. The program consists of stand-alone Blackboard modules that target different employment search skill areas relevant to engineering students in all disciplines. These Blackboard modules are administered by one person and are associated with required courses in the sophomore, junior, and senior years. Each lesson consists of video instruction, a quiz (administered through the university LMS, Blackboard), and potentially an assignment. Upon completion of each of the module, the grades of the students are provided to the associated discipline course instructors for tabulation in their final grade. Requiring the ESSP content to be weighted into the final grade of the associated disciplinary course incentivizes students to spend time with the material when they otherwise would allocate their time elsewhere. Student surveys and focus groups were completed to assess the program and determine suggestions for improvement.

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