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Teacher-Less Teaching: The Efficacy of Student-Taught Soft Skill Modules

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Teacher-less Teaching? The Efficacy of Student-Taught Soft Skill Seminars

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A project submitted to the faculty of
Brigham Young University
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Master of Science

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ABSTRACT

Teacher-less Teaching? The Efficacy of Student-Taught Soft Skill Seminars

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This report presents the results of an implementation evaluation of new modular content for the BYU ACME Soft Skills seminar. The seminar was changed from a teacher-led seminar to a student-facilitated, teacher-less model. Evaluative data was gathered using a mixed methods approach, including in-class observations, surveys, and personal and small group interviews. The new seminar structure was piloted over two semesters in the student teacher facilitated teacher-less format and was met largely positively by students, who reported high engagement and beneficial soft skill development. Students provided suggestions for seminar improvement, such as offering graded credit, integrating the seminar with other hard skill-oriented optional seminars, and inviting experts in the field to teach the seminar periodically. Best practices in seminar operations, such as clearly-identified training and resources, wielding experts with subject matter knowledge, and the use of meaningful, engaging activities, are discussed.

Keywords: soft skills, seminars, student-taught, student-facilitated, evaluation

ACKNOWLEDGEMENTS

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Introduction

Universities exist for many purposes. Perhaps most critically, they exist to imbue students with knowledge and practical reasoning skills (Sullivan & Rossin, 2008). They assist students in their acquisition of knowledge but also teach specific skills such as effective writing, logical thinking, and how to complete a variety of technical processes; in most cases, colleges do this well (Stewart, 2010). Thus, a college graduate carries with him or her multitudinous opportunities because of what they have gained but also expectations for performance in post-college life.

In many ways, a college student might be considered a "product" of his or her education. In this sense, a potential employer is a "consumer" of the graduating college student product. As a product, potential employers might justly assume that graduating students from a specific program have obtained the knowledge, understanding, and skills they will need to be a productive member of the work force. From the consumer's perspective, knowing what each graduate provides serves as a hiring heuristic, enabling consumers to select qualified individuals for their companies.

As potential employers read a college graduate's resume, they look for a degree associated with the skills and ability that correlate with what their specific company seeks in an employee. Unfortunately, they may be disappointed that obtaining a degree does not always guarantee that an individual possesses all the requisite skills for the jobs they need done. In this regard, universities have a time and space problem – it can be difficult to guarantee that each student receives all pertinent training due to already-demanding degree requirements and the amount of credits they can require students to take in order

to obtain a degree. As a result, in many technical majors (e.g., math, computer science, mechanical engineering, etc.), students develop desirable hard skills but often lack sufficient developmental coursework in soft skills (e.g., active listening, teamwork, leadership, etc.). The simplistic choice of merely adding new for-credit courses into existing programs is not an option as college programs are regulated in terms of the number of credits they can require for a degree. When valuable curricular contents does not fit within specified credit load restrictions, universities wanting to augment a program's curriculum must think creatively to overcome these constraints.

One example of a program with these challenges is Brigham Young University's Applied Computational Mathematics Emphasis (ACME) program, a relatively new[1] emphasis in the math department which employs math in solving real-world problems. Students receive excellent training on technical aspects of the subject, but soft skills training was largely missing. Seeing the need, but being unable to add a required course, the ACME program felt that providing an optional soft skill seminar to students might be a viable solution. Optional seminars have no credit demands and the required workload is relatively small compared to the major's core classes. How the program might best deliver a soft skills seminar remained an issue.

For several years the ACME program utilized a more traditional soft skills seminar, characterized by an instructor with subject-matter knowledge (e.g., a graduate student or adjunct faculty) providing a formalized lecture to students. While this solution was considered successful it still had a faculty assignment cost. To provide quality, standardize seminar content resources, and to reduce the financial cost to the

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[1] *The ACME program launched officially in Fall 2012.*

department's budget, ACME program leaders proposed shifting the seminar to a student-directed teacher-less format. A teacher-less seminar has the potential to be a cost-effective option for providing students exposure to desired content, while minimizing the demands on students and instructors in terms of required coursework and instruction time. But is it an effective alternative?

This project was a case study examining the efficacy of teacher-less classes and its ability to economically foster the development of soft skills in its students. ACME sought to determine the degree to which a soft skills seminar might enable technically-proficient students to overcome their social limitations and increase their post-collegiate chances of meaningful employment through enhanced interpersonal capacities. We hoped to find out whether a teacher-less seminar structure had the potential to positively affect many technical programs in need of soft skill content augmentation.

Purpose Statement

The purposes of this project are to: (1) determine the degree to which the seminar could be implemented autonomously by students, (2) determine the seminar's instructional efficacy in terms of perceived learning gains and skill development, and (3) identify ways in which the seminar's structure might be improved.

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Project Background Information

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BYU ACME Program

BYU's ACME program employs a rigorous approach to solving real-world problems using mathematics and technical coding. These problems are complex and the ACME program curriculum is rigorous. The program has recently experienced great success in generating graduates with exceptional technical and analytical abilities and has

attracted the attention of top consumers such as Google, Goldman Sachs, Intermountain Healthcare, and others. The academic caliber of students in the ACME program is tremendous, and employers pay well for the expertise they develop.

However, the average ACME student possesses an interesting combination of personality traits which exemplify both strong positive *and* negative traits, in a somewhat stereotypical sense. Generally, the students are bright, but socially uncomfortable; confident in their subject matter, but stubbornly defensive of their ideas; hard-working, but often competitive to a fault. So, while many ACME students have found great success during and after college, some of its brightest graduates struggle to work well in after-graduation career settings; thus, they are ultimately unable to achieve their full potential.

To remediate this issue, the ACME program began a soft skills seminar to improve the students' chances of post-collegiate success.

ACME Soft Skills Seminar

The ACME program administrators introduced a soft skills seminar the same year as its impetus in 2012 to balance the students' considerable technical and analytical focus with people-focused skills. The seminar ACME provides has gone through several iterations to find the best format. Topics have ranged from active listening and conflict management, to capitalizing on personal strengths and resume development. The most recent—and most radical—change made in Fall of 2016 was the departure from a traditional classroom model—where a teacher (typically a graduate student) guides the class—to a student-directed, activity-focused seminar model. It was hoped that students would be able to help each other learn about and improve their skills in this area without the direction of an instructor.

The seminar was one of several optional courses which students in their Junior year may opt for, the others being Data Visualization and Competitive Coding. The seminar has been generally comprised of soft skill-oriented lectures with facts, principles, and activities structured to increase sensitivity toward soft skills and, as far as it is possible, provide ACME students the opportunity to cultivate these skills in themselves.

The structure of the seminar has made it difficult to gauge the extent to which any concrete soft skill development has taken place, and the seminar's "fluffy" perception has limited ACME student interest and involvement. For this reason, Jeffrey Humpherys contacted the BYU IP&T department for additional help in developing the new seminar materials and implementation format.

Jacob Brown[2] and Stacie Mason, both graduate students in the BYU IP&T program, jointly developed 20 student directed soft skills modules for the seminar, 10 for each semester (see Appendix A). Modules were created using Microsoft PowerPoint and are comprised of soft skills content gathered from scholarly journals, books, and reputable online sources. The PowerPoint presentations were housed on GitHub, an online software development center and repository[3], and shared to a Google Drive folder which was made accessible to students. This folder also contains the course syllabus and schedule (see Tables 1 and 2).

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[2] *Referred to in the first person throughout this work, being the author of this manuscript.*

[3] *Note: BYU ACME professor Jeffrey Humpherys received a federal grant from the National Science Foundation to develop the seminar and share the content via GitHub to provide access to other university applied math programs across the United States.*

Table 1

Fall 2016 Semester Calendar—ACME Soft Skills

Date	Content	Instructor	Module
9/7/16	Intro, Resumes	Jeff, visitor	Applied Math Power
9/14/16	Goldman-Sachs	Visitor (Goldman)	n/a
9/21/16	Google	Visitor (Google)	n/a
9/28/16	Networking	Jacob Brown	Get Noticed
10/5/16	InterMountain Healthcare	Visitor (IHC)	n/a
10/12/16	Building a New Life	Jacob Brown	Building a New Life
10/19/16	Goals and Your Job	(Student)[4]	Goals and Your Job
10/26/16	Synergy	(Student)	Synergy
11/2/16	NO CLASS	NO CLASS	NO CLASS
11/9/16	Talking Good	(Student)	Talking Good
11/16/16	Use Your Strengths	(Student)	Use Your Strengths
11/23/16	NO CLASS	NO CLASS	NO CLASS
12/1/16	Looking Outward	(Student)	Looking Outward
12/8/16	The Good Life	(Student)	The Good Life

Table 2

Winter 2017 Semester Calendar—ACME Soft Skills

Date	Content	Instructor	Module
1/26/17	Public Speaking	Jacob Brown	Public Speaking
2/2/17	Teamwork & Collaboration	(Student)	Teamwork & Collaboration
2/9/17	Leadership	(Student)	Leadership
2/16/17	Personality Theory/Mindfulness	(Student)	Personality Theory & Mindfulness
2/23/17	Google - Campus Visit	Google	n/a
3/2/17	Confidence & Humility	(Student)	Confidence & Humility p1 Confidence & Humility p2
3/9/17	Happiness	(Student)	The Sunny Side of Life
3/23/17	Project Management	(Student)	Project Management
3/30/17	Conflict Resolution	Class Discussion	Conflict Resolution
4/6/17	Sell-It	Jacob Brown	Sell-It
4/13/17	Group Problem-Solving	Jacob Brown	Group Problem-Solving

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[4] *Student names have been removed for privacy.*

Evaluator Background

As I began to investigate the potential subject for my thesis project, I found that my various interests were sometimes difficult to definitively select and corral. As I investigated several options, the ACME project stood out. A friend and colleague, Casey Wright, worked with the soft skills seminar the year prior to me and spoke highly of his experience with the students. As he was then finishing his program of study, he needed someone to continue the work.

The project intrigued me most because it appealed to several of my academic interests: a) *instructional design*. I had the opportunity to collaborate with Jeff, Stacie, and others to identify soft skills that would be most desirable and beneficial for the ACME students, following the instructional design process I had learned in the program; b) *teaching*. One of my great pleasures is to teach, to boil down a complex principle and illustrate it in a way that is both memorable and enjoyable. I learned that I would have the chance to serve as a model teacher for the ACME students, a challenge I ultimately embraced with great personal satisfaction; c) *interaction with a unique population.* During my undergraduate career in Psychology and graduate career with the IP&T program, I intermingled with a group of people who, though comprised of individuals with idiosyncratic beliefs and strengths, were quite similar to me in their academic interests and paradigms. Given my understanding of the confirmation bias (Nickerson, 1998), I wanted to associate with those who did not share all my perceptions, beliefs, or preferences. ACME students are exceptionally precise and analytical in their thinking, and their strengths include many areas in which I can personally improve; d) *soft skills development.* Like what I just described, psychology students seem to possess a proclivity

toward heightened soft skills, or at least a desire to cultivate them. Many ACME students appear relatively unaware of the effect that strong soft skills can have on their relationships, and for this reason I wanted to be involved in helping them to improve in their abilities. In another way, I knew that different people would enable me to learn more about areas of weakness in myself; they did not disappoint; e) *evaluation.* It is satisfying to determine to what extent a given evaluand is effective in accomplishing its purposes, and to provide information that will lead to the improvement of a product, process, or person; and f) *data analysis.* The precision of the quantitative data and the depth of the qualitative data was gratifying to gather and analyze.

Due to this combination of factors—and, frankly, because the opportunity presented itself propitiously and fortuitously—I decided to make the ACME soft skills seminar the subject of my thesis project.

Stakeholder Issues and Concerns

The stakeholders attached to this project include the ACME students, faculty, and administrators, as well as employers to whom the ACME students will eventually apply for employment. That said, the primary stakeholders in this project are ACME administrators, who were interested in gathering formative evaluative data concerning the seminar's improvement and its progression toward a teacher-less format.

Previous iterations of the seminar functioned well enough but, according to Dr. Humpherys, were not always enthusiastically received by ACME students. ACME administrators were keenly interested in creating another iterative step in the direction of an applicable, engaging, and competency-building seminar. Administrators have offered

a significant amount of autonomy to the instructional designers in charge of this project (i.e., Jacob Brown and Stacie Mason), allowing for improvement to the seminar.

The key concerns of the primary stakeholders included: a) to what degree does this format get ACME students to genuinely participate in the seminar, and b) whether the seminar truly foster the development of soft skills as hoped.

Evaluation Questions

Based on stakeholder concerns, the purposes of this project are to: (1) determine the degree to which the seminar could be implemented autonomously by students, (2) determine the seminar's instructional efficacy in terms of perceived learning gains and skill development, and (3) identify ways in which the seminar's structure might be improved.

Review of Literature

The ACME Soft Skills Seminar began an in effort to systematically improve ACME students' access to novel content (i.e., soft skills) as they prepare to approach the job market following graduation. As such, there have been iterative improvements made since the program's inception in 2012 intended to strengthen its perceived and actual validity and desirability among ACME students.

This being the newest iteration of the seminar—and with it, the novelty of introducing a student facilitated, teacher-less format—it was recommended that this project serve as an *implementation evaluation* – part a) development project, and part b) evaluation of the efficacy of this iterative piece.

To substantiate our rationale for the addition of student-led seminars, we examined several bodies of literature: (a) Seminars, (b) Soft Skills, and (c) Teacher-less Classrooms (Autonomy); each is elucidated below.

Seminars

Jaarsma et al (2008) reported that seminars generally consist of 25-30 students and discuss relevant issues and/or readings. Social constructivist theory (Vygotskii & Cole, 1978) suggests that involvement in small groups leads to improved cognitive processing. This suggests that seminars with small class sizes could foster this type of growth, with similar challenges as exist in any small group (Sprujit, Jaarsma, Wolfhagen, van Buekelen, & Scherpbier, 2012). In addition, seminars have been used for purveying important information to large groups of students, administered in low-credit, pass-fail fashion (Brinthaupt, 2010).

Seminars have been proven to improve group processes and increase perceived relevancy to subject matter in university students (Thakral et al., 2016), and have also been used to "promote psychosocial adjustment and stress management" (Conley, Travers, & Bryant, 2013, p. 75). Other seminars have experienced considerable success in teaching group processes in "professional training" and the "development of social capital", and were just as effective—if not more so—when seminars took place in an online setting (Mebane, Iannone, Attanasio, & Francescato, 2008, p. 68; Francescato, Solimeno, Mebane, & Tomai, 2009). Seminars are also commonly implemented to train university faculty and assess institutional needs (Long et al., 2014), and appear to lose efficacy due to some or all the following: poor structure, groups are too large (over 15),

ambiguously-defined materials and/or preparation, and poorly-explicated course requirements (Sprujit, Jaarsma, Wolfhagen, van Buekelen, & Scherpbier, 2012).

As the popularity of seminars continues to rise (Massingham & Herrington, 2006), the efficacy of student-led seminars has been preliminarily explored (Gbadamosi, 2015). Gbadamosi's study (2015) asked whether universities should enforce and increase student attendance in seminars, or not. The study's results are overwhelmingly affirmative, indicating that seminar attendance predicted improved academic performance in a connected lecture series. Regarding potential future research, Gbadamosi recommended that student-led seminars could be further improved by allowing seminar performance to constitute a larger part of the overall grade. However, the possibility of a stand-alone, student-facilitated seminar on soft skills has not been thoroughly explored.

Soft Skills

The term "soft skills"—or social skills, social intelligence (Thorndike, 1920), and the like—represents multitudinous behaviors to different audiences and can be misleading. Several somewhat diverse definitions of soft skills highlight its wide potential for application: (1) "the different classes of social behavior of the individual's repertoire that allow him/her to deal adequately with the demands of interpersonal situations" (Pereira-Lima & Loureiro, 2015, p. 354); (2) "qualities such as self-awareness, self-regulation, motivation, empathy, and social skill" (Marques, 2013, p. 163; Goleman, 2000); and (3) "a combination of interpersonal and social skills" (Dixon, Belnap, Albrecht, & Lee, 2010). The overlap and distinct emphases among these

contemporary definitions illustrates the general context when speaking about soft skills – that they are universally recognized, though their categorization is somewhat subjective.

Soft skills are generally considered desirable across industries (Moses-Mercer, 1994**;** Bedwell, Fiore, & Salas, 2014; Hatcher, 2015), but they are generally tested far less frequently than hard skills (e.g., memory, summarization; Timarová & Salaets, 2011) and researched even less (Doo, 2006). Most relevantly, soft skills can be reliably improved using structured methods and programs (Zautro, Zautro, Gallardo, & Velasco, 2015). The breadth of and need for a soft skills development seminar—particularly in a technical skill-heavy discipline like applied mathematics—has been widely validated from several sources.

Teacher-less Classrooms (Autonomy)

The literature on teacher-less classrooms is sparse. For this reason, we examined the literature on related fields and found connections to related fields that give credence to the purpose of this study. For example, autonomy, or "the degree to which [an] individual has independent discretion in determining the pace and process of the task" (Hackman & Oldham, 1976), has been correlated with *flow*, the term coined by Csikszentmihalyi (1975) meaning the "holistic sensation that people feel when they act with total involvement" (p. 36). Wong (2000) found that autonomy was positively correlated with academic activity and autonomy. Additionally, teachers' encouragement for student autonomy is correlated with higher student satisfaction (Reeve, Jang, Carrell, Jeon, & Barch, 2004). Given the nominologically iterative nature of educational research, autonomous learning has various related constructs in educational domains, some of which include *self-instruction* (Holland & Skinner, 1961; Robin, Armel, & O'Leary,

1975; Littlemore, 2001), *self-directed learning* (Knowles, 1975; Hiemstra, 1994), *self-guided learning* (Brydges, Dubrowski, & Regehr, 2010), *learner-centered education* (Norman & Spohrer, 1996), and, perhaps most relevant to student-led seminars, *student-directed learning* (Wehmeyer & Agran, 2000). Each of these domains provides specific context into this learning modality, but the relative novelty—at least in its name—of student-led seminars presents a potentially powerful pedagogical strategy by which soft skill development might be included economically in technically-focused emphases in higher education. Thus, we could reasonably hope that the autonomy we have structured into our seminar will foster higher student involvement and satisfaction (Steele & Fullagar, 2009).

Evaluation Design

This evaluation utilized a case study approach to capture student experience and development, as well as ACME faculty perception of the initiative's efficacy; the evaluation was conducted during the Fall of 2016. A mixed methods approach to data collection was used to target the principal outcomes of the evaluation. Below is a description of the (a) participants, (b) class structure, (c) data collection and (d) data analysis procedures, and (e) evaluation criteria and standards, respectively.

Participants

This evaluation project took place during the Winter 2017 semester (January to April). One ACME student officially enrolled, and five other ACME students attended the seminar and provided feedback. By contrast, the Fall 2016 semester (September to December) consisted of 27 students (see Table 3). Though we advertised well in advance

for Winter 2017 and prepared for a similar number as in Fall 2016, there were far fewer students than we predicted would sign up.

Table 3

Student Demographics

Category	Fall 2016	Winter 2017
Total Students	27	6
Gender (M/F)	18/9	5/1
Year in School		
Junior	27	5
Senior	0	1

Class Structure

The seminar was scheduled on Thursdays from 3-3:50pm. The seminar consisted of ten soft skill modules per semester and visitations from companies interested in hiring ACME students as interns. At the beginning of the semester students volunteered to teach (i.e., facilitate the discussion and activities) a module each during the semester. Unlike previous seminar iterations, students enrolled in the class were asked to take on the role of instructor for a given seminar. Students who opted to present were asked to review provided resources prior to the class, then lead the discussion. Those who volunteered to present were invited to participate in a 'taco fiesta' (i.e., group debriefing interview) during the final seminar of the semester. Before the semester began, guest presenters from Google were invited to describe ACME-related problems that they work on, and recruit students to apply for summer internships. During other semesters, other companies (e.g., Goldman Sachs, Intermountain Healthcare) also sent representatives to perform similar functions; Dr. Jeffrey Humpherys made these arrangements.

Seminar grading was determined through class attendance and was completed by the seminar facilitator (Brown) then finalized by ACME Faculty (Dr. Humpherys); grading consisted of a pass/fail classification, with no letter grade being assigned.

When Stacie, Jeff, and I developed the newest iteration of soft skills modules, we created the two semesters as highly related, but distinct enough to enable students to enroll both semesters and not receive overly redundant content. Specifically, the first semester (Fall 2016; 10 modules) consisting of the life cycle of an ACME student, moving from getting the job to moving up the ladder to thriving in every aspect of life; the second semester (Winter 2017; 10 modules) consisted of 10 practical skills that we expected would expand on what students learned in the first semester. We hoped that developing the seminar in this way would enable students to prepare during the Fall semester for job fairs and internship opportunities, whereas the Winter semester would bolster specific, desired workplace skills (see Tables 1 and 2 for semester's contents).

Data Collection

Data was gathered using a mixed methods approach, combining survey data with observation-based data, interviews (individual and group), and in-class observations. However, the relatively underwhelming amount of quantitative data available to us proved difficult to draw definitive claims from, and so we largely focused on the interpretation of patterns gathered from the qualitative data.

Surveys. Following each seminar, student facilitators and participants were asked to complete a brief online survey regarding their participation in that specific class, and rated class elements using a five-point Likert scale[5] in the following categories:

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[5] *Likert scale included items from 'Strongly disagree' to 'Strongly agree' (5 points). Likert items were recoded from 1 (Strongly disagree) to 5 (Strongly agree) for data interpretation.*

engagement, quality of instruction[6], perceived utility, and the extent to which the class

contributed to individual soft skill development; Table 4 delineates survey questions.

Surveys provide an efficient glimpse into respondents' minds, which expeditiously

illustrate patterns that can be further perused using qualitative methods.

Table 4

ACME Soft Skills Seminar Post-Class Survey

Survey Items
1. What is today's date (ex. June 1st, 2019) *[Qual.]*
2. Which module is this survey in reference to? *[Qual.]*
3. Who taught? Did you teach class today, or did someone else teach? *[Qual.]*

4. Rate the extent to which you agree with the following statements about teaching:
    a. I was prepared to teach [the module]. *[5-point Likert]*
    b. I believe that my quality of instruction was high in this class. *[5-point Likert]*

5. Rate the extent to which you agree with the following statements about participation: a. The class participated well in our class. *[5-point Likert]*

6. Rate the extent to which you agree with the following statements about content & skills:
    a. The content for [the module] was of a high quality. *[5-point Likert]*
    b. The students developed marketable skills during this class. *[5-point Likert]*
    c. The students gained valuable knowledge during this class. *[5-point Likert]*

7. What else would you say that would shed more light on the class? *[Qual.]*

8. Rate the extent to which you agree with the following statements about teaching:
    a. The instructor was prepared to teach [the module]. *[5-point Likert]*
    b. The quality of Instruction was high in this class. *[5-point Likert]*

9. Rate the extent to which you agree with the following statements about participation: a. I participated well in our class. *[5-point Likert]*

10. Rate the extent to which you agree with the following statements about content & skills:
    a. The content for [the module] was of a high quality. *[5-point Likert]*
    b. I feel that I developed marketable skills during this class. *[5-point Likert]*
    c. I feel that I gained valuable knowledge during this class. *[5-point Likert]*

11. What else would you say that would shed more light on the class? *[Qual.]*

In-class observation. As lead evaluator, I attended seminar meetings and noted

relevant details, including student engagement during activities, acknowledgement of

[6] *A conditional piece was added to the online surveys, enabling student facilitators to describe their own preparation and execution as instructors. Otherwise, students assessed their peers' instructional quality and perceived preparation.*

salient student behaviors, student involvement levels, potential concerns, and other details that I considered relevant to the social atmosphere of the seminar (see Appendix C for observation notes audit trail). This data collection strategy was critical to understanding ACME students' needs because, as Anderson (1981) says, "Details matter. Secrets matter. The ordinary is extraordinary." (p. 244). This approach can help to answer small and seemingly meaningless queries (e.g., Why are some students always late? Why are these two individuals always resistant to full involvement in class activities?) and provided rich insight into the ACME students' behaviors, customs, and needs.

I gathered 15 discrete in-class observational entries throughout the evaluation, differing in length and topic. These entries included classroom observations, details about ACME students and their behavior, ideas, and theories about student behaviors, and brainstorming about how best to solve seminar-related problems (see Appendix C). Given the data's qualitative nature, I decided to code it jointly with the interview data.

Interviews. The richest source of data on the seminar was collected during interactions with ACME students, mostly in the form of individual and group interviews. Interviews were semi-structured, with the general purpose of identifying student perceptions on the course efficacy and validity, as well as identifying elements of seminar that worked well and potential areas for improvement. The interviews' semi-structured format was chosen strategically to enable flexibility for myself, as the interviewer, to react to the flow of conversation and explore element of the seminar the students opted to focus on in more depth, while also arming me with guiding questions to keep our

conversations focused. Table 5 outlines the guiding interview questions used.

       As a data collection method, interviews are typically phenomenological in nature; this interview structure is commonly used in qualitative data gathering (see Giorgi, 2009; Wertz et al., 2011). In this study, they more thoroughly illustrated ACME students' seminar experiences. ACME program administrators were keenly interested in the entire student experience—good, and bad—and believe that this deep dive would assist them in improving outcomes and student experience in the seminar. Interviews ranged from several minutes to nearly an hour in length, and were kept casual, non-judgmental, and open to promote optimal levels of student disclosure.

Table 5

Guiding Interview Question List

Questions
1. Should the seminar be required? Graded?
2. What effect(s) does the student-to-student teaching structure (i.e., lack of a SME) have? Do you think that students can teach soft skills to other students effectively?
3. How effective is students teaching each other?
4. How would you improve the seminar?
5. What value do you see in the seminar? Please be specific.
6. What was your experience with the seminar?
7. How does the seminar compare to other ACME electives (e.g., Competitive Coding)?
8. How does a small class size compare to a larger class size?

Data Analysis Procedures

       Qualitative coding is a means of transforming raw data into categories which can be used to better understand meaning and patterns in the data (Guetzkow, 1950; Coffey & Atkinson, 1996; Auerbach & Silverstein, 2003). Following the data gathering phase, I

compiled and segmented the three sources of data (i.e., in-class observation, survey responses, and interview) into meaningful units for interpretation. In-class observations as were interview data were coded and tabulated together to triangulate student perceptions on the seminar. Quantitative data from the weekly online surveys was aggregated and summarized. Students could also provide open-ended responses regarding aspects of each class they felt was important. Basic descriptive statistics were used for the analysis of quantitative responses (i.e., means, standard deviations, frequencies) to gain a general impression of students' perceptions about the class.

Data from in-class observations, interviews, and surveys were coded using an inductive coding method of categorization. These were compared with survey results and observation data, then verified through a triangulation process to identify patterns and insights that would help with the evaluation results and recommendations.

Evaluation Criteria and Standards

As the purpose of the evaluation is primarily to provide information regarding the current state of the soft skills seminar, and to suggest ways in which it might be improved for future iterations, the values for judging the evaluand are relatively undefined. That is, students were asked to evaluate their own experiences during the seminar (through survey and interview data) phenomenologically, describing their perceptions, feelings, and ideas however they saw fit, and with little direction regarding valuation. It was hoped that this approach would present a more objective perspective on the seminar's successes and shortcomings and leave the data for the decision-makers in ACME administration to make their best-informed decision. Ultimately, the ACME program administrators will

make decisions regarding the seminar's future based on economic and educational priorities—of which I consider myself unqualified to describe.

Results and Discussion

Prior to answering the guiding questions of this evaluation, I will present some general findings from the surveys, interviews and in-class observations. The post-class survey was fully completed 27 times throughout the Winter 2017 semester. Given that the survey was administered in a self-report format, this limits generalizability. I conducted 6 interviews with ACME participants and registered 3 personal recordings following interviewing students or seminar proceedings. Interviews varied in duration, from 9 minutes to nearly 45, according to each student's availability and willingness to discuss.

Qualitative data analysis (i.e., coding) yielded 58 distinct initial categories of a wide range (e.g., "Students teaching students"; "There are many ACME students ('mathy' types) who could benefit from this class"; "The seminar was applicable to real life", etc.). The category with the highest frequency "Students teaching students" showed 9 registered instances, and several categories ("ACME is hard - students work together to overcome it"; "Practical techniques and skills are preferred."; "There are many ACME students ['mathy' types] who could benefit from this class."; "ACME is hard - students work together to overcome it.") registered 8 each.

Drawing from these categories, I developed 8 superordinate categories, each with their own instance frequencies (see Appendix D) which I hoped would more realistically approximate the core elements in the seminar's successes and shortcomings. The superordinate categories with the highest frequencies were as follows: first, "The seminar provides novel content to the ACME program which is valued highly by students who

have taken the class" ($n = 17$); second, "The seminar is a social experience, which is the epitome of how soft skills are developed" ($n = 14$), and third, "We gathered several specific suggestions for improving the seminar" ($n = 13$). The analysis of these superordinate categories led me to the development of six principal claims (see Table 6).

This evaluation intended to accomplish the following: (1) determine the degree to which the seminar could be implemented autonomously by students, (2) determine the seminar's instructional efficacy in terms of perceived learning gains and skill development, and (3) identify ways in which the seminar's structure might be improved.

Table 6

Principal Claims—Soft Skills Seminar

Claims
1. Seminar demonstrates efficacy in helping students develop applicable soft skills.
2. Seminar is highly valued and considered the best elective course by some ACME students.
3. The seminar's social element is a key component of soft skill development.
4. Peer-to-peer instruction was an engaging element of this seminar iteration.
5. Students and evaluator identified clear improvements to peer-to-peer instruction.
6. Students and evaluator identified clear improvements to other seminar elements.

The results and discussion presented in this section are organized by evaluation question.

Feasibility of Implementing the Seminar Autonomously

Drawing from the data gathered, this student-led iteration of the ACME Soft Skills Seminar was implemented with reasonable success. In post-class surveys, seminar participants rated the class highly in various domains, chiefly in student participation, instructor preparedness, and quality of instruction (see Figure 1). This suggests that students believed the seminar to have been implemented well in these domains.

Implementation Efficacy

	Instructor Preparedness	Quality of Instruction	Student Participation	Module Quality
■ Students	4.87	4.61	4.74	4.35
■ Instructors	4	4.25	4.75	4.5
■ Combined	4.74	4.56	4.74	4.37
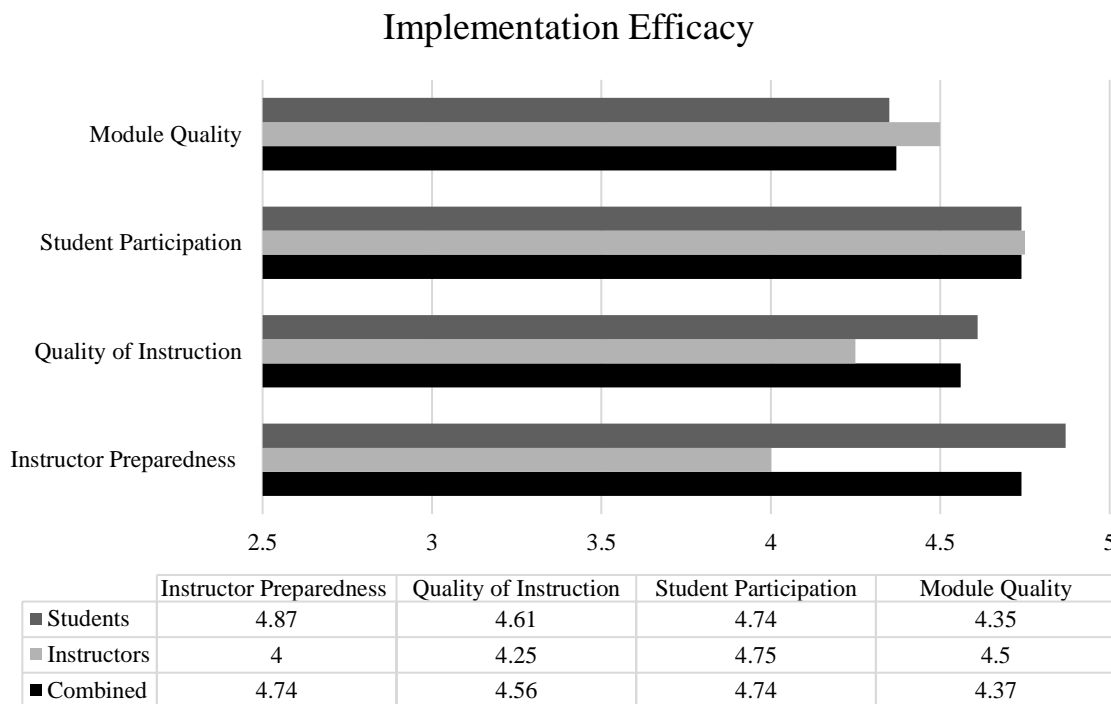
Figure 1. Soft Skill Seminar Survey. Presents survey results regarding seminar efficacy in various domains (e.g., "Instructor Preparedness"); results divided into 1) surveys completed by student instructors, 2) students who participated, and 3) combined.

There are interesting discrepancies between facilitator and student results in three domains: "Instructor Preparedness", "Quality of Instruction", and "Knowledge Gained" (see Figure 2). Facilitators who taught rated their preparation noticeably lower (4 out of 5) than participating students (4.9) and assessed instructional quality lower (4.3) than the students (4.6). This seems to indicate that student facilitators may have had a lower measure of confidence in their instruction than the students' perception of the instruction, and that students were perhaps more forgiving of facilitator preparation. Perhaps more interesting is the discrepancy in "Knowledge Gained", where facilitator ratings (4.5) were larger than student ratings (4.2), suggesting that facilitating a class increases perceptions

of knowledge gained compared to the perceived knowledge gains for those participating as a student. In each case students rating averages exceeded 4 out of 5 (with 4 = Somewhat Agree). Responses to the open-ended qualitative survey items ($n = 18$) ranged from positive to constructive. They highlighted valuable elements of the seminar as well as areas of improvement. Comments described the seminar as "fun", "enjoyable", "meaningful", "effective", and "valuable. This indicates that these students found various elements of this implementation effective.

One critical component of the seminar's efficacy is the extent to which it may be successfully implemented without extensive faculty oversight in future iterations; this was, after all, the reason this change to the seminar's structure was requested. Drawing from the data collected, it seems that students were able to teach topics (e.g., Teamwork and Collaboration) and facilitate activities (e.g., Group Scavenger Hunt) well enough given the resources made available to them. They were capable instructors and have the capacity to prepare well, deliver sound instruction, lead their peers, etc. However, the optional nature of the course—and especially the current, ungraded aspect—suggest that students will have a better experience with the seminar if a logistical facilitator assists them. It became apparent early on that I had to serve as a facilitator for both semesters, working with ACME department contacts to coordinate visitors (e.g., Google), assist students with syllabus-related questions, prepare student instructors, ensure that the students were aware of the seminar topic, and remind student instructor who was to be responsible for teaching in the upcoming week. These actions were relatively minimal and resembled logistical support more than content-specific knowledge, but they were nonetheless critical to the implementation success of this iteration.

Indeed, it would be foolish to presume that the data I collected suggest that ACME students would produce a quality seminar by themselves primarily because I did not use this model completely during either semester; I did not merely observe the students and note their failures—I intervened for the perceived benefit of the students. This being recognized, I suggest that a student of some kind (be it an undergraduate teaching assistant, graduate research assistant, or department liaison) would be needed to: (1) introduce the seminar structure during the first week of class, (2) coordinate seminar schedule with volunteering student instructors, (3) provide support to said instructors, (4) manage visits from company recruiters, and (5) generally enable seminar attendees to have a positive experience.

In summary, an analysis of these results indicates that the ACME Soft Skills Seminar's new iteration, utilizing a peer-to-peer instructional model, could be implemented with reasonable efficacy. However, this model is most likely to be implemented well only if student instructors are guided by a class facilitator who provides an understanding of course structure, arranges class visitations from companies, and offers general support to students.

Efficacy of Soft Skill Development and Perceived Learning Increase

Overall, the data indicate that students found the teacher-less, student-led format of the ACME seminar reasonably effective and engaging.

Soft Skill Development. The survey data indicate that both students and student instructors perceived significant knowledge gained and skills developed, with a slight edge to student instructors (see Figure 2).

Seminar Skill Development & Learning

	Skills Developed	Knowledge Gained
■ Students	4.22	4.22
■ Instructors	4.25	4.5
■ Combined	4.22	4.26
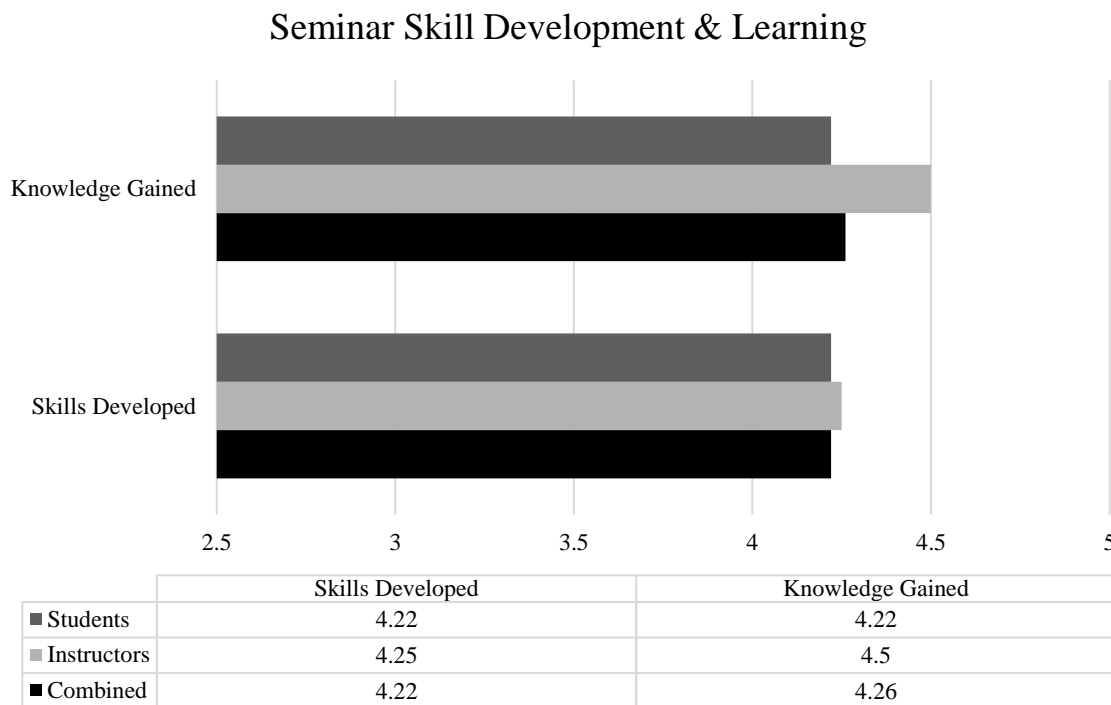
Figure 2. Soft Skill Seminar Survey. Presents survey results regarding seminar efficacy in various domains (e.g., "Knowledge Gained"); results divided into 1) surveys completed by student instructors, 2) students who participated, and 3) combined.

In view of the principal objectives of this study, the qualitative data indicate that the seminar enabled students to develop meaningful skills and have valuable learning experiences. In particular, this result suggests that participating as a student instructor is a valuable way for students to maximize their learning while participating in the seminar. Table 7 illustrates the most salient seminar elements which students identified as successful. Perhaps the most compelling quotation came from a student who gave his opinion on the seminar's efficacy relative to other ACME optional courses (e.g., Data Visualization, Competitive Coding). He said:

"I've taken those, and I think that (the soft skills seminar) is better because all of our classes are about technical skills... (With the others), you can Google it or

learn it on your own. With soft skills, I'd say you need more instruction and you

probably need somebody else to guide your education in that area."

Table 7

Qualitative Perceptions of Successful Seminar Elements

Comment Category	Examples	Frequency[7]
General Learning Efficacy	"The activity was the most effective part…because we could put in practice what we learned in the class."; "I think the paper tower activity was very effective."; "I learned a lot."	11
Specific Soft-Skill Learning Efficacy	"I think that was really beneficial just because in opportunities like the career fair and job interviews…learning how to adequately talk about my strengths, and how I want to brand myself."; "I find that I'm able to catch myself…and remember to say how it is."	21
Real-World Applicability	"(It's) real-world experience that isn't (readily) available"; "A big part of getting through the job is definitely being able to have a conversation and being able to relate to people, and have those other skills."; "The message of cutting through the BS was really helpful. That was probably one of my more memorable ones because it was very tangible...in everyday life, one of those lessons that can be applied here and now."	14
Student Engagement and Motivation	"It really left me thinking of what is the cost of becoming an excellent problem-solver, and it was really interesting because the whole class got involved in the conversation."; "For now, (the seminar) leaves me more motivated to spend more time doing math, because then I can understand what it takes...That's motivated me to work as hard as I can."; "There's an inherent need to participate in class."	4
Student Relationship-Building and Enjoyment	"I think we understand each other better because of (the seminar)."; "I've enjoyed the soft skill seminar! It's been useful and enjoyable to be with other students during that hour."	12
Seminar Value Versus Other ACME Optional Courses	"I've taken [the other courses], and I think that soft skills seminar is better because all of our classes are about technical skills…"; "If we were to rank them, I'd say that (this seminar) is number one, in importance."; "This class helped me win (a competition) more than the competitive coding class did."	5
Recognition of Course Value	"Many students pretend they don't need (the soft skills seminar), and those are likely the ones who need it most."; "It is nice to continually have a reminder of these things, and to discuss them again, [in] a group environment where you're able to discuss them, and to understand...how to apply them in my life, regularly."; "The person I know in ACME who is probably closest to a savant...very much wants to take this class, even though it's not available to him at the time. I feel like it's a valuable course of study."	18

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[7] 'Frequency' for Tables 7, 8, and 10 indicates the number of student comments in that domain, given the corresponding categories (i.e., codes) listed in the far left column.

Interestingly, this student had entered the seminar with a degree of apprehension, but his perceptions shifted dramatically after participating in the seminar more fully and he emphatically rated the seminar as the top ACME optional course. Comments like this one suggest various successes in this iteration of the seminar.

Various qualitative data points describe students as having developed tangible skills from participation in the seminar (see Table 8). These ranged from easily identifiable soft skills (e.g., communication, teamwork) to relatively nuanced ones (e.g., unspecified life skills from Dr. Humpherys).

Table 8

Comments regarding specific soft skill development

Comment Category	Examples	Frequency
Life Skills (from Jeff)	"I wanted to take the class because I thought Jeffrey was teaching it."; "Jeffrey is highly respected; students trust him."	3
Teaching & Facilitation Skills	"I think probably the most valuable thing in the (seminar), for me at least, was the opportunity to teach classes. I think teaching classes is beneficial because it's one of the things that I did a lot more of in the past…I don't get many opportunities to do group presentations…very often."	5
Salesmanship & Presentation Skills	"I think that was really beneficial just because in opportunities like the career fair and job interviews…learning how to adequately talk about my strengths, and how I want to brand myself."; "You may have all the technical skills in the world, but in the end, if you can't talk about it, it really doesn't matter."	5
Teamwork & Synergy	"The seminar is valuable because it's important to know how to express your ideas easily, as well as listen to others' ideas."	6
Problem-Solving	"It really left me thinking of what is the cost of becoming an excellent problem-solver, and it was really interesting because the whole class got involved in the conversation."	2
General Communication	"I hadn't ever really looked for jobs in the tech industry…but through the interviews, I was able to better talk with the more technical people because of things I learned in the course."	9
Self-Awareness	"I'm find that I'm able to catch myself…and remember to say how it is."	3
Introspection & Pondering	"I think it's valuable to have time to sit and ponder about how to apply these things."	2
Goal-Setting & Personal Management	"Students had time to plan activities and ideas for the future, which they otherwise might not have taken time to do."	2

Most saliently, students spoke highly of the skills they developed from serving as student facilitators; one student said, "I think probably the most valuable thing in the (seminar), for me at least, was the opportunity to teach classes. I think teaching classes is beneficial because it's one of the things that I did a lot more of in the past…I don't get many opportunities to do group presentations…very often". These data points illustrate the efficacy in soft skill development that the seminar had on these students.

Perceived Seminar Value.   Survey rankings coupled with qualitative data demonstrate student commitment to the course and its value. One student from the Fall seminar described his initial skepticism of the seminar, and how he became highly committed to and praiseworthy of the seminar's value:

"At first, I didn't like how there were a bunch of other students teaching, but by the end I grew to appreciate it because I enjoyed hearing other people's perspectives on the subjects…I enjoyed being one of the people that prepared and taught it because I got to dive deeper into it, which was helpful for me. …

"I really remember one of the lectures…it was great, I thought (the student instructor) did a really great job, but I also thought that the message…was really helpful. That was probably one of my more memorable ones because it was very tangible…in everyday life, one of those lessons that can be applied. …

"One thing that I found beneficial was that, in the curriculum overall, there were different ideas of how to get a job in the tech sector, and how to be a good employee once you get there. …

> "Yeah, I would (require the seminar for all ACME students), in particular because I see…students in my classes who struggle with these soft skills and I think that they could definitely benefit from this class."

This student found significant value in the seminar, placing even more value in it than the other, highly-respected ACME electives. In his words:

> "It was a nice break from other ACME things…it was good material that we don't get exposed to a lot (in ACME) … Most of us had applied for jobs, and had that experience, but it's nice to get more experience with group work and leadership, and all of the good stuff we talked about (in the seminar)."

These quotes illustrate the value of the seminar to students because this student entered the seminar with a degree of skepticism, and, after several transformative activities and the opportunity to teach, he found the seminar the most effective of any ACME elective. I do not expect equivalent results for every ACME student, but I am nonetheless optimistic that other students will find value in the seminar, as this student did.

Seminar Social Element. As discussed in the literature review, soft skills are, simply, interpersonal skills. It is therefore implicit that a class geared toward interpersonal skill development would require people interacting with each other as they practice building relationships. That being so, ACME students who participated in the Soft Skills seminar found value in it because it offers novel content—that is, interpersonal skills—to their largely technically-focused curriculum. Seminar students found value in various social elements (see Table 9).

Table 9

Salient Seminar Social Elements

Elements
1. Socialize and Apply Soft Skills with Peers
2. Conquer ACME Coursework as a Team
3. Developing Relationships with Peers
4. Practicing Teaching Skills
5. Participating in Student-led Instruction and Activities
6. Gaining Exposure to Soft Skills, and Resting from Hard Skill Content
7. Offering Opportunities for Introspection
8. Teaching & Facilitation Skills
9. Student-Facilitator Relationship

First, as an opportunity to apply soft skills with peers. Students supported this element with the following statements: "I've enjoyed the soft skill seminar! It's been useful and enjoyable to be with other students during that hour.", "I always feel like I got a lot out of the class when it was just open to discussion and nobody had the answer; that was kind of a turn from math classes in general.", "(The seminar is valuable because) it's important to know how to express your ideas easily, as well as listen to others' ideas.", "It is nice to continually have a reminder of these things, and to discuss them again, have a group environment where you're able to discuss them, and to understand…how to apply them in my life, regularly.", and, "Many of the kinds of discussions we have in here are the same kinds of discussions we have down in our study area.".

Second, conquer ACME coursework as a team. Students said that, "ACME was designed to break students so that they couldn't do it individually. The students weren't exactly aware that Jeffrey had created the seminar with the specific intent to require students to seek help from others. Knowing this may help to attract more students to the seminar as they seek to learn to help each other with their coursework.", as well as, "For now, (the seminar) leaves me more motivated to spend more time doing math, because

then I can understand what it takes to spend a 15-hour day working.", and finally, "We kind of pick (teamwork) up as we go along, but it's really good to keep that in perspective.").

Third, in developing deeper relationships with peers. When asked about whether the seminar assists ACME students in deepening relationships with peers, one student said, "I think it does, to some degree, yeah. I think we understand each other better because of (the seminar).", while another said, "I think it definitely helps, from what I've seen…I think the learning evens out when you get to the field…a big part of getting through the job is definitely being able to have a conversation and being able to relate to people, and have those other skills").

Fourth, in practicing teaching skills. This concept was described by several students, who described the importance and uniqueness of practicing their teaching skills in a major where hard skills are so emphasized. One student said, "This comes down to teacher preparation, which is kind of an eternal problem…when I've taught, it's easy to get into a discussion about whatever idea we're talking about and…rush through (the activity)"; another said, "(ACME) isn't like MCOMM where you have to give presentations and stuff like that, so it's nice to have a place where you still have to work on those things; I like the idea of it."; yet another said, "I think that we (ACME students) are capable facilitators of discussion; we're all intelligent and capable as teachers as a general rule."

Fifth, in participating in student-led instruction and activities. Students highly enjoyed learning from their peers, as evidenced by quotes emphasizing others' perspectives ("…It's very easy to say that they were very useful, insightful course

corrections along the way…I really enjoyed hearing other people's perspectives on the topics as well."), the energy derived from successful, student-led activities ("The excitement that good activities bring is incredible! Making great activities with strong content and high applicability is the best way to attract students to the class."), and the opportunities for student-run discussions ("I really like the students teaching because it fosters that discussion in the classroom.").

Sixth, in gaining exposure to soft skills, and resting from hard skill content. Nearly all students who were interviewed mentioned this element in one form or another. One student said, "I feel like (the seminar) is a nice break from the regular ACME routine because I feel like my brain is just going non-stop, and throwing on another computer-related class would just extend it, whereas this class…is a valuable use of time that wasn't as demanding as the alternatives"; another said, "It was a nice break from other ACME things…it was good material that we don't get exposed to a lot…Most of us had applied for jobs, and had that experience, but it's nice to get more experience with group work and leadership, and all of the good stuff we talked about".

Seventh, in offering opportunities for introspection. One student mentioned, "I think it's valuable to have time to sit and ponder about how to apply these things." When comparing the typical behavior of ACME students (i.e., generally shy, introverted, analytical, and precise) to the behavior elicited by the seminar (i.e., social, discuss topics with others, others-oriented, etc.), I feel comfortable in stating that students who participate in the ACME Soft Skills seminar will reliably experience a unique social experience that they would not otherwise have in their technical skill-drenched major.

Finally, the potential significance of the student-facilitator relationship. The social element of the seminar is perhaps best described by an exchange I had during a group interview with several seminar participants. During a Winter semester class period for which we believed Google was scheduled to visit—but was really for the following week—many more students than normal ($n = 25$) had arrived and were dressed to impress the recruiters. When they heard that the tech juggernaut would not be arriving for another week, though, nearly all the students filed out in exasperated fashion. This is to be expected; they hoped to see Google, and Google had not arrived, so they left.

But I did not expect what happened next: some students stayed anyway. These were students who had taken the seminar in the Fall, and we—the students, and I—had already developed a close bond and co-commitment to each other. We engaged in a 45-minute group interview about the seminar, the importance of social connection, and accountability. Below are a few notes from our interview which capture the scene:

"(One student) described the expression on my (Jacob's) face—as if to say, "Oh, is everybody leaving?"—when everyone got up to leave, and he stayed because he felt committed to my commitment to the class. The majority of the 25 people left because they did not feel a strong connection to the class or to the facilitator, and those who stayed were those with whom the facilitator had already developed a close working relationship. As another student said, "Part of what we decided is that, it's one hour a week for us, but it makes a huge difference to you, and so it seemed like a perfect opportunity to have giving so little mean so much."

"This appears to be at the very crux of the seminar—relationships. Friendships and social connection are…critical. I was considered an effective facilitator

because of the relationships developed - in and out of class. If a non-ACME

student got such a strong commitment from students, why couldn't they get the

same positive effects - or more - from a fellow ACME student?

"It strongly appears that commitment from the facilitator—and maybe by

association, the administration—is strongly correlated with student engagement

and seminar success. Though the role of the facilitator can be increased or

decreased, the depth of the relationship between facilitator and student

nonetheless positively affects course outcomes (i.e., attendance)."

This story emphasizes the unexpected finding of the importance of the student-

facilitator relationship. Students stayed because they were committed to the facilitator's

commitment and felt accountable and responsible for the class' success. In fact, one of

the students had an interesting idea, which I took note of:

"(One student) discussed his commitment to the seminar and began to draw the

correlation that, of those who stayed in the seminar during the Winter, it tended to

be those who participated most heavily in the Fall. Thus, a correlation between

participation, engagement, and commitment to the class seems apparent."

So, this student believes that the extent to which a student participates in the

seminar—and perhaps, by bold extension, in any class—directly affects their

commitment level to the class. As he later said, "There's an inherent need to participate in

class". This is significant because, if this predicted correlated were more deeply tested,

student commitment to individual classes could be augmented by encouraging higher

participation levels.

This finding is somewhat nuanced because, when I agreed to participate as an evaluator and facilitator for the class, my committee encouraged me to participate as peripherally as possible, and to witness the class' functionality as an outside observer. I did so with some efficacy during the Fall semester, although students would often solicit my opinions about course content in and out of class, which I gladly obliged in answering to the best of my ability. As the Fall semester morphed into Winter, though, the course's small size made it nigh unto impossible to continue in this fashion. I determined that, if the seminar were to succeed, I would need to facilitate more classes myself, participate as a student in classes, and engage with other students as their peers. I realize that this contradicted my committee members' advice, but I felt that I had no other logical option. I shifted into the role of a participant-evaluator, realizing that this change would irreversibly change the nature of the future data collected.

However, as I sat in the aforementioned group interview, I began to see the value of the closer, peer relationships which I had developed with these students. We trusted each other completely and valued each other's opinions, perspectives, and contributions. We showed loyalty to and investment in the success of each member, and the seminar, though scantly attended, became an incredibly warm, open, and encouraging atmosphere in which students felt free to fully express themselves and develop valuable skills together. It became an immensely edifying experience which we looked forward to each week, and often attended even at personal detriment (e.g., choosing to study for a test later, forgoing a free period, being tired or unmotivated, etc.).

In this interview and others following it, I asked the participants about their opinions on facilitator involvement in future iterations. Students believed, and I agree

with them, that the facilitator should be a graduate student—or even a motivated undergraduate Teaching Assistant—who serves mostly as a logistical aide, coordinating the schedule, providing teaching preparation assistance, acquiring teaching materials, etc. Students also agreed that the facilitator should participate in classes as I did, which would foster the mutual social commitment that made the seminar a success in this iteration. It is hoped that the continued inclusion of such a facilitator might continue to improve seminar efficacy and engagement.

Peer-to-Peer Instruction Efficacy

Students were also asked to rate the efficacy of their peers' instruction, or to self-assess if they had taught the class (see Figure 1). For students who taught, they gave themselves a 3.8 out of 5 for Question 1 ("I was prepared to teach [module]"; $n = 5$, $SD = 0.98$) and 4 out of 5 for Question 2 ("I believe that my quality of instruction was high in this class"; $n = 5$, $SD = 0.89$). This indicates that student facilitators felt moderately prepared to teach seminar classes, but still believed that the level of instruction was relatively high. For students who rated the quality of their peers' instruction, students gave a strong rating of 4.87 out of 5 to Question 1 ("The instructor was prepared to teach [module]"; $n = 23$, $SD = 0.34$) and 4.61 out of 5 to Question 2 ("The quality of instruction was high in this class"; $n = 23$, $SD = 0.71$). These results indicate that, though student facilitators may have felt less than prepared, their peers rated their perceived preparation levels more highly than the student facilitators rated themselves, and that students rated their peers' instructional quality as higher than the student instructors rated themselves (see Figure 1). Hopefully this begins to provide some credence to the perceived efficacy of student-led seminars, and the importance of prepared instructors.

ACME students rated their peers' instruction levels highly and gave themselves high levels of in-class participation (see Figure 2). Coupling this data with in-class observations of interview data, seminar students demonstrated high levels of engagement, soft skill development, and social interaction with the new implementation of student-facilitated classes. Table 10 contains comments specifically addressing the student-facilitated classroom format and its efficacy.

Table 10

Comments Regarding Student-Facilitated Classroom Format

Comment Category	Examples	Frequency
Positive Perceptions of Students Teaching Students	"I really like the students teaching because it fosters that discussion in the classroom."; "At first, I didn't like how there were a bunch of other students teaching, but by the end I grew to appreciate it because I enjoyed hearing other people's perspectives on the subjects...I enjoyed being one of the people that prepared and taught it because I got to dive deeper into it, which was helpful for me."; "I think that students teaching students worked out really nicely."	9
Student-Facilitated Discussions Increased Student Engagement	"The first time we had other students (teaching) the class, I know it helped me pay attention a lot more. In most of my classes, I have trouble focusing on what they're saying...but, I got pretty engaged when one of the students who had prepared pretty well was giving a good lesson. It definitely helped me out and I think it worked pretty nicely."	8
Perceptions of the Value of Acting as Instructor	"I think probably the most valuable thing in the (seminar), for me at least, was the opportunity to teach classes. I think teaching classes is beneficial because it's one of the things that I did a lot more of in the past...I don't get many opportunities to do group presentations...very often."; "(ACME) isn't like MCOMM where you have to give presentations and stuff like that, so it's nice to have a place where you still have to work on those things; I like the idea of it."; "(It's) real-world experience that isn't (readily) available"	5

That students support the efficacy of peer-to-peer instruction has already been established; reiterating that seems redundant. Rather, I wish to focus on one element relevant to student-led seminars which a student described:

"I don't think there necessarily has to be a trained instructor; there just has to be

an *information gradient*."

According to this student, an information gradient is the information which a subject

matter expert possesses (e.g., real-world expertise, advanced knowledge and research,

etc.), and an untrained student does not. This information gradient provides the edge to

trained instructors as they convey information packaged in practical experience that could

not be gained otherwise. It is precisely this element that we aimed to measure from the

onset of this project—i.e., can students effectively attain an acceptable level of perceived

competency in their instruction?

The data show that students' perceived competency of their own teaching was

lower than their perceptions of the other students', but nonetheless registered high

rankings on both accounts. Additionally, students believed that an effective information

gradient could be provided through preparation with the pre-prepared slides. One student

said, "I think that the compliment of (a facilitator) helping (students) prepare, I think

they're just as prepared (as a teacher would be).", and another said, "As I reviewed the

prepared slides, I began to better understand the point that was being driven. When I was

able to do that, I was able to go and find my own resources that I thought helped me

understand it, personally."

Students perceived that their peers were just as capable as formal instructors with

proper preparation. This preparation ranges from the facilitator aiding with in-class

activities, personal perusal/rehearsal of materials before class, and the acquisition of

additional resources that augment instruction. From the students' perspective, this

preparation effectively bestows a perceived information gradient upon instructors.

In summary, the results of this study seem to indicate that ACME students consider various elements of the soft skill seminar effective in fostering soft skill development, learning, and growth.

General Seminar Recommendations

This section identifies program improvements that can be instituted into the seminar which do not overtly relate to teacher-less instruction. It is implicit that there are multitudinous potential areas of improvement; that said, the data suggested the following domains of program improvement during the evaluation process. Table 11 displays the most significant of these recommendations; I further discuss each in this section. Items 1 through 7 are the likely the most important of these; items 8 through 13 deserved mention but are probably not as critical to the seminar's continued success.

      Increase Class Size (15-25 Optimal). As has been stated already, student attendance for the Winter semester was extremely low, with 1 student being formally registered and 5 other students (who attended the seminar in the fall) who voluntarily attended. Various factors contributed to the low attendance. First, ACME students though that the seminar's content in the winter semester would be identical to the previous semester— even after we clearly and repetitiously announced otherwise. This was a strange occurrence, one that I admit I still do not fully understand. It could be that past iterations of the class—including during the Fall 2016 semester—left a negative impression of the class, and thus students felt less inclined to register. In my opinion, however, I believe that students viewed the seminar as more of a "one-off", to take once and not again. I am pleased with the number of students from the Fall 2016 semester, and I hope that, with greater organization and clarity of communication to the students, we

can moderate class sizes throughout both semesters.

Table 11

Recommended Improvements to Seminar

Recommendations
❖ Increase Class Size (15-25 Optimal)
1. Provide Seminar Grade
2. Use Student Facilitator (Logistics)
3. Solidify Seminar Structure
4. Continue to Improve Peer Instruction
5. Regulate Seminar Workload
6. Emphasize Practicality in Instruction
7. Invite Company Recruiters & Local Company Representatives
8. Set Enrollment Cap
9. Increase Appeal to 'Mathy Types'
10. Produce Deliverables
11. Emphasize ACME Student Camaraderie
12. Increase Food & Other Motivators
13. Combine ACME Electives (Seminar + Data Visualization)

Second, there are several low-credit, elective courses in the ACME program
which pull students away from the seminar (i.e., the Soft Skills Seminar, Data
Visualization, & Competitive Coding). These classes are distinctly hard-skill focused,
though students often view these classes as superfluous. One student said:

"This class helped win (a competition) more than the competitive coding class did
… I've taken those (other ACME electives), and I think that soft skills is better
because all of our classes are about technical skills … (With the others), you can
Google it or learn it on your own. With soft skills…you need more instruction and
you probably need somebody else to guide your education in that area."

However, elective courses in the ACME department at least appear to be more relevant to ACME students' needs than a soft skills seminar; as one student said, "Data visualization sounds more exciting, it sounds more 'ACME'". Though the data we gathered shows substantial support for the soft skill seminar's value relative to other classes (e.g., "I think that was really beneficial just because in opportunities like the career fair and job interviews …learning how to adequately talk about my strengths, and how I want to brand myself."; "Problem-solving is just as important as coding - this is nearly a direct quote from Google representatives. Essentially, he was saying that the value in soft skills is there."; "I hadn't ever really looked for jobs in the tech industry…but through the interviews, I was able to better talk with the more technical people because of things I learned in the course.", etc.), it appears that some students still find the class less applicable to ACME-related outcomes. This may be because, as Jeffrey and ACME students have repeatedly mentioned, ACME students that register for the soft skills seminar might possess greater self-awareness and proclivity toward soft skill development than their peers (e.g., "ACME is filled with lots of 'mathy' people who…are very known for not being very open. You give them an assignment, they do it, and they're done. I know that it's important to have all the other (soft skill) aspects, too."; "Many students pretend they don't need (the soft skills seminar); those are likely the ones who need it most.", etc.).

Third, related to the previous paragraph, the other ACME electives present their students with actual grades, rather than a pass/fail distinction. The students I interviewed said that this is a small but powerful motivator for students. One said, "Other classes in ACME are super easy, but they offer a grade; students opt for that to boost their GPAs.";

another, "If it was for a grade, getting some kind of credit for needing to teach, or getting some kind of group to teach as some kind of participation grade…that could help out." This appears to have a simple and obvious solution.

Fourth, there was a scheduling conflict with the Data Visualization class during the Winter semester seminar which reportedly (albeit unwittingly) pilfered students from the seminar. Jeffrey acted quickly and solved the scheduling conflict, and the teacher for Data Visualization was cooperative, but the damage appeared irreversible by the time the conflict was resolved; no students transferred to the seminar from Data Visualization.

Though the results are generally positive, I am disappointed by the scant number of overall quantitative responses (i.e., 30) collected during the Winter semester; this number is correlated to the number of students who regularly attended class in that semester ($n = 6$). Had the seminar been regularly attended by the same number of students as attended during the Fall semester ($n = 27$), we would likely have generated 5-10 times the number of survey results, and I would feel more confident in generalizing the quantitative results. However, at worst, the quantitative data gathered provides some triangulating support for the qualitative data, and at best provides some evidence that ACME students find value in the seminar. As one student said, "The person I know in ACME who is probably closest to a savant…very much wants to take this class, even though it's not available to him at the time. I feel like it's a valuable course of study."

In my opinion, the primary strategy to increase seminar attendance in the future will be through positive word of mouth between students, who will promote the seminar if they have a transformative experience in it, which is predictably fostered by high levels of participation and commitment to the seminar and peers.

Based on my observations, students who participated well during the Fall seminar were: first, more engaged in the Winter seminar, particularly among those that volunteered to teach/facilitate a class. For example, one student said, "The first time we had other students (teaching) the class, I know it helped me pay attention a lot more. In most of my classes, I have trouble focusing on what they're saying…but, I got pretty engaged when one of the students who had prepared pretty well was giving a good lesson. It definitely helped me out and I think it worked pretty nicely."; second, found greater value in the seminar overall. A student said, "You may have all the technical skills in the world, but in the end, if you can't talk about it, it really doesn't matter."; and third, students were more likely to recommend it to their peers. When asked if he would recommend the seminar to other ACME students, or even require ACME students to register for it, he said, "Yeah, I would actually, in particular because I see…students in my classes who struggle with these soft skills and I think that they could definitely benefit from this class, but the problem is that they would never choose to attend it on their own. Maybe it's a lack of self-awareness, maybe it's a sense of pride, and maybe they just don't care, but I think that they would benefit from it." This seems to suggest that a powerful way to increase seminar attendance would be to require all ACME students to register, an idea which was suggested and supported by some seminar attendees. But, the extent to which this would work could only be determined after an implementation of that model; ACME program administrators will determine if this course of action is in their best interest for future iterations.

Though the Winter 2017 semester seminar attendance was low, I hope I have provided

sufficient rationale to suggest the reasons for this are well-documented, and that methods

to bolster future attendance are clear.

   Provide Seminar Grade. Another suggestion students gave was to provide a

grade instead of a pass/fail distinction for seminar attendees. One student said, "If it was

for a grade, getting some kind of credit for needing to teach, or getting some kind of

group to teach as some kind of participation grade...that could help out." Others said that

the incentive to work hard in classes is increased when a grade, even in a low-credit

seminar, is up for grabs. With many difficult classes and many high-powered people in

the ACME program, this seems an easy way to attract more students. Attached to this

idea, one student suggested that student ratings of teacher instruction be integrated into

the overall grade; peer rating could prove an interesting grading addition.

   Use Student Facilitator (Logistics). Students suggested using a student

facilitator (graduate student or undergraduate TA) to coordinates seminar logistics (e.g.,

student teaching readiness, activity preparation, scheduling, etc.). This point has been

brought up in previous sections, but it is so important that it bears repeating; of all my

recommendations, I stand behind this one most firmly. Not only could this be a great

addition to the seminar and preserve the 'teacher-less' feel of the class, but this could be

an excellent potential job opportunity for someone interested in teaching soft skills,

continuing the growth and efficacy of the class, etc. Additionally, having a facilitator who

not only arranges logistical operations, but who also has subject matter expertise could

improve upon the supposed information gradient between students and instructors, and

contribute to the overall quality of instruction and perceived validity of the course.

Solidify Seminar Structure. Student felt a need to solidify the seminar structure (e.g., syllabus, expectations, etc.) and ensure facilitator preparation well in advance. I attempted a risky innovation to the seminar, which did not work as well as I hoped; I'll describe that now. Throughout my experience in higher education, each semester begins with a ponderous introductory period where the professor attempted to show excitement while reviewing a syllabus. I had grown to detest such days, and so I attempted to dive straight into the instruction on the first day of class and allow the students to review the syllabus on their own time. However, I soon realized why teachers sacrifice the first period of their semester: because students are *much* less likely to sit down and review the syllabus outside of class. As one student said, "If I had been able to set better expectations up front, I could have better anticipated how to use that class in my life, but even that said, it didn't take too long to get into the class structure." This is reassuring because there was a relatively short recovery period, and the student then felt comfortable with the seminar structure and feel. However, it seems an easy fix to spend a few minutes reviewing in class—or even, as was suggested by another student, having students review it prior to the first class.

Continue to Improve Peer Instruction. While peer-to-peer instruction was found to be effective from students' perspective, it can certainly be improved upon. These improvement domains seemed to be reasonable enough to preclude a redundant defense of their inclusion in this list. Suffice it to say, these are specific improvements that students identified that would benefit the seminar's next iteration (see Table 12).

Table 12

Recommended Improvements to Peer-to-Peer Instruction

Recommendations
1. Use Facilitators with Subject Matter Expertise
2. Allow Flexibility with Module Modification
3. Encourage Students' Use of Outside Resources
4. Enable Teams of Students to Present Jointly
5. Check-In with Facilitator Before Class
6. Train Students Further in Presenting Skills
7. Encourage Instructors to Focus on Activities
8. Consider Reducing Modular Content
9. Announce Teachers Before Class

First, the students and I recommended using a facilitator with subject matter expertise, if possible. As one student said, "I think that the compliment of (a facilitator) helping (students) prepare, I think they're just as prepared (as a teacher would be)."; another acknowledged that "a facilitator who is also familiar with the content and who participates in class is very relevant and beneficial for the seminar." This subject matter knowledge will improve on the information gradient discussed in Claim 4.

Second, students requested increased flexibility with prepared modules. In my notes, I recorded, "Having the prepared PPs [PowerPoint presentations] is a good idea, but giving students flexibility (e.g., allow them to edit PowerPoints, add content, etc.) is [also] a good idea. It would be difficult to fully regulate, but it would likely increase teacher engagement." Facilitators may have rated their preparation lower because they felt a lower degree of connection to the subject matter; perhaps increased control over instructional materials would increase their desire to prepare, and lead to an improved seminar experience—for facilitators and students alike.

Third, students suggested the idea of using outside resources to assist them in their instruction. Students highly supported this idea; one said, "As I reviewed the prepared slides, I began to better understand the point that was being driven. When I was able to do that, I was able to go and find my own resources that I thought helped me understand it, personally."; another said, "This way, the seminar is student organized and not necessarily student-taught." Later, one student used footage of an interview with his mission president about leadership and showed the video in class.

Fourth, teams of students could present together. As one student said, "I think it would be hard for them to work with someone they haven't been working with all the time. I know that my group works together every day, all day, but I think a lot of kids sit around in two particular rooms…I don't know how well they are branching out and working with new people … Having students present together could help that." This being a class focused on interpersonal skills, this seems an effective innovation.

Fifth, students could check in with the facilitator before class, especially to verify preparations with the in-class activities. In my notes, I wrote, "One idea that we could use to improve instruction is to have student presenters briefly check in with the class facilitator. That way, they could verify that the material is understood, the activities are clear, and that other questions can be addressed before class begins."

Sixth, students should be trained in presenting and facilitation. Students are trained in presentation skills during the first module in the second semester, but perhaps this could be emphasized and improved further.

Seventh, continue to encourage student instructors to focus on in-class activities. In my notes, I wrote, "There's a difficult balance to be had with having prepared

instruction, because it's completely dependent on the students' preparation before class. Regardless of what happens, students need to focus on improving their understanding of and preparation for the activities.

Eighth, some students suggested that we reduce modular content as needed. Following an interview, I recorded, "The modules might need to be cut down in content, but if we do that we'll risk not enough content. This should be gauged in future iterations and adjusted accordingly." This could potentially be difficult because the modules were constructed in a decidedly lean format, and further content reduction might drastically reduce the quality. However, it is valuable to consider moving forward.

Finally, ninth, announce student teachers before class. I began this during the Fall semester to build excitement for their peers' teaching and the students responded very positively to it. I believe that this could be a simple and valuable practice to continue for future iterations.

Regulate Seminar Workload. The amount of work and effort required of seminar attendees should be carefully regulated and adjusted according to student needs. This may appear directly contradictory to the previous paragraph, but I include this because of student comments on the subject. These students mention that, in other classes, class time is mostly spent waiting for the professor to gradually release the answers to upcoming quizzes in the classic lecture format. Following an interview with one student, I wrote, "Limit (the amount of work required for students) - don't make it too intense; don't make it a burden. It's critical to keep this light for students, in terms of their cognitive load." Instead of a heavy, dreary course, the seminar ought to be an engaging *experience*, where ACME students engage in content that they would not normally

experience in their major. To optimize this experience, students requested that the effort required of students—in and out of class—be carefully regulated.

Emphasize Practicality in Instruction (Especially Activities).   Emphasize practicality in instruction, especially in the in-class activities and discussions. ACME students are exceptionally pragmatic, and practically-focused. This is a great attribute for someone in a technical field, but some students mentioned that the activities they experienced did not fulfill their expectations in practicality, and requested that they be created to resemble real-world situations more closely[8]. As I included in my notes following an interview, "Students are looking for specific techniques and strategies that are applicable. Discussion is great, but they want solid take-aways (e.g., public speaking's clock face)." Jeffrey mentioned as the course came together that students are not interested in fluff. That much is true, but, unfortunately, student instructors, either due to a lack of preparation or teaching expertise, sometimes introduced more fluff through in-class discussions and superfluous questions than one might expect. One student said, "Somehow, do a better job of getting good content up in the instruction. If someone could walk away saying, 'I feel enriched', or, 'there's more information in this lesson than I could possibly process', or information that I couldn't have gotten from another source." This student indicated in other parts of the interview that he loved the activities and discussions which the seminar prompted, and that he hoped to see more of them. Indeed, he mentioned that, in his opinion, "The activities we've done are very, very useful…the longer activities do more than the shorter ones." When I mentioned that the activities

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[8] *Though, often a primary reason for the lack of compelling activity was not its inclusion in the prepared modules, but its lack of exposition and preparation by student facilitators. For this purpose, I ask that student instructors be asked to prepare well for each class and include this piece in their overall grade.*

were indeed the crux of my instructional design process, and that their lack of integration

was more likely a lack of student preparation, he agreed. So, there is certainly a difficult

dynamic between desired practicality in instruction, instructor preparation, and quality of

prepared modules; this will have to be further scrutinized in future iterations.

Invite Company Recruiters & Local Company Representatives. Continue

bringing recruiters from top companies, but also consider bringing in local companies in

the field as non-recruiters. Students found great value in the visits from great companies

such as Google, Goldman Sachs, and Intermountain Healthcare; on the topic, one student

said, "I do like to see (seminar activities) complimented with companies coming. We can

talk theoretical, but they can talk about, you know, 'these are the things you have to do',

kind of thing", and another agreed, saying, "One of the most fun parts of this class is

when companies come in, and that's stayed fairly constant." However, one student

posited the idea that smaller, local companies visit the seminar and talk about their work

and how it relates to ACME. In this way, it would be less of a recruiting visit, and more

of an informative description of how applied math looks in business. Again, perhaps a

seminar facilitator could assist the ACME department in arranging these visits.

Set Enrollment Cap. Consider placing an enrollment cap on the seminar to

improve in-class functionality and increased commitment, accountability, and

participation. The literature suggests a class size of 25-30, which would be optimal; in

that case that this number of students did not register, however, I believe that a class size

of 15-20 could also be effective. This contributes to the idea that small class sizes

implicitly foster higher participation levels and, by association, higher accountability and

commitment to the class. Supporting this, one student said, "There's definitely an

increased feeling of responsibility (in a smaller class size)", while another said, "There's an inherent need to participate in class."

Increase Appeal to 'Mathy Types'. Given the seminar's current makeup, it will likely not appeal to every ACME student. I am pleased with the success we experienced this year, but I worry that the ACME seminar will continue to appeal largely to those with relatively higher self-awareness and struggle in reaching those who need it most. I did not spend enough time with exceptionally introverted or 'awkward' ACME students—the excessively 'mathy types' described in some interviews (e.g., "Many students pretend they don't need (the soft skills seminar); those are likely the ones who need it most")—to establish patterns in their behavior and begin to predict how we might be able to better help them. I believe that these students could benefit from the seminar, but I wonder how it might become interesting to them if they are, at their root, generally unwilling to socialize or uncomfortable in social situations. To maximize the efficacy of the seminar, I believe that more data about these students must be gathered and compared to the types of students who have heretofore been willing to register for the seminar. Furthermore, I believe that the institutional action of requiring all students to register for the seminar may be perceived as foolish or unnecessary by the students who do not wish to take it. Their negative attitude toward being obliged to participate in a course they do not believe they need might lessen their potential growth and development. However, these are merely conjectures with little substantiating data; I would recommend trying anything that has the potential to help the students, and to continue to gather data on alternatives. As we continue to seek to understand what constitutes ACME students and their needs, I believe that the ACME program will be better suited in attracting that

demographic to the seminar.

Produce Deliverables. The seminar's efficacy could be further enhanced by having students produce deliverables (e.g., resumes, interviewing skills, examples of leadership or teamwork, etc.) that are accomplished outside of class. In my notes, I reasoned that guest lecturers could be coupled with a project that the students work on after viewing the presentation. The structure of such an addition would require further planning, but I believe it makes a strong case in improving the seminar.

Emphasize ACME Student Camaraderie. The seminar presents a great opportunity for students to bond together, such that they are better prepared to tackle ACME coursework as a team. In my discussions with Jeff, the ACME program is designed to be more than any one student—no matter how bright—can handle. Some students are aware of this, but many are not (e.g., "Jeffrey knows that (ACME is designed to be almost impossibly hard)?"). When new students enter the ACME program, the seminar could be presented as a way to facilitate working together such that they experience greater success in the program. The ACME students which have participated in the seminar appear to be some of the highest-performing students in the major; perhaps that correlation could be identified and pitched to potential seminar-goers.

Increase Food & Other Motivators. Bring food and other motivators to seminar activities more consistently. This may appear a trivial, almost petty request, but students were nonetheless in favor of having food periodically brought to class. One student mentioned, "Food...is a really good idea and gets people there. It's a 3pm seminar – everybody's hungry and they want a chance to eat", and another said, "If you can take a break, and have some food, especially at 3 in the afternoon, that's a good idea." Students

remember that Jeffrey offered more food for students when announcing the winter semester seminar, and, likely because Jeffrey had an exceptionally busy semester, he did not provide as much food as students expected. Perhaps one function of the seminar facilitator could be to arrange periodic refreshments for seminar attendees, or, as I considered in my notes, organize a potluck meal or snack.

Combine ACME Electives (Seminar + Data Visualization). Consider combining the seminar with the data visualization class and label the class "Communication & Presentation Skills", "ACME Communication Class", or something similar. During an intense group discussion, students excitedly happened upon this idea and suggested the fusion as a way to attract those interested in hard and soft skills. A student said, "Data visualization sounds more exciting, it sounds more 'ACME'...if there was a good way (to combine them) ... (that'd be good)", and another said, "Improve your communication skills - both soft, and technical - would be good." This would be a recognizably larger project than the students who suggested it likely realize, but it nonetheless presents an alternative not previously considered.

In summary, ACME students identified many specific ways in which the seminar may be improved in future iterations. Again, items 1 through 7 are the most important of these and bear my strongest recommendation; items 8 through 13 deserved mention but are not as critical to the seminar's continued success.

Conclusions

The extent to which this implementation evaluation succeeded is dependent on its purposes, which are to: (1) determine the degree to which the seminar could be implemented autonomously by students, (2) determine the seminar's instructional

efficacy in terms of learning gains and skill development, and (3) identify ways in which the seminar's structure might be optimized; these are answered below.

The implementation evaluation had mixed results. Several aspects of the seminar worked well (e.g., students teaching students, enhancement of soft skills abilities, etc.), and others require iterative improvement (e.g., making expectations clear up-front, incorporating a grade rather than pass/fail structure, etc.). Overall, the results suggest that the newest iteration of the seminar could be implemented autonomously in that student were able to present the materials well enough. The course structure was adopted efficaciously by student participants, who largely took full accountability for the quality of their instruction and generally did great work in instructing their peers. However, it is unlikely students could run that seminar on their own. There would need to be someone to manage the logistics of the course.

In terms of the seminar effectiveness in developing understanding and skill, participants found the student-facilitated model of the class effective in developing new skills, highly engaging (from both teaching and participation perspectives), and successful in fostering peer relationships, cultivating meaningful discussion, and growing from the perspectives of others. Though it would be foolish to generalize this one, small sample to all student-facilitated, teacher-less classes, the success of this seminar nevertheless illuminates its potential for further exploration—especially where departmental constraints threaten to limit faculty involvement, and/or in the presence of departmental economic strain.

In terms of how the course might be improved, the most promising suggestions include: providing a seminar grade, regulating student workload, emphasizing practicality

as the soft skill modules are accessed and updated, and to consider how best to appeal to those students who need the seminar most ('mathy types'), but who would like avoid participation.

Epilogue

When I learned that only one student had registered for the winter seminar, I was terrified. I doubted myself, the modules' validity, and the seminar's ability to attract ACME students. Due to their incredibly busy semesters, many ACME contacts were unable to assist me as thoroughly as I or they had hoped. It seemed that the seminar would fail. However, I was reminded many, many times of the goodness of people, and their ability to snatch victory from the jaws of defeat when placed in a trying circumstance. Students from the previous semester stepped forth and volunteered to teach, be interviewed, and contribute in meaningful ways. I am immensely grateful for these students and their kindness, candor, and willingness to support me.

Soft skills can indeed be developed in a seminar taught by students, to students—of that, I am now confident. However, it is of course obvious that students will require much more exposure to and practice of soft skills to master them. As one student said, "I feel like all the things in this class have been effective reminders...I think you can kind of compare it to why we go to church every week. You're not going to hear anything groundbreaking and new, but I think that I saw what I learned here more as course corrections—little deviations from what I was doing. That may not be the case for everyone, but I just felt like...it's very easy to say that they were very useful, insightful course corrections along the way." It appears to me that we learn in a similar way—

perhaps lessons which appear relatively meaningless to us in the moment, show their true power after repeated exposure and careful reflection.

As I near the completion of this project and examine its efficacy, I have often asked myself if I accomplished what I aimed to. For me, it seems that success in this seminar would equate to leaving these students better-equipped to live their lives and perform their typical responsibilities, but with increased confidence, motivation, and zest. One student lifted my spirits in this regard as he reflected, "For now, (the seminar) leaves me more motivated to spend more time doing math, because then I can understand what it takes to spend a 15-hour day working...That's motivated me to work as hard as I can so that I can be motivated to work hard at work, and at home." This statement and others like it have me convinced: we have a long way to go, but we have done well.

I hope that the ACME Soft Skills seminar continues to improve, grow, and bless the lives of students who register. I am immensely grateful for my opportunity to participate in it, and to do engage in something difficult with such brilliant, thoughtful, and incredible students. I am thankful for the effort which this project required, and for the growth I personally experienced as I sought to learn to improve this great seminar. As Leibniz said,

"He who hasn't tasted bitter things, hasn't earned sweet things."

References

Anderson, L. W. (1981). *Assessing Affective Characteristics in the Schools*. Boston: Allyn and Bacon Inc.

Auerbach, C., & Silverstein, L. B. (2003). *Qualitative data: An introduction to coding and analysis*. NYU press.

Bedwell, W. L., Fiore, S. M., & Salas, E. (2014). *Developing the future workforce: An approach for integrating interpersonal skills into the MBA classroom*. Academy Of Management Learning & Education, *13*(2), 171-186. doi:10.5465/amle.2011.0138

Brown, J. S., Collins, A., & Duguid, P. (1989a). Situated Cognition and the Culture of Learning. *Educational Researcher, 18*(1), 32-42.

Breuer, K., Molkenthin, R., & Tennyson, R. D. (2006). Role of Simulation in Web-Based Learning. In H. F. O'neil & R. S. Perez (Eds.), *WEB-BASED LEARNING: Theory, Research, and Practice* (pp. 307-326). Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

Brinthaupt, T. M. (2010). *Development and implementation of an online careers seminar in psychology*. Teaching Of Psychology, *37*(1), 58-62. doi:10.1080/00986280903425953

Brydges, R., Dubrowski, A., & Regehr, G. (2010). A new concept of unsupervised learning: directed self-guided learning in the health professions. *Academic Medicine*, *85*(10), S49-S55.

Coffey, A., & Atkinson, P. (1996). *Making sense of qualitative data: Complementary research strategies*. Sage Publications, Inc.

Conley, C. S., Travers, L. V., & Bryant, F. B. (2013). *Promoting psychosocial adjustment and stress management in first-year college students: The benefits of engagement in a psychosocial wellness seminar*. Journal Of American College Health, *61*(2), 75-86. doi:10.1080/07448481.2012.754757

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass.

Dixon, J., Belnap, C., Albrecht, C., & Lee, K. (2010). *The importance of soft skills*. Corporate Finance Review, *14*(6), 35–38.

Doo, M. Y. (2006). *A problem in online interpersonal skills training: Do learners practice skills?*. Open Learning: The Journal Of Open And Distance Learning, *21*(3), 263-272. doi:10.1080/02680510600953252

Francescato, D., Solimeno, A., Mebane, M. E., & Tomai, M. (2009). *Increasing students' perceived sociopolitical empowerment through online and face-to-face community psychology seminars*. Journal Of Community Psychology, *37*(7), 874-894. doi:10.1002/jcop.20338

Gbadamosi, G. (2015). *Should we bother improving students' attendance at seminars?* Innovations In Education And Teaching International, *52*(2), 196-206. doi:10.1080/14703297.2013.796717

Giorgi, A. (2009). *The descriptive phenomenological method in psychology: a modified Husserlian approach*. Pittsburgh, PA: Duquesne University Press.

Goleman, D. (2000). *Leadership that gets results*. Harvard Business Review, *78*(2), 78–90.

Guetzkow, H. (1950). Unitizing and categorizing problems in coding qualitative data. *Journal of Clinical Psychology*.

Hackman, J., & Oldham, G. (1976). *Motivation through the design of work: Test of a theory*. Organizational Behaviour and Human Performance, *16*(1), 250–279.

Hatcher, R. L. (2015). *Interpersonal competencies: Responsiveness, technique, and training in psychotherapy*. American Psychologist, *70*(8), 747-757. doi:10.1037/a0039803

Hiemstra, R. (1994). Self-directed learning. *The sourcebook for self-directed learning*, 9-20.

Holland, J. G., & Skinner, B. F. (1961). *The analysis of behavior: A program for self-instruction*. New York: McGraw-Hill.

Jaarsma, A., de Grave, W., Muijtjens, A., Scherpbier, A., van Beukelen, P. (2008). *Perceptions of learning as a function of seminar group factors*. Med Educ *42*(12), 1178–1184.

Knowles, M. S. (1975). Self-directed learning.

Leibniz, G. W. (1902). *Leibniz: Discourse on metaphysics* (No. 52). The Open court pub. co.

Littlemore, J. (2001). Learner autonomy, self-instruction and new technologies in language learning: Current theory and practice in higher education in Europe. *ICT and language learning: A European perspective*, 39-52.

Long, C. R., Ackerman, D. L., Hammerschlag, R., Delagran, L., Peterson, D. H., Berlin, M., & Evans, R. L. (2014). *Faculty development initiatives to advance research literacy and evidence-based practice at CAM academic institutions*. The Journal Of Alternative And Complementary Medicine, *20*(7), 563-570. doi:10.1089/acm.2013.0385

Marques, J. (2013). *Understanding the strength of gentleness: Soft-skilled leadership on the rise*. Journal Of Business Ethics, *116*(1), 163-171. doi:10.1007/s10551-012-1471-7

Massingham, P., & Herrington, T. (2006). *Does attendance matter? An examination of student attitudes, participation, performance and attendance*. Journal of University Teaching and Learning Practice, *3*(1), 82–103.

Mebane, M., Porcelli, R., Iannone, A., Attanasio, C., & Francescato, D. (2008). *Evaluation of the efficacy of affective education online training in promoting academic and professional learning and social capital*. International Journal Of Human-Computer Interaction, *24*(1), 68-86. doi:10.1080/10447310701771498

Moser-Mercer, B. (1994). Aptitude testing for conference interpreting: Why, when and how. In S. Lambert & B. Moser-Mercer (Eds.), *Bridging the gap: Empirical research in simultaneous interpretation*. Amsterdam/Philadelphia: John Benjamins, 57–68

Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of general psychology*, *2*(2), 175.

Norman, D. A., & Spohrer, J. C. (1996). Learner-centered education. *Communications of the ACM*, *39*(4), 24-27.

Pereira-Lima, K., & Loureiro, S. R. (2015). *Burnout, anxiety, depression, and social skills in medical residents*. Psychology, Health & Medicine, *20*(3), 353-362. doi:10.1080/13548506.2014.936889

Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). *Enhancing students' engagement by increasing teachers' autonomy support*. Motivation and Emotion, *28*(1), 147–169.

Robin, A. L., Armel, S., & O'Leary, K. D. (1975). The effects of self-instruction on writing deficiencies. *Behavior Therapy*, *6*(2), 178-187.

Spruijt, A., Jaarsma, A. C., Wolfhagen, H., van Beukelen, P., & Scherpbier, A. (2012). *Students' perceptions of aspects affecting seminar learning*. Medical Teacher, *34*(2), e129-e135. doi:10.3109/0142159X.2012.644829

Steele, J. P., & Fullagar, C. J. (2009). *Facilitators and outcomes of student engagement in a college setting*. The Journal Of Psychology: Interdisciplinary And Applied, *143*(1), 5-27. doi:10.3200/JRLP.143.1.5-27

Thakral, C., Vasquez, P. L., Bottoms, B. L., Matthews, A. K., Hudson, K. M., & Whitley, S. K. (2016). *Understanding difference through dialogue: A first-year experience for college students*. Journal Of Diversity In Higher Education, *9*(2), 130-142. doi:10.1037/a0039935

Thorndike, E. (1920). *Intelligence and its use*. Harpers, 140, 227–235.

Timarová, Š., & Salae ts, H. (2011). *Learning styles, motivation and cognitive flexibility in interpreter training: Self-selection and aptitude*. Interpreting, *13*(1), 31-52. doi:10.1075/intp.13.1.03tim

Wehmeyer, M. L., Agran, M., & Hughes, C. (2000). A national survey of teachers' promotion of self-determination and student-directed learning. *The Journal of Special Education*, *34*(2), 58-68.

Wertz, F., Charmaz, K., McMullen, L., Josselson, R., Anderson, R., & McSpadden, E. (2011). *Five ways of doing qualitative analysis.* Guilford Publications: New York, NY.

Wong, M. (2000). *The relations among causality orientations, academic experience, academic performance, and academic commitment*. Personality and Social Psychology Bulletin, *26*(1), 315–326.

Zautra, E., Zautra, A., Gallardo, C., & Velasco, L. (2015). *Can we learn to treat one another better? A test of a social intelligence curriculum*. PLOS One, *10*(6), 1-17.

Appendix A

PowerPoint Modules

Below is a collection, module by module, of the PowerPoint modules prepared by Stacie Mason and Jacob Brown for the BYU ACME soft skills seminar. Modules are accessible via hyperlink on GitHub; left click + control to access.

If you are using a print version of this manuscript, use the following URL to access the modules:

http://tinyurl.com/acmesoftskillmodules

Semester I—Journey of an ACME Student (Fall 2016)

Module 1: Applied Math Power
Module 2: Get Noticed
Module 3: Sell Your Skills
Module 4: Building a New Life
Module 5: Goals and your Job
Module 6: Synergy
Module 7: Talking Good
Module 8: Use Your Strengths
Module 9: Looking Outward
Module 10: The Good Life

Semester II—Marketable Skills (Winter 2017)

Module 11: The Power of Public Speaking
Module 12: Teamwork & Collaboration
Module 13: Leadership
Module 14: Personality Theory & Mindfulness
Module 15a: Confidence & Humility (Part 1)
Module 15b: Confidence & Humility (Part 2)
Module 16: The Sunny Side of Life
Module 17: Project Management
Module 18: Conflict Resolution
Module 19: Group Problem-Solving
Module 20: Sell It

Appendix B

Reports from post-class survey

Students completed a survey about the seminar after each class period. Following is the aggregated report taken during the Winter 2017 semester.

If you are using a print version of this manuscript, use the following URL to access the full survey results:

https://ql.tc/72D2mw

Appendix C

In-Class Observation & Reflection Notes

Following is a compilation of notes taken about student behavior and observations about the functionality of the classes, perceived attitudes of the students, and questions about how to address holes in the seminar. The majority of the notes were taken during the seminar, with a few having been compiled outside of class (including notes taken during the prospectus review).

To view all in-class observations, please access the following URL:

http://tinyurl.com/acme-observation-data

Appendix D

Interview Coding

Interviews were conducted with students to determine the extent to which the seminar was effective in cultivating soft skill competency development, as well as to gather information on how best to arrange the seminar structure to best meet student and department needs.

To view interview codes in their entirety, please access the following URL:

http://tinyurl.com/acme-qualitative-data

Superordinate Coding Categories

1. Use outside resources to improve seminar
2. The seminar is a social experience, which is the epitome of how soft skills are developed.
3. The SS seminar teaches valuable skills, such as:
4. We gathered several specific suggestions for improving the seminar
5. Relationship development is key
6. Participation is key - you get from the seminar what you put into it
7. The seminar provides novel content to the ACME program which is valued highly by students who have taken the class
8. There are currently ACME students who would benefit from this class, but who might choose not to.