

The Career Compass Professional Development Program

Prof. Frank E. Falcone P.E., Villanova University

Professor Falcone is the Director of Professional Development & Experiential Education in the College of Engineering at Villanova University. His current primary focus is the leadership and management of the College's Professional Development Program entitled CAREER COMPASS. His primary fields of technical interest and experience are in Hydraulics, Hydrology, Fluid Mechanics, Water Resources and International Water Resources Master Planning. In addition to teaching numerous technical courses, he has also taught Professional Practices in Engineering and Engineering in the Humanistic Context which are courses focused on exploring a wide range of leadership, management & ethical issues confronting engineers and engineering students on a day-to-day basis. Prof. Falcone is a registered professional engineer, a founding diplomat in the American Academy of Water Resources Engineers, a retired Captain of the U.S. Navy, a former William C. Foster fellow at the U.S. Department of State and a consultant for the U.S. Department of State in the field of International Arms Control. In 2017, he was awarded the EDUCATOR OF THE YEAR Award from the American Society of Civil Engineers, Philadelphia Section.

Gayle F Doyle, Villanova University

Ms. Gayle Doyle is the Associate Director for Undergraduate Student Services and Program Operations in the College of Engineering at Villanova University. In this capacity, Ms. Doyle is responsible for numerous undergraduate recruitment activities, for providing liaison with the College's Admissions Committee, for collaborating with leaders of the student organizations and for administering the Career Compass Program. Administration of the Career Compass Program requires managing the 'Top hat' learning management system for all students, monitoring student progress and communication with individual students as necessary.

The Career Compass Professional Development Program: Continuous Improvement in instilling Integrity, Courage, Competence, and Accountability in all Undergraduate Engineering Students

Abstract

In November 2020, The Accreditation Board for Engineering & Technology (ABET), officially recognized the *Career Compass Program* in the College of Engineering at Villanova University as an '*Institutional Strength*'. *Career Compass* is a mandatory professional development program for all 1st, 2nd & 3rd year engineering students. A 4th year *Career Compass* elective course, to be included in a future College of Engineering Honors Program, is also offered for all engineering seniors.

Predominantly 'online' oriented, *Career Compass* is designed to help prepare undergraduates for their entry into professional engineering careers, graduate education and/or other professional career paths. Its focus is on developing a wide range of skills including leadership, management, ethical behavior, professional etiquette & communication.

This paper is submitted to the ASEE Middle Atlantic Section and is designed to discuss the founding, establishment and history, to date, of *Career Compass*, its goals, its delivery system, specific subjects of *Career Compass* Modules, its methods of grading & assessment and its long term value for our engineering students.

Based on preliminary anecdotal data, it seems that *Career Compass* is now becoming known as a benchmark, cutting edge professional development program among colleges of engineering nationwide

Introduction

Formalized professional development programs are taking on increased importance in engineering education in response to the needs and desires of the profession. Today's engineers are expected to be technologically competent. In addition, they must be able to lead, manage, innovate, and identify and solve problems. In response to these increasing demands on engineers, the College of Engineering at Villanova University developed a comprehensive professional development program called Career Compass (CC). This program has four themes: The Engineering Profession, Setting the Stage for Personal and Professional Success, Post-Graduation Career Planning, and Effective Communication Skills for the 21st Century. This paper describes the development, content, management, and lessons learned from the first 4 years of administering the program.

Technological advancements, globalization, and critical world issues are profoundly transforming the engineering profession [1]. Today's engineering graduates are no longer needed to perform routine assignments that can be accomplished by trained technicians or advanced computerized systems. Instead, both the public and private sectors are seeking engineering professionals who are driven to innovate, lead, and manage in ways much different than their predecessors [1]. The clear demand is for those who can quickly and efficiently create, identify,

macro-design, construct, deploy, and operate technological responses to meet and exceed the needs to present and future generations.

This mandatory undergraduate program is designed to stimulate and develop broad-based innovative leadership and management skills within each student. In addition, Career Compass provides specific guidance in ethical behavior, group dynamics, networking, oral and written communication, and career planning and preparation.

Institutional Background

Villanova University is a comprehensive Roman Catholic institution founded in 1842 by the friars of the Order of St. Augustine. The University welcomes students of all faiths and is located in a western suburb of Philadelphia. The University offers a wide variety of degree programs through six colleges: the College of Liberal Arts and Sciences, the School of Business, the College of Engineering, the College of Nursing, the College of Professional Studies, and the Charles Widger School of Law. The College of Engineering offers five BS and nine MS programs through its four departments: Civil and Environmental, Chemical and Biological, Electrical and Computer, and Mechanical. The College also offers a PhD. The university's Carnegie Classification is a Doctoral University with moderate research activity (R-3). Currently there are 1036 undergraduates in the College.

Overview of Program

Developed in conjunction with industry leaders, engineering alumni, faculty, and students, Career Compass is a series of six required courses and one optional course. The first six courses are completed during the first three years of the undergraduate curriculum and the optional course may be completed during the fourth year. Program content is grouped around four major themes as follows:

1. The Engineering Profession
2. Setting the Stage for Personal and Professional Success
3. Post-Graduation Career Planning
4. Effective Communication Skills for the 21st Century

Career Compass is largely self-directed and does not have designated, routine meeting times. The courses are delivered in a variety of formats including online videos, professional events/presentations, in-person workshops, and an organized, guided mentorship program. Students earn 0.5 credit per semester for a mandatory total of three credits earned for the first three years of the Career Compass Program.

The overall goals of Career Compass are to provide professional guidance and to develop a sense of personal awareness within each student such that he/she proactively searches for and finds a post-graduation career path best suited to his/her professional interests and personal aspirations.

Development of the Career Compass Program

Currently, many technical institutions and colleges of engineering offer a range of professional development activities and programs [2], [3]. Over the past two decades, The College of Engineering at Villanova University has organized events generally centered around on-campus

industry talks and presentations. Attendance at these events was voluntary and was not attached to any course offering. Also, over the past two decades, individual departments within the College established professional development initiatives. These initiatives have included mandatory courses, workshops, and/or industry presentations. Although these individual programs were effective and recurring; they were, usually, narrowly focused within individual engineering disciplines [1], [4]. There was no comprehensive, college-wide program providing a broad, career-based perspective for all undergraduates. In 2015, the College of Engineering decided to establish a comprehensive program to help students become more self-aware and to prepare them for a professional career regardless of their major field of study. Although this college-wide program relieved some of the professional development burden from individual academic departments, they may continue to offer their own professional development initiatives tailored to their specific technical needs.

In 2015, a Career Compass Program Advisory Board was established which includes both public and private sector professionals from all major branches of the engineering profession. This board worked with faculty, staff, and students from the College of Engineering, including the Dean and Associate Dean for Academic Affairs, to develop a list of the primary topics that should be included in the Career Compass Program (Table 1). In addition to these topics, four core values were identified by the Advisory Board as being central to the operation and implementation of the program. All services and skill sets provided to the students adhere to the core values of Integrity, Courage, Competence, and Accountability.

Table 1. List of Primary Topics by Year

Year in Curriculum	Primary Topics
Freshmen	Engineering careers Ethical behavior Strengths Mental wellness Team/group dynamics Resume preparation LinkedIn Time management
Sophomore	Technological advancement and society Management of self and others Effective listening skills Effective team and group dynamics Interviewing skills Proactive career searching
Junior	Inclusive career paths Self-awareness Conflict resolution Resume updates Technical writing and presentation skills Advanced presentation skills
Senior	Next steps in career planning Advanced leadership and management skills Project management by industry Ethical behavior Negotiations Skills

The Advisory Board meets once per year, usually in June, to plan out the activities for the following academic year and to provide advice on how to continuously improve the program. Although Career Compass is now in its 5th year of operation and realizing that this Program is continually emerging and improving, the Director, Associate Director, and Associate Dean for Academic Affairs also meet regularly to discuss how to advance and improve this program. Thus, the topics listed in Table 1 have changed and may continue to change and evolve as the program continues to mature.

Management, Operation, and Delivery

Following the establishment of the broad guidelines and goals of Career Compass, specific plans were established for the effective day-to-day management, operation, and delivery of the program.

Management

Central to these functions was the funding and assignment of personnel. One college-level position was created, and another staff member's role was redefined and elevated to include their new responsibilities for Career Compass. In addition, a grader was provided by the College. The Director of Professional Development and Experiential Education was a new position created to manage this program. The Director is responsible for creating, developing, implementing, managing, and executing all functions and aspects of Career Compass. The Director is also responsible for all outreach aspects of the Program. This outreach includes interacting with representatives from industry, government, and other educational institutions and participating in applicable conferences and meetings focused on professional development and experiential education initiatives in engineering education.

Approximately 50% of the Associate Director of Undergraduate Student Services and Program Operations' time is spent on Career Compass. The Associate Director is responsible for administering the program, maintaining student progress records, and participating in all administrative program activities. Other clerical and secretarial functions are provided by the College of Engineering's administrative staff.

One year after implementation, a grader was funded by the College of Engineering to assist with grading and other administrative tasks.

Operations and Key Relationships

Career Compass is operated within the Office of the Dean, College of Engineering. The Director reports to the Associate Dean for Academic Affairs. During the second year of implementation, the Associate Dean for Academic Affairs established the Central Office of Resources for Engineers (CORE). The CORE administers a wide range of services to students, including tutoring. The CORE has been assigned a designated suite of offices and dedicated clerical and secretarial staff. The Director and Assistant Director's offices are located within the CORE area with full access to all other CORE initiatives and services. The inclusion of the Director and Associate Director's office in the CORE was important because it sent a message to students, faculty, and staff that Career Compass is an integral part of the College.

Furthermore, it was critical that the faculty accept Career Compass as integral to the curriculum. To achieve such acceptance, members of the engineering faculty have been invited to participate in the program by preparing videos, and by participating in workshops, networking sessions, and in other approved Career Compass activities. This initiative has been partially successful to date and the Director continues to encourage faculty participation. This participation is extremely important as the program becomes fully integrated into day-to-day college operations. Starting with the conclusion of the Fall 2020 semester, the Director began to provide a summary of Career Compass activities to Department Chairs, the Dean and the Associate Dean for Academic Affairs.

One of the goals of Career Compass is to provide proactive career search services to students in line with their personal and professional goals. Villanova University already offers a full suite of career search services through its University Career Center (UCC). Therefore, it is essential that a close working relationship and full professional understanding exists between the Program and the Career Center. Such a highly productive and collaborative relationship has been established and continues to grow and strengthen. Career Compass helps undergraduates discover and identify their true personal and professional interests and goals, while the University Career Center helps to connect the students with organizations seeking their services.

For example, in conjunction with the University Career Center, Career Compass developed and began a mock interview program during the fall 2017 semester for all sophomore engineering undergraduates. This initiative is now a routine requirement in Career Compass. Through this collaborative effort, volunteers from many local companies and organizations conducted individual, on-campus, in-person, 30-minute mock interviews with all sophomores. The University Career Center provided guidelines for these mock interviews and feedback was provided to all students. Through this collaborative and very practical hands-on effort, all sophomores will be more prepared for future interviews for internships, externships, and entry-level career positions. Such an effort was possible and practical through continual collaboration between Career Compass and the University Career Center.

Another example of CC/UCC collaboration is the establishment of the COMPASS CONVERSATIONS initiative. Through this joint initiative, 5 virtual sessions were held during the Fall 2020 semester; one for each of the 5 engineering majors offered by the College of Engineering. These 1-hour virtual sessions featured volunteering alumni in their respective professional fields from around the nation offering current and relevant career guidance and advice to participating students. 27 alumni volunteered to participate, and 239 students registered for these sessions. This joint CC/UCC initiative, COMPASS CONVERSATIONS, is planned for continuation, annually.

Relationship to ABET Educational Outcomes

The Director, Associate Director, and Associate Dean for Academic Affairs worked with the ABET coordinators from each of the four departments within the College of Engineering to determine if/how they would like to use the work products from Career Compass for assessment. Most of the departments use a model of introduce-reinforce-satisfy for the ABET outcomes. Only work products that satisfy the outcomes are assessed. As Career Compass continues to

develop, we will continue to work with the ABET coordinators in the future to provide any work products they deem worthy of assessment. Career Compass does support the achievement of several of the Criteria 3 outcomes (Table 2). It should be noted that, from its November 2020 visit to the College of Engineering, ABET cited Career Compass as an ‘Institutional Strength’ of the College.

Table 2. Relationship of Career Compass Topics to ABET Educational Outcomes

ABET Outcome	Career Compass Assignments	Notes
2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Viewing required videos, completing assigned quizzes, attending required broad-based engineering presentations and participation in the mentoring program	Career Compass will support the achievement of this outcome; however assessment will still be required in design classes
3) an ability to communicate effectively with a range of audiences	Communication is a major theme for the junior year using a program recommended and organized by The Center for Speaking and Presentations. This program will include instruction on the following: Personal Speech Style Proper Breathing & Voice Projection Eye Contact & Attire Management of Speaking Anxiety Power Point Design & Visual Aides Non- Verbal Indicators (movement, posture, etc.)	Career Compass will support the achievement of this outcome; however assessment will still be required in department-specific classes
4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Students view three videos on ethical and professional responsibility: one each year for three years. Successful completion of associated quizzes for each of these videos in mandatory. These videos are prepared by professionals providing varying viewpoints on ethical and professional responsibility. During the sophomore year, students attend an in-class session where the National Society of Professional Engineers (NSPE) Code of Ethics is introduced. All students participate in case study discussions regarding ethical and professional responsibility issues during this in-class session. All students are required to attend two presentations per semester given by external professionals in varied fields. Most of these presentations are structured to address the global, economic, environmental, cultural, and social context of engineering solutions. In addition to attendance, all students are required to prepare a	Work products from Career Compass may be used by the departments, if desired

ABET Outcome	Career Compass Assignments	Notes
	1-2 page summary of these presentations and to submit them for grading.	
5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Group and Team Dynamics are covered by having the students view a video on this topic and taking and passing a required quiz. All students are routinely involved with group and team activities in their standard engineering courses.	We are working to determine if including an introduction of 360° evaluations in Career Compass will allow departments to better assess this outcome in later years

Mentoring Program

The benefits of mentoring to students is well established [4]. A mentoring program was developed to help prepare students for entry level positions along their chosen career paths. This mentorship program is mandatory for all sophomores and juniors.

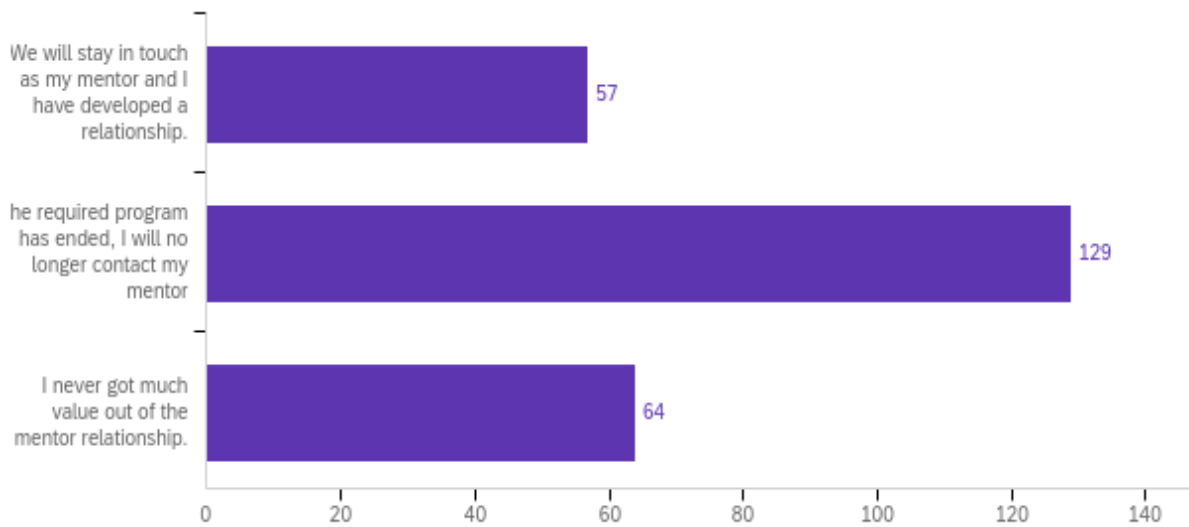
Mentors

Mentors are volunteering alumni from Villanova University’s College of Engineering. To date, we have had 660 unique alumni volunteers participate. The continuing plan is to assign one student per mentor so that individual and professional relationships may develop between students and their mentors. The average class size is approximately 250 students. For the fall 2020, 251 alumni mentors were needed to continue the program. At steady state, this program will require approximately 500 to 550 alumni mentors for students in both the sophomore and junior classes. Following the junior year, students and mentors may continue their professional relationships. It is hoped that these relationships will develop into internships, externships, and/or entry level professional positions.

Ideally students and mentors are paired based on selected majors and gender. Since mentors are volunteers, it has been found that, although this pairing approach was attempted, it’s not always possible to build pairs based on the above listed criteria. The only pairing effort that has been strictly achieved, thus far, is gender-based. Recent literature indicates that female students prefer female mentors. This gender-based pairing effort has been successful.

Success of the overall Mentors Program continue to be measured through evaluation of student responses to specific survey questions asked at the conclusion of the sophomore and junior years. These questions were developed by the Director of Professional Development & Experiential Education and the Associate Director of Undergraduate Student Services and Program Operations in conjunction with the Office of Strategic Planning and Institutional Effectiveness (OSPIE) at Villanova University.

Results from junior class, Spring 2020 re: **How would you characterize your relationship with your Career Compass Mentor?**



Structured Initial Interaction

Being mindful of the mentors' limited time, Career Compass provides a basic structure for student-mentor interaction. For each of the four semesters (two sophomore year and two junior year) during which students and mentors must interact, a series of three interactions take place between the students and their mentor. The first contact is via email and then the students are given the latitude to determine the follow-up method that works for them and their mentor. Some students stick with the emails model, others use texts and still others will connect via phone or zoom. A limited number (pre-Covid) met in-person. Following responses from their mentors, students are required to reflect on their exchange. The subject matter and the specific text for each of these emails is provided to the students by the Director of Professional Development & Experiential Education. Students can choose to use the exact text provided. They are free to alter the text, but not the basic intentions or the specific subject matter. The subject matter for the six emails, in the form of abbreviated student questions to their mentors for the sophomore year, are:

- After graduation what career paths did you consider?
- How did your selected career path lead you to where you are now, professionally?
- What did you do during your undergraduate years to help you on your current career path?
- In your work life how are teams formed and what leads to the most effective teams?
- How do you and your organization address the issue of 'inclusion'?
- What about Group Dynamics? What do you do and/or what does your organization do to make groups much more effective?

Though the intention of the pairings is to lead to long term relationships there have been a few instances where mentors have not responded and a few instances where students have not sent out the required emails. Broadly observing, the mentoring program is moving effectively toward its goal of providing real, personal, and professional advice for undergraduates which should help them define their individual career paths forward.

Public and Private Sector Interaction

Clear, sustained, and vibrant interaction with the public and private sectors is essential to the success of Career Compass [5]. Such interaction is currently occurring through several channels:

- Interaction with the University Career Center via resume preparation, prototyping, mock interviews, internship opportunities, and entry level position opportunities.
- A series of approved, on-campus presentations from representatives from many organizations in both the public and private sectors. The COMPASS CONVERSATIONS initiative is housed here. All 1st, 2nd and 3rd engineering students must attend a minimum of two of these events per semester and must write a brief recap of the event and discuss 3 key take-aways.
- Participation in the Engineering and Construction Contractors (ECC) Association in *Closing the Gap*, which is a major initiative in the *Capital Projects Industry*. This initiative is designed to help prepare entry-level engineers to assume leadership and management roles early in their professional careers.
- Participation in numerous regional professional industry organizations to keep current regarding the requirements and interests of both the public and private marketplaces hiring entry level engineers.

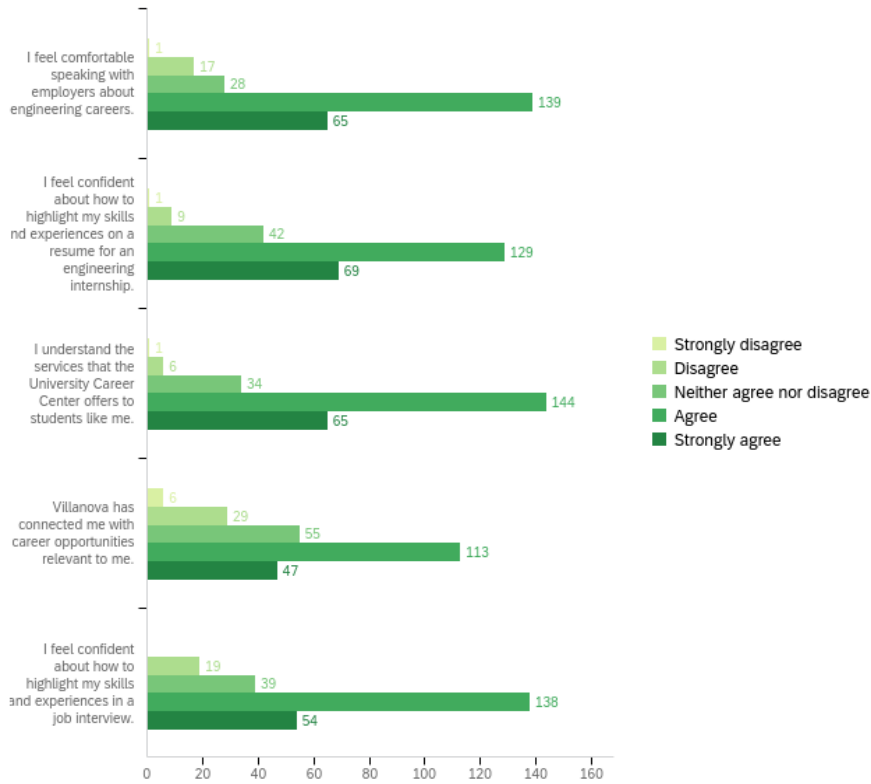
Pre-Assessment and Post-Assessment Survey

To measure progress and continuous improvement, the Director and Associate Director collaborate with Villanova University's Office of Strategic Planning and Institutional Effectiveness (OSPIE) to develop and administer Pre-Assessment and Post Assessment Surveys. The results of these surveys are utilized to improve the program.

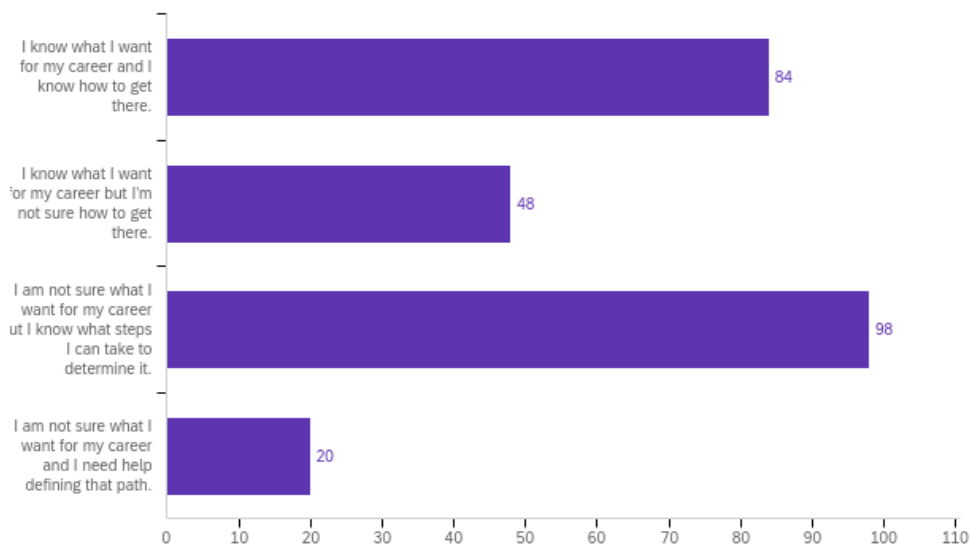
An initial Pre-Assessment survey is conducted at the beginning of the fall semester for the incoming first-year students. A Post Assessment survey is conducted at the end of the spring semester of each year.

Students were asked, at the end of their junior year (third year of the program), to respond to questions related to the teaching modules throughout the course. Below are responses to 2 Selected Questions regarding Career Perspectives.

To what extent do you agree with the following statements?



Which statement best describes your thoughts on your career?



Improvements Based on Results

The Director, Associate Director, and Associate Dean for Academic Affairs reviewed the results of the surveys, including the comments, and used these as a basis for making several substantive improvements to the program. These changes were:

- Mentor interactions were originally designed to be email based only. This was expanded to allow for any type of interaction: email, text, in-person, phone call, zoom meeting.
- Requirements after attending events were streamlined. Students are now required to list brief descriptions of the events and identify three specific, key takeaways.
- Changed grading model to allow for earning 90/100 points to pass rather than having to complete 100% of requirements.
- Initiated the COMPASS CONVERSATIONS to give students a better understanding of where they can take their specific major.
- From first iteration to now, made all videos 15-18 minutes vs. the hour videos in the first years of the program. Students prefer the shortened length.
- The program became a series of required credit-bearing courses.

The most critical change was moving the Program inside of the normal academic curriculum. The original approach of making successful completion of these courses a requirement for graduation, but not actual, credit-bearing courses was confusing and it de-legitimized the Program. In addition, numerous first year students expressed the valid observation that a program that is mandatory for graduation should be credit-bearing. Therefore, in fall 2017, six new courses, each worth 0.5 credits, were created for the Career Compass program. These three credits must be successfully completed (e.g. earning a Satisfactory) for a student to graduate. Students must earn at least 90 out of 100 points to earn an S. An optional fourth year of programming has been developed, so it will be possible for students to earn 1 additional elective credit during their senior year. This senior course, EGR 4007, will be included in the future College of Engineering Honors Program.

Continuous Improvement

Continuous improvement of any emerging program is critical to its success. In this case, continuous improvement is achieved through the following processes:

- Annual Advisory Board meetings in June. At these meetings, decisions from the previous meeting are revisited, implemented activities are described, problems are discussed, and specific solutions are identified for implementation. The Advisory Board then moves onto the next year's Program for discussion. The leadership and management offers a plan for the next year and the overall Advisory Board provides their input. The result is a plan for implementation for the next year's activities.
- The leadership and management staff meet monthly with the Associate Dean for Academic Affairs in the College of Engineering. At these meetings, the Program is discussed, future activities are planned, and near-term problems are addressed and solved.

The concept of continuous improvement is vigorously stressed with the students throughout Career Compass. This concept is also directly applied to the administration of this Program. All individuals involved in Career Compass, the college administration, the Director and Associate

Director, the Advisory Board members, and engineering students, have real, valid, and respected voices in its growth and success [6].

Through firm dedication to the concept of interactive continuous improvement, Career Compass will continue to move forward, become well-founded and become more effective as each subsequent year passes. As expected, Career Compass, at the conclusion of the 2020 fall semester, was considerably different and more effective than the program that was originally developed in 2015 and implemented at the outset of the fall 2016 semester.

Lessons Learned

Career Compass was initiated in fall 2016 for the incoming freshman class. It was designed to be rolled out over a four-year period. The class of 2020 was the first class to complete the entire program. Career Compass is now in its 5th year of operation. To date, here are the broad lessons learned thus far.

- Professional development programs should be credit-bearing if they wish to be taken seriously by students, faculty, and staff.
- Videos should be 15-20 minutes or less in duration.
- Students perceive real value in their interactions with the Career Center.
- The mentorship program is successful with numerous students expressing very positive interaction with their assigned mentors.
- Attendance at approved professional development events is regarded as very valuable by the students.
- The COMPASS CONVERSATIONS initiative will become an annual CC event.
- The students desire more in-person contact with the Career Compass leadership.
- Normalized grading (A-F) should replace the current S/U System and specific Career Compass course designations, not EGR, should be established.
- A designated, on-campus, class period per week should be assigned for Career Compass activities.

Future Program Goals

On January 25, 2021, an internal long-range Career Compass Planning Meeting was held which included the Dean College of Engineering, the Associate Dean for Academic Affairs, The Director of Professional Development & Experiential Education and the Associate Director of Undergraduate Student Services & Program Operations. The following long-term goals were identified for implementation. These goals reflect the ‘Lessons Learned’ shown above as well as input from the Career Compass Advisory Board, faculty members and students.

1. Revise, update and modernize all videos.
2. Continue to offer opportunities for more faculty to conduct and narrate videos.
3. Utilize the ‘*Interview Format*’ for more of the future videos instead of the standard ‘*Lecture Format*’.

4. Share Career Compass Program Goals & Objectives with CoE Department Chairs at the end of each academic semester.
5. As an Assessment Tool, add Career Compass question(s) to individual CoE Dept. Surveys.
6. In accordance with student and Advisory Board input, develop much more of an *'in-person'* structure for Career Compass. Move forward with establishing one defined time slot per week during each semester for Career Compass academics and activities.
7. Establish new and specific Career Compass Course Designations (CC), not 'Engineering' (EGR).
8. Develop a *'Post Internship Program'* through which seniors & juniors can share internship experiences with freshmen & sophomores.

Acknowledgements

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