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Completing the Pass: Leadership 'On' and 'In' the Field

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Completing the pass: Leadership 'on' and 'in' the field

Abstract

Throughout the university community, opportunities abound in extracurricular activities to develop professional skills, specifically, leadership and team skills, and these provide unique crossover experiences for engineers. Our pilot program partners with the university's football team where scholar athletes, i.e., the engineers, are coached in leadership skills that apply to group situations on and off the field. Each participant in the program completes both the Klein Group Instrument for Effective Leadership and Participation in Teams (KGI)® and the Myers-Briggs Type Indicator (MBTI)®. Specifically, the KGI provides each individual with a personal profile, identifying their strengths and areas for improvement. Our study looks at two different populations of engineers, highlighted by our three senior football captains, who receive intensive leadership coaching, and our ten freshmen players, who participate in our regular training provided to all freshman engineers. We examine the impact of the intensive training for the upperclassmen and the influence of the more general training on the first year students. This study shows how the process of leadership development can be strengthened by a dual application—participation on the football team and involvement in professional training in labs and in the workplace. Through personal interviews and surveys, the results show the captains' intensive training has significantly increased their awareness of their own behaviors and that of others. They have learned to analyze group dynamics in a more astute manner and make interventions that promote higher team performance. They have refined their observational, communication, and interpersonal skills. Their qualitative feedback indicates they have also applied these new skills on their engineering teams, and with their engineering internship experiences. With our freshman engineers, highlighting the connection between their team interactions on the gridiron and their first engineering design has heightened their awareness of the value of formal leadership training. Lessons learned here will benefit future development of our program and provide scholar athletes with ability to transfer leadership and teaming skills between the two 'fields', thus, completing the pass!

Introduction

Throughout the university community, opportunities abound in co- and extra-curricular activities for engineering students to develop leadership and social skills that will ultimately benefit them in the work place. Leadership development for engineers is not strictly confined to their program's leadership training, targeting the acquisition of 'professional skills' to go along with 'technical skills'. While such training provides a foundation for leadership development, co- and extra-curricular opportunities provide the chance to practice and refine these skills--with a diverse array of teammates--which can really enhance leadership growth and skill acquisition.

Background Research

The definitions of engineering leadership, engineering management, and teamwork for engineers have been debated, as the definition of 'engineering leadership' has evolved. Wilding, W. V., & Knotts, T. A., & Pitt, W. G., & Argyle, M. D. [1] have defined leadership characteristics for engineering students and created a working definition comprised of 13 qualities for their

engineers; highlighted by “follows as well as leads”, “takes time to evaluate personal performance as a team member and improves when needed”, and “understands the personality traits of self and others and can work with others in accomplishing tasks”. They have noticed the “prominence of teamwork skills” in their list.[1] From an extensive review of best practices, Paul, R., & Cowe Falls, L. G.[2] propose the definition is comprised of three pillars, “Technical”, “Self” and “Others”. Under the “Others” pillar, engineering leadership characteristics include self-awareness, personal skills, and active engagement. Six core competencies are also presented in their work, which include communication, innovation, creativity, execution, personal drive, and team work.[2] Some of the points in engineering leadership suggested by Bayless, D. [3] include “understanding the role of emotional intelligence, understanding your personality and self better, recognizing personality traits in others, team building skills, listening skills, and communication skills.” Many others echo similar traits and attributes in the literature that encompass ‘engineering leadership’ and work to develop these profession skills in engineering students to better prepare them to be effective leaders in workplace.

Leadership training for engineering students is delivered in a variety of ways: in a lecture series with guest speakers; in a leadership course(s); Bernard M. Gordon Leadership Programs[4, 5] and in an Engineering Leadership Minor[6,7,8]. Universities with a Minor utilize a variety of institutional resources, including courses within the engineering program and in other departments on campus, which facilitates a focused interdisciplinary program structure across the university. Often students must go through a rigorous application process, and be selected and accepted into the leadership program. With regard to the candidature of engineering students for leadership programs, Tonkay, G., and Zimmers, E.[9] remarked that they “migrated their honors engineering leadership program to the general engineering population because they found it was the middle of the class (who) tended to do quite well years after graduation, often advancing into positions of leadership.”

Although engineering leadership is viewed as important to a student’s professional skill set, there are issues: limited room in engineering curriculums to dedicate time for a leadership course(s) [10]; or engineering faculty may lack the background and training to effectively teach team skills to the students[11]. These problems provide the impetus for new and innovative engineering leadership programs.

With leadership so closely intertwined with personal traits of the individual, leadership curricula often utilizes one or more instruments, such as MBTI, True Colors, or DISC, to provide students with insights to their own personality and/or behaviors in groups or teams. Recently, the Klein Group Instrument for Effective Leadership and Participation in Teams (KGI)®, which provides an individual with a set of skills to promote social growth, has shown initial success with engineering students.[12] A new assessment tool to “measure leadership, change, and synthesis abilities” has been proposed in the work of Ahn, B., Cox, M.F., London, J., Cekic, O., and Zhu, J.[13] Developed on a holistic set of leadership skills, their instrument, the Personal Leadership profile, “helps each student to focus on what courses will be best suited for them and what leadership initiatives (at the university) to undertake to become a better leader.” In their university’s leadership program, Louis, J., & Osagiede, A., & Berdanier, C. G., & Cox, M. F., & Ahn, B., & Sharma, K.[14] subsequently applied the results of the Personal Leadership survey to

recommend that students promote their own personal growth by joining strategic extracurricular activities".

When looking beyond a leadership course, there is significant literature on what 'co- and extra-curricular activities' best promote the development of leadership skills in undergraduate engineering students. Bayless, D. [15] states that most often extra–curricular experiences are related to engineering activities: design projects (course related and capstone), student design competitions, and internships. Durham, S. A., & Marshall, W. E.[16] advocate "that student organizations are shown to have benefits realized though student leadership within these organizations and organizational activities." They note that there are "opportunities for students, who fill the leadership roles, to learn non-technical skills such as people, time management, and most importantly, people management." Yu, R., & Simmons, D. R.[17] reported that "student involvement in out-of-class activities promoted the development of leadership skills, group skills, and engagement." Fisher, D. R., & Bagiati, A., & Sarma, S. [18] posed a "student skill development framework", which included "skills and attributes for engineering students to ideally obtain or experience during their undergraduate education." Common, and evident, in the work of both these authors[17,18] is the development of a number of professional attributes and skills, including interpersonal skills (e.g., social and communication), leadership skills (e.g., self-confidence, self-direction and teamwork), and cross-cultural awareness and skills, gained through a student's participation in activities 'outside of a course'.

Our Approach to Leadership Development and Skills Training

Our pilot study proceeded with the idea of crossing activity lines, to connect engineering leadership training with leadership development in a specific extra-curricular context, the football team. We recognized there was a 'common thread' between skills required for an engineering career in industry and those exhibited in the athletic experience. We utilized two assessment tools, the Klein Group Instrument for Effective Leadership and Participation in Teams (KGI)® and the Myers-Briggs Type Indicator (MBTI)®, to guide our leadership training model.

Our objective was to execute a pilot program at our university to gain insight to the following questions.

- ➔ Can our model inspire significant leadership development for the engineering students, using the KGI and MBTI instruments, in this extracurricular environment?

- ➔ Do the students see relevant connections between their leadership actions on the football team and in their engineering program? Do they foresee worthwhile applications of these skills in the future as professional engineers in the workplace?

Description of the Personal Assessment Tools Highlighted by the KGI®

We propose that the use of the Klein Group Instrument for Effective Leadership and Participation in Teams (KGI)® and the Myers-Briggs Type Indicator (MBTI)® in our program will greatly enhance the leadership development in our engineering students. These instruments, particularly the KGI, will introduce them to leadership and group behavior skills, which they can

apply in extracurricular activities as well as in engineering lab teams and at internships. The KGI assessment targets team skills in four domains: Leadership, Negotiation Orientation, Task Focus, and Interpersonal Focus. The Myers-Briggs Type Indicator identifies psychological preferences that help students understand and use their psychological energies in leadership skill building.

Our leadership training program begins in the freshman engineering course. Here, we focus on educating students about the fundamentals of small-group dynamics and effective leadership and team behaviors. Students gain a deeper understanding of their personality styles and what skills can make them effective leaders, so they can influence group dynamics to achieve team success. We ground the training on a new assessment tool, the Klein Group Instrument (KGI) that focuses on essential categories of small-group life. The model's diamond design provides a visual illustration of the interconnection of these elements, and identifies the essential focus of each domain, as shown in Figure 1.

Figure 1. The KGI Diamond highlighting the primary skill set associated with each point

For each of the four major domains of the KGI model, there are subscales that identify specific skills that contribute to high team performance, as follows:

Leadership Subscales

1. **Assertiveness:** the expression of ideas in the group.
2. **Group Facilitation:** the coordination of the group's efforts with regard to negotiation, task, and interpersonal relations.
3. **Initiative:** the willingness of members to assume primary leadership roles in different aspects of the group's work.

Negotiation Orientation Subscales

1. **Perspective Taking:** the skill of investigating and understanding other people's values, interests, and needs.
2. **Constructive Negotiation Approach:** the promotion of a win-win negotiation method so that all members benefit from an agreement.

Task Focus Subscales

1. **Task Analysis**: the examination of problems, opportunities, and task solutions.
2. **Task Implementation:** the competent execution of a plan with appropriate strategic adjustments along the way.

Interpersonal Focus Subscales

1. **Positive Group Affiliation:** the promotion of mutual acceptance and personal rapport among members, with the aim of fostering a team spirit.
2. **Feeling Orientation:** attention to the emotional issues in the group.

In combination with, and complementary to, the KGI assessment, we also use psychological typology, identfying the students' psychological preferences, according the Myers-Briggs Type Indicator (MBTI) model. The MBTI design informs people about their preferences along four dichotomies: Extraversion (E)—Introversion (I); Sensing (S)—Intuition (N); Thinking (T)—Feeling (F); and Judging (J)—Perceiving (P). For each dichotomy, an individual, based on his or her preferred ways of functioning, falls on one side or the other, identifying the individual's personality preferences. We show the students how these psychological energies can be integrated into their leadership skill building. Based on a statistical correlation study, the diamond design below in Figure 2 shows how the MBTI and KGI assessements complement each other.

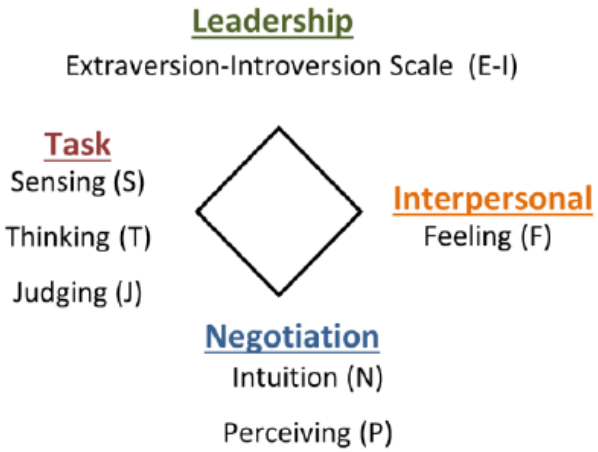

Figure 2. The KGI Diamond matching the MBTI and KGI points

With this design, the students' practice new KGI group skills, with a deeper understanding of their psychological preferences. Our training of the freshman engineers has shown positive results.[12] We have seen evidence that students, who have gone through training with the KGI and MBTI assessment**s** in our freshman course, can implement these skills in non-engineering activities, such as community services, student clubs and organizations, and varsity and intermural sports. At our University, we are cultivating the opportunity to involve engineers in these types of activities, ventures that they can care deeply about and in organizations that are welcoming. We want to capitalize on this natural extension of our freshman training. As part of this process, we formed a partnership with our athletic department, in particular, our football team.

Table 1. The 'Common Threads' in Leadership Attributes and Skills for Engineering Students

Points of the KGI Diamond linked with KGI Individual Profile & SKILLS	**Leadership defined in D3 Athletics & our university**	**Attributes in athletics as an out-of-class activity** [18] Fisher, D. R., & Bagiati, A., & Sarma, S. E.	**Points for assessable leadership skills outside the engineering classroom** [15] Bayless, D	**Leadership competencies among engineering** [19] Warnick, G. M., & Schmidt, J., & Bowden, A. E.
Leadership -Group Facilitation	•Be a mentor •Coordinate efforts of a team	Team work	**1c** More intentional in your use of leadership styles	Develops vision in his/her scope of responsibility
Leadership -Initiative	•Be motivated and be a motivator	Teamwork	**1b** Critical thinking in your leadership actions	Leads and also knows how to follow
Leadership -Assertiveness	•Lead by example—in all situations	Team work	**1a** Actions you take leading others	Takes initiative rather than waits for assignments
Task focus -Task Analysis	•Set team and individual goals	Teamwork	**1i** Communicate your vision (solution to problem) more effectively	Identifies problems and solutions
Interpersonal focus -Feeling Orientation	•Demonstrate self-confidence • Show concern for others •Demonstrate composure under pressure	Self-confidence	**1d** Understand your personality and yourself better	Demonstrates a good attitude on life and is pleasant to work with
Negotiation Orientation -Perspective Taking	• Show respect for others • Be approachable for all teammates, not just friends	Cross-cultural skills	**1e** Recognize personality traits in others	Is culturally sensitive and works effectively with people from diverse backgrounds
Interpersonal focus -Positive Group Affiliation	•Develop good communication skills •Build relationships with teammates and coaches	Interpersonal communication	**1h** A more effective listener **1i** Able to communicate your vision	Is an effective communicator, including being a good listener
Negotiation Orientation -Constructive Negotiation Approach	•Be humble and level-headed • Be selfless not selfish • Admit mistakes	Self-direction	**1f** Flex leadership styles to influence others based on your understanding of yourself & personalities of others	Understands the personality traits of self & others; can work with others in accomplishing tasks

Connections among the KGI Skill Set, Athletics, and Engineering

In Table 1, the connections or 'common threads' between the KGI skill sets, the athletic standards for leadership development, and the engineering goals for leadership advancement are displayed, and provide the direction for our study. These connections underscore the important relationships among these seemingly different areas, opening up opportunities for creative and innovative leadership training programs. Engineering leadership skills, which are outlined in the literature, are highlighted in columns 3, 4, and 5 of Table 1, and correspond well with points in the KGI Diamond and its primary skill sets. Added here is the leadership development idealized in the philosophy of NCAA Division 3 athletics and our Athletics Department. Quoting from the NCAA, "Division III affords student-athletes the opportunity to discover valuable lessons in teamwork, discipline, perseverance, and **leadership**, which in turn make student-athletes better students and responsible citizens." [20] Additionally, "Division III encourages student-athletes to take advantage of the many opportunities available to them, **both within and beyond athletics**, so that they may develop their full potential as students, athletes, and citizens." This is echoed by our university's Athletic Director in his statement: "We are committed to providing all of our student-athletes with a broad based experience that is second to none and one that will help for the rest of their lives. Athletics at Western New England University is committed to comprehensive excellence in three major areas: Academics**,** Athletics**,** and **Leadership**." [21] This opportunity for a partnership had rich promise to positively affect our engineer/athletes with formal leadership training, making them better mentors for the younger students and players who can promote higher team performance.

Application: The Pilot Study with the Football Team

Our pilot study set out to take advantage of our initial work[12] with freshman engineers, and craft an innovative program to facilitate greater personal leadership development for engineering students during their academic career. We began with the goal of crossing activity lines, to connect engineering leadership training with a specific extra-curricular context. As we indicated in Table 1, there are many common threads between skills required for an engineering career in industry and those exhibited in the athletic experience. Focusing our study on engineering student-athletes also proved to be a valuable way to observe how these students practice leadership skills with a diverse group of majors from all academic levels, reflecting the different 'constituencies' the engineering students may see in the workplace.

The Western New England University football team consists of 125 players, including a large number of first-year students who need to be acclimated to the team and its culture. The team is structured around eight position groups, representing skill-area specialists-- quarterbacks, receivers, running backs, offensive line, defensive line, linebackers, cornerbacks, and safeties. For each of the sub-groups, there is a designated captain, an experienced, upper-class player who helps guide the development and performance of that segment of the squad. Last fall, three of the captains were upper-class engineers: captains of the offensive line, defensive line, and cornerbacks, respectively. All of these players had received initial KGI and MBTI leadership training as freshmen, as part of the First Year Seminar course in our engineering program.

This appeared to be a fertile context to explore leadership development in an extra-curricular arena, since upper-class engineers had meaningful leadership responsibilities on a semester-long basis. As part of this research enterprise, we approached the Head Coach about providing all of the football captains with intensive KGI/MBTI training during the season to enhance their leadership skills. The training would consist of several one-on-one coaching sessions with Professor Klein, similar in style to that of executive coaching in business and professional settings.

The beauty of working with the football team is the critical nature of peer leadership on the squad, so instrumental to success. Since the team wins or loses each week, there are immediate results to assess performance. With a different opponent each week, there is always a need to make new adjustments, and for captains to play a role in preparing the position players to perform well. In addition, there were ten first-year engineers on the football team, part of the new crop of 'rookies'. This enabled us to also examine their experience with the KGI/MBTI training model in our seminar, and see how it might begin to connect to their involvement with the team.

So our study looks at two different populations of engineers, highlighted by our three upper-class football captains, who received intensive leadership coaching, and the group of freshmen football players who received more general training as part of the First Year Seminar course.

With regard to the engineering captains, all of them retook the KGI and MBTI instruments in preseason to obtain fresh results with which to work. This built upon the previous first-year training. In the current situation, they had the experience of selecting new skills, practicing these skills, and self-reflecting on the skill development process at a deeper level.

During the football season, the captains received one-on-one coaching sessions with the KGI/MBTI model at three intervals: in pre-season, at mid-season, and toward the end of the season. The sessions ran from 60-75 minutes, focusing on the student's personal results and identifying specific leadership and group skills to work on, drawn from their KGI Individual Profile. The student's psychological preferences were also part of the conversation. There was discussion about how the student would employ established preferences, or opposite preferences (the non-preferred side of each dichotomy) to build new skills. Details about the structure of the captains' training are outlined in Table 2.

For all freshman engineering students, including the football players, the training in leadership and team work is outlined in Table 3. Details of this program can be found in previous work.[12] Students take both instruments, the MBTI and KGI, and in a workshops, are educated on ways their personal results can be interpreted and implemented in groups and teams of all types, including engineering teams and extra- and co- curricular activities. Students are asked to select one or two of their own KGI skills to work on during the semester. The guided reflection papers allow students to take stock of their progress in light of what was easy for them and what was difficult. Many students continue to practice their KGI skills after this course is over, often adding another one or two new skills to their repertoire, as evidenced through a Learning Beyond the Classroom (LBC) essay, reflection papers, or conversations.

Table 2. Captains' Training Program and Activities

Meeting	Activity	Interaction : time
Pre-season	Discuss previous experience with KGI and MBTI in First Year Seminar. Review new results with KGI/MBTI; identify new KGI skills to practice and how various psychological preferences would be involved with this effort.	Met with leadership coach: 60-75 minutes
Mid-season	Reflect on skill implementation; clarify ways to refine practice & expand skill usage. Select additional skills to practice with discussion about the connection with MBTI preferences.	Met with leadership coach: 60-75 minutes
Late in season	Review experiences with KGI skills and the utilization of a new range of psychological preferences. Discuss connections to engineering leadership skills in various contexts.	Met with leadership coach: 60-75 minutes
Post -season	Interview to reflect on leadership training process and applications to engineering training and future career.	Met with leadership coach: 60-75 minutes

Table 3. The Leadership Training in First Year Engineering Seminar

Meeting during semester	Activity	Interaction: time
Week #1	Administer MBTI	On-line : 20-25 minutes
Week #3	Workshop on MBTI	Speaker : 50-60 minutes
	Guided reflection paper	Write 1 ½ pages : 30 - 45 minutes
Week #3-5	Administer KGI	On-line : 20-25 minutes
Week #5	Workshop on KGI and using their Individual Profile	Speaker: 50-60 minutes
	Guided reflection paper	Write 1 ½ pages : 30-45 minutes
Week #12	Team exercise	Small groups : 20-25 minutes
	Workshop to review KGI implementation	Speaker: 40 -50 minutes
	Guided reflection paper	Write 1 ½ pages : 30 – 45 minutes

Results

We examined the impact of the intensive training for the upperclassmen and the influence of the more general training on the first year students, related to their participation on the football team in the fall semester, 2015.

We explored how the process of leadership development can be strengthened by a dual application—participation on the football team and involvement in professional training for the engineering program. Through personal interviews (captains) and surveys (first year players), we considered the experiences of these two subgroups with the goal of refining our training to produce more flexible, competent leaders. In our pilot study, personal interviews provided the best feedback on our work with engineering students as they implemented their KGI skills in the context of the football team. This is consistent with many in the field as an assessment to determine the impact on the individual involved in leadership training.

Captains' Group

In a systematic way, each of the captains implemented the new skills. They benefitted from the First Year Seminar training as a foundation for the work. But being a captain added important motivation to really persist with the skill practice. For the good of the team, they were willing to really stretch themselves, get out of their usual comfort zones, and perform new leadership actions, many times utilizing opposite MBTI preferences which increased the challenge for them. These efforts made them into well-rounded leaders. Their commitment to the sport served as a great motivator to get them to change and improve their leadership skills. Also, since they had to meet with their leadership coach every few weeks, there was important accountability. They had to report on their efforts, their setbacks, their adjustments, and their successes. They had to show they were making the effort. The process also reinforced their reflective process. They had to explain how they thought through situations, the tactics they decided on, and how they refined their efforts. Over time, this became a more natural process for them, one that helped them become a reflective practitioner. This was a trait that would be vital skill for their future professional career.

It should be noted that the leadership efforts of these engineering captains, and the entire group of captains, produced tremendous results. The football team went undefeated in the regular season (10-0) for the first time in the 45-year history of program, winning the conference championship. This is significant because this group of players did not experience conscientious mentoring by the upper-classmen, and as they reflect back on their early years, it was not a friendly environment, even quite cliquey. All captains worked hard to change this situation, by committing to the leadership development program based in KGI skills. As observed by a 4-year team member, "I witnessed a complete culture shift on the team. And it was nice that this year's freshman had a better year than we did. "

Table 4 breaks out, for each captain, details about MBTI preferences, and the specific target skills and challenges with expanding the psychological preferences.

Table 4. Development of Leadership Skills: KGI/MBTI Connections

Captain Type	Selected KGI skills	Action	Close loop
ESTP Extraversion (Moderate) Sensing (Moderate) Thinking (Moderate) Perceiving (Slight)	**Assertiveness**	Speak up more, make ideas clear	Tap more into Extraversion
	Task Implementation	Make sure information passed smoothly; watch his teammates executions of strategies and give immediate feedback about performance; watch physical actions	More Sensing function; move from Perceiving towards Judging
	Initiative	Being proactive in creating a positive, big-picture mindset; role model and advocate	Move from Sensing toward Intuition
INTJ Introversion (Very Clear) Intuition (Moderate) Thinking (Very Clear) Judging (Clear)	**Initiative**	Step up and really lead his group by taking command and expressing himself more	Move from Introversion toward Extraversion
	Feeling Orientation	Pay attention to emotional reactions of teammates and watch how they took feedback	Move from Thinking toward Feeling
	Positive Group Affiliation	More personable to other players; praise those around him at appropriate times	Move from Introversion and Thinking toward Extraversion and Feeling
ENTP Extraversion (Moderate) Intuition (Moderate) Thinking (Slight) Perceiving (Slight)	**Assertiveness**	Modulate his assertiveness; clear but not overwhelming	Move toward Introversion
	Task Implementation	Assess effectiveness of strategies in situation; coordinate strategy adjustments	Tap more into Thinking; move toward Judging
	Positive Group Affiliation	Manage the emotional reactions in his group to maintain a positive atmosphere	Move toward Feeling

Captains' Comments

Below is a sample of the comments, as the captains reflected on their overall experience with the KGI/MBTI model and working with a leadership coach. The research questions focus on establishing validity to our program and its extension past first year seminar and into extra-curricular activities.

Can the model inspire significant leadership development for the engineering students, using the KGI and MBTI instruments, in this extracurricular environment?

Captain One (ESTP)

**Then* ….The First Year Seminar introduced me to the KGI Diamond Model, orienting me to basic group dynamics.

NOW…. ***When I was a captain, I realized I needed to develop these practical skills in a serious way, if I was going to be effective.***

And the KGI….The KGI gave me a clear focus and clear goals to strive for. The MBTI helped me understand myself: how to use my natural preferences more thoughtfully, and how to challenge myself to develop new skills with opposite preferences.

Captain Two (INTJ)

**Then* … I remember the testing with the KGI and MBTI assessments during the First Year Seminar. But there was a maturity problem. I didn't take it as seriously as I should have; there were so many things going on at the time.

NOW…*You find yourself in a team with people you don't necessarily like or feel comfortable with. How can you try to make something positive happen? The KGI gave me ideas about that. I learned how to interpret group dynamics and how to take positive action to help the team.*

And the KGI…I did see how the ideas matched up in my Internship during my Junior Year. Applying KGI ideas, I could see why my group of Mechanical Engineers was able to create synergy on our team, while the group of Electrical Engineers at the company didn't.

Captain 3 (ENTP)

**Then…* The work with KGI and MBTI in the First Year Seminar needs more reinforcement. It was interesting…..

NOW… ***The ideas you get are solid, but they need to be reinforced practically, over and over, to really make them stick. Working with these ideas this fall really reinforced them for me and really helped me with my leadership development.***

And the KGI… Refreshing KGI ideas every couple of weeks or so makes it more memorable and more useful, like we did during the football season. There are also connections for lab teams and internships that are helpful, allowing you to practice the skills in those situations.

Do the students see relevant connections between their leadership actions on the football team and in their engineering program? Do they foresee worthwhile applications of these skills in the future as professional engineers in the workplace?

Captain 1 (ESTP)

"In every **engineering class** I was in this fall semester, there were group projects. I was able to **explicitly connect my new leadership skills to these projects**. I knew how to **create positive group dynamics** and be a strong leader and group member. My project teams turned out to be **very successful**."

Captain 2 (INTJ)

"When I **had to lead** my position group with the football team, it **really reinforced the KGI ideas**. I needed to learn to make more interpersonal connections with other people. The KGI helped me do that, particularly bringing together **Assertiveness**, speaking up, and **Perspective Taking**, listening to other people. I learned how to strike a balance with those two that really helped me as a leader. In fact, this semester I was in **a team project** for a course. It had me working with engineers and students from the College of Business on a joint marketing project. The business people had a different style from the engineers, but I was **able to adjust** to that with the KGI/MBTI skills, and I helped make the group **successful**."

Post-season: "My work and training with Professor Klein (in his role as his leadership coach) and my KGI skills just helped me land a job in the Leadership Program of a major aerospace company! *(Huge smile!)* The football team gave me the motivation to do it, and it was pretty tough, but so worth it!"

Captain Three (ENTP)

"With the football team, I wanted to be an excellent leader, a player the other guys would look up to. The **KGI gave me confidence** to do that. It gave me **quality ideas and the challenge to execute them**. When I did, it got great results. It helped me talk to the guys in effective ways that made me a **better communicator**. It also taught me how to create a **positive atmosphere** with my position group. When players were having bad days, making mistakes, I jumped right on it and helped them reset their minds in a positive way, helping them focus on improvement. The KGI taught me how to **reach out to others in a proactive, positive way."**

"When you are in an internship, or a future job setting, they expect you to step up and show what you can do. Do you have the confidence to do that? After refining my leadership and group skills with the KGI and MBTI, I have that **confidence.** They have given me **the tools to work with others** and to solve problems. I am ready to go forward and be **successful."**

First Year Group

The group of 10 freshman received MBTI results as follows: 10 Extraverts and 0 Introverts; 4 Sensing types and 6 Intuition types; 8 Thinking types and 2 Feeling types; 5 Judging types and 5 Perceiving types. Like the football captains, there was a leaning towards the Extraversion and Thinking preferences. Below, in Table 5, is a chart with their responses to survey questions about their experiences with the KGI/MBTI training in the First Year Seminar.

Table 5. Response from Freshmen Engineering Football Players in First Year Seminar

How accurately do you feel your MBTI results describe you?	90% said: somewhat or highly accurate		
How well do you feel your KGI profile described your current group behavior?	70 % said: somewhat or highly accurate		
Please select your level of agreement for the following:	**On sports teams**	**In student activities/ extra-curricular activities**	**On engineering teams**
Do you think the MBTI will help you in the following situations?	Strongly or somewhat agree: 60%	Strongly or somewhat agree: 80%	Strongly or somewhat agree: 80%
Do you think your KGI profile will help you in the following situations?	Strongly or somewhat agree: 70%	Strongly or somewhat agree 70%	Strongly or somewhat agree 80%
To date, where have you used your KGI skills?	30%	40%	80%
In the future, do you feel your KGI profile will help in the following situations?	Yes: 60%	Yes: 70%	Yes: 80%

Discussion

Starting with the captains' data, it is clear that the reinforcement of the KGI/MBTI ideas and the consistent practice of skills are critical components for a significant leadership transformation in terms of knowledge, confidence, and effectiveness in leadership roles. Using the KGI/MBTI model, the upper-class engineers showed they were able to apply the leadership skills generally, both to their athletic team and to their engineering training in its various aspects, lab teams, and internships. They also saw direct application of these skills to their future professional career as engineers.

For the first year engineering football players, who only receive general training, there is a lesser recognition of the value of the KGI/MBTI skills for their sports careers. Significantly, this group may not envision that being a captain or even continuing to play football is in their future, which could affect their point of view in responding to the survey questions. In all fairness, they are at the very beginning of their university athletic careers and professional training. What is impressive is that 80% of this sample saw a direct connection with the KGI skills and their present lab teams and future engineering activities.

For the captains, their intensive training with the Klein Group Instrument (KGI)® and Myers-Briggs Type Indicator (MBTI) model has significantly increased their awareness of their own behaviors and that of others. They have learned to analyze group dynamics in a more astute manner and make interventions that promote higher team performance. They have refined their observational, communication, and interpersonal skills. Their qualitative feedback indicates they have also applied these new skills on their engineering teams, and with their engineering internship experiences.

Leadership, both 'on' and 'in' the field, has been defined earlier in the paper in Table 1. From our pilot study, we can see that, with our leadership training model, the students acquire skills that reflect the desired leadership characteristics for engineering education, D3 athletics, and the University Athletics Department. Leadership and team skills that apply in engineering training can also be applied to participation in athletic programs and in other appropriate extra-curricular activities. As advocated by ABET and the book, "The Engineer of 2020", employers are looking to hire engineers with leadership skills, or more broadly, good interpersonal skills. Our student's comments suggest they will bring these new skills with them as they move forward into the workplace as engineers.

The foundation of our leadership training is the new instrument, the Klein Group Instrument for Effective Leadership and Participation in Teams (KGI), complemented by the use of the well-established Myers-Briggs Type Indicator (MBTI) personality test. As reflected in the student comments, they appreciated the SKILLS reported in their KGI profiles. These SKILLS not only posed "Behaviors That May Help You Grow", but also reflected on a positive sense on "What You Enjoy". Our previous results[12] showed students are receptive to the process of taking the KGI and working with information in their KGI Individual Profile. From captains' comments, they remember their experience freshman year and completing the required activities. However, they did not continue with the KGI skills in earnest, since there were no graded assignments on this topic in other courses, and as cited by one student, 'a maturity problem'.

Our pilot study, as described, set out to explore a method to capitalize on the initial training. By using the football team, we found a meaningful experience where students can implement their KGI skills. They gained new skills and refined their leadership and group behaviors. The team was a context where they could clearly see the impact their new skills and personal actions on the people around them. As the team moved forward to an undefeated regular season, the captains recognized they were on a solid path with skill development. The success of the team helped to sustain their motivation to polish the skills. They contributed in an important way to an excellent team performance.

As observed by the authors, another factor influencing the success of the pilot study was the freedom allowed us by the football coach and the athletic department to implement our program. The Head Coach and his staff were truly supportive and also reinforced the 'effective leadership behaviors' they observed in the captains. Being captains on the football team, the engineering students felt they must 'lead' for the greater good of the team and for a winning season. Again, student quotes echoed the sentiment they must 'step out of their comfort zone' to practice their KGI SKILLS. We observed a very high level of motivation in these students to engage in the process and implement the skills identified in their KGI Individual Profile. The Head Coach felt our training effort with captains made such a difference in the interpersonal dynamics on the team that he wants to continue the program next year.

As we look forward, it raises the question, "Can we expand this leadership training, featuring the KGI and MBTI assessments, to other extra-curricular activities? " The 'crossover' in application of leadership skills is quite evident and played out well in our pilot study. There could be a real opportunity to connect with other extra-curricular program within our university in a similar fashion.

Conclusions

*****Engineering students, who were captains on the football team, proved to be highly motivated to practice new leadership and group skills. They found themselves in a situation that allowed for the continuous practice of the skills throughout the fall semester. Consequently, they really increased their acquisition of relevant leadership skills, based on the Klein Group Instrument (KGI) and Myers-Briggs Type Indicator (MBTI) model, which prepares them well for their future careers as engineers.

*The captains deepened their understanding of themselves, how to exercise and refine group skills, and how to promote effective collaboration on teams.

*As they achieved success with the leadership skills on the football team, it gave them confidence in their abilities to be effective leaders in other contexts. They readily transferred these skills into lab and project teams connected with their engineering training during the semester.

*Their knowledge and confidence about being effective leaders has put them in a strong position to be successful in internships and in future professional engineering jobs.

*A significant majority of the first-year engineering football players, who received initial training with the KGI/MBTI model in the First Year Seminar, saw a meaningful application of these skills for their current lab teams and for their future engineering activities. Eighty-percent of these students said they were using the new leadership and group skills in their lab teams during the current semester. As with our previous research about the first-year students' application of these skills in their lab teams, the students can readily move forward and apply the skills in a practical way in their engineering labs.

*A majority of the first-year student athletes saw a value in the KGI/MBTI training for their future sports careers, but only 30% had currently applied the skills in an athletic context. The current application of skills for the athletic team could be more directly addressed in our training, which would benefit these students.

*A critical issue for the acquisition of leadership and group skills is the continuous practice and refinement of the skills. Initial training provides the theoretical foundation for the skill development, but it is the on-going practice, in situations that are personally relevant for the engineering students, that propels them to a greater mastery of the skills.

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