Pilot Study: Impact of Coaching in Leadership Development for Engineering Undergraduate Students

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Abstract

How much will students perceive themselves to grow in various leadership competencies after working with a coach? As a pilot study, the Zachry Leadership Program in the College of Engineering at Texas A&M University offered coaching as an optional activity for students and recent graduates of the program, and 24 people accepted. These participants met with their coach approximately three times during the fall 2020 semester using videoconferencing software like Zoom or Teams. In the first meeting, the coaches asked the participants to complete a leadership wheel in which they rated their level of satisfaction in ten competencies: academics/work; communication; assertiveness/confidence; organization skills; work/school relationships; self-regulation; clarity/focus; building networks; conflict management; and resilience. The participants scored each competency on a scale of 1-10, based on how satisfied they were with their ability in that area. The coach and participant then talked over the scores and identified competencies to work on together. Subsequent meetings were organic in nature, as participant and coach together discussed current challenges or growth competencies, what the participant wanted to achieve, and how to achieve it. At the end of the fall semester the participant completed the same wheel again, allowing us to measure perceived progress. A group of similar students, who did not meet with a coach, also completed the same wheel twice, allowing a comparison of perceived progress made by coached and uncoached students. Data collected during this pilot study indicate that the coached participants perceived that they grew in every competency described, but uncoached students reported larger gains, on average. In addition, concerns about the assessment method and number of students assessed both times prevent concrete conclusions about the growth accomplished through the coaching program. Further research is needed to more completely evaluate the effectiveness of coaching on the leadership development of engineering students.

Background

The practice of coaching has grown tremendously since the mid-1980s as an approach to achieve holistic development in both professional and personal domains. While the literature has not settled on a definition for coaching, common themes include the partnership between the coach and client, and the focus on setting and achieving future goals as defined by the client. For example, according to Lefdahl-Davis et al., "Life coaching is a process focused on collaboration and solutions, in which a coach assists and facilitates an individual in achieving his or her goals and improving his or her life." [1] The official professional organization, the International Coaching Federation, defines coaching as, "partnering with clients in a thought-provoking and creative process that inspires them to maximize their personal and professional potential." [2] Renowned coach Dr. Pamela McLean describes coaching as distinct from other methods of development, including consulting, counseling, and mentoring, in its focus, role of the helper, and intended outcomes. Coaching is focused on the future and supporting the client as he/she investigates, identifies, and works towards a desired end state. In coaching, the client chooses the direction and areas for growth, and the coach facilitates through inquiry and active listening. The intended outcome, then, is a vision for the future, with goals and a plan to reach it, that are

all identified by the client. [3] Table 1, presented first in Dr. McLean's book, highlights further differences between these various approaches. [3, Tab. 1.1]

Table 1: Coaching, Consulting, Counseling, and Mentoring: Key Distinctions [3, Tab. 1.1]

	Coaching	Consulting	Counseling	Mentoring
Who receives?	Individuals Teams Organizations	Individuals Teams Organization	Individuals Family systems	Individuals
Focus	Future focus Identifying and achieving a desired future state	Problem-solving focus Fixing a known issue and achieving greater results	Healing the past Examining repeated patterns of behaviors	Advancing in the organization Networking Understanding politics
Role of the helper	Lead from behind: client chooses direction forward	Lead from in front: offer advice and solutions	Lead the process through questions, feedback, observations, and advice	Share past experiences as they might benefit recipient
Helper-client relationship	Partners working together to achieve a client's stated goals	Expert who helps the organization fix problems and grow	Expert (counselor) who helps the client	Senior, experienced individual who helps the novice
Outcomes	Goals, vision, and plan identified Forward progress on action steps	Opinions, and recommendation provided	Greater insight Healing of past	Understanding of organizational dynamics, networking
Length of relationship	Leader as coach: ongoing relationship External coach: six to twelve months to achieve significant change	Varies, depending on nature of assignment	Depends on approach of counselor; some foster ongoing relationships over years	May last over very long periods of time

Because coaching is a relatively new developmental approach, "it has no theory or methodology that it can call its own; however, it borrows from three traditional academic fields: psychology, business management, and adult education (training) and development." [4] Coaching focuses on helping people and inspiring them to change by allowing them to establish their own goals and supporting them with compassion. [5] Coaches challenge their clients, but generally to dream bigger and be more authentic.

Published research on coaching in education is generally focused on student growth and retention. Fields' study found that "coaching does provide a positive and effective form of support for enabling education students that is distinct from the support already provided lecturers and counsellors to improve student performance and retention." [6] Lefdahl-Davis, Huffman, Stancil, and Alayan researched the impact of coaching on 94 undergraduates and found that, "students who received at least three coaching sessions reported increased confidence in self, satisfaction with major, confidence in choice of major, confidence in goal setting and attainment, and awareness of values and alignment with decision making." [1] Other studies on medical students [7] and high school students [8] reached similar conclusions.

Devine, Meyers, and Houssemand's literature review found that "there is an emerging evidence-base that coaching is a powerful tool to support learning and development for students." [9] Their review, focused on scholarly articles containing the terms "coaching" and "education," found that coaching methods have been successfully deployed throughout the United States, United Kingdom, and Australia, to support growth in students, teachers, and school leaders. [9]

Method

Coaching was offered to current undergraduate students and recent graduates (less than three years removed) from the Zachry Leadership Program. Forty participants registered for the program. Participants were paired with a novice coach who had recently completed two graduate-level courses in coaching. They were expected to meet at least 3-4 times over the course of the three-month semester, and had the option of continuing meeting if deemed mutually beneficial by both the coach and the participant. The students or graduates (hereafter "participants") in the coaching program were all highly successful students or graduates, and all had been selected for a highly-competitive leadership development program for engineering students. The meetings between coaches and participants were allowed to develop organically, according to coaching best practices. [3] Participants were allowed to pick the areas they wanted to develop. Coaches then guided participants towards creating a vision and setting goals by asking questions, reflecting back observations, and facilitating exercises.

Fourteen coaches worked with students one-on-one during the semester (some coaches worked with multiple participants). The coaches who were paired with students had recently completed two graduate courses: *Foundations in Professional Coaching* and *Coaching Groups and Teams*. The majority of the coaches were mid-career professionals who were fulfilling the requirements for a master's degree in education and human development fields, while a few were non-degree seeking students who enrolled in the courses to learn how to incorporate coaching into their occupations.

Coached participants were provided with a leadership wheel (Figure 1) during their first session with their coach, and asked to fill it out according to how satisfied they felt in each competency described. The program staff selected the competencies on the wheel based on skills deemed a priority for development in this program and skills the coaches had been trained to help develop. While the staff's intention was to make the wheel as comprehensive as possible, covering every important competency, there are undoubtedly others that could be argued for and should be considered (such as delegation, creating and sharing vision, and inspiring action in others). Other programs could consider a wide range of competencies to assess and/or to develop through coaching, based on their learning outcomes and student priorities.

Figure 1: Leadership Wheel Categories and Scale
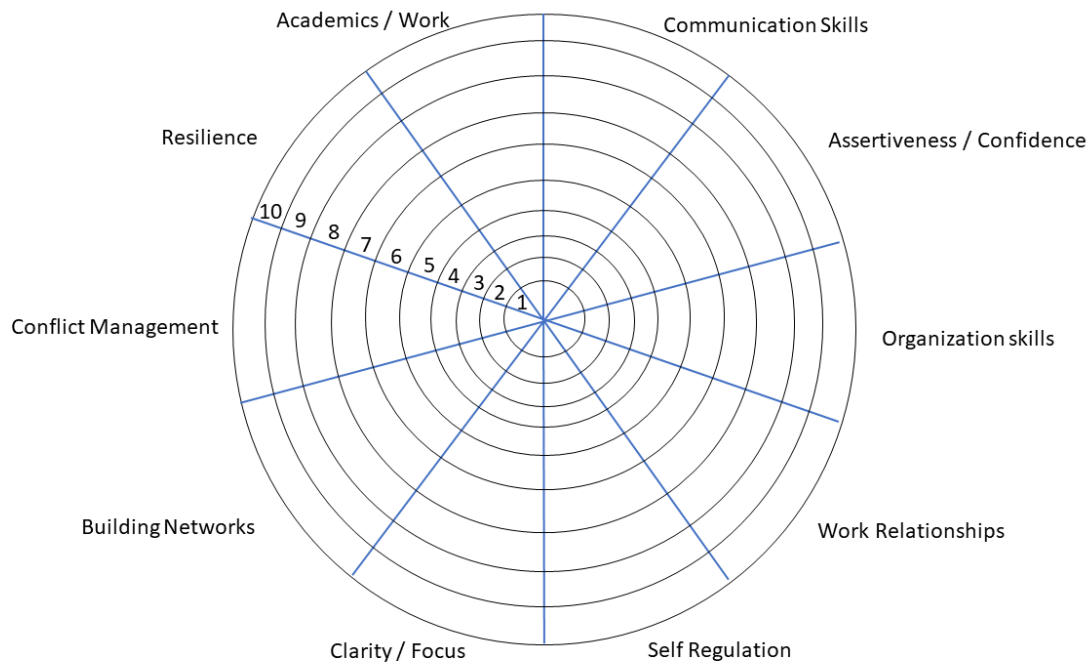
Eighteen participants self-rated their satisfaction in each competency on a scale from 1-10, where a score of 1 indicated strong dissatisfaction and a score of 10 indicated strong satisfaction; a score of 5 indicated neither dissatisfied nor satisfied. After completing the wheel, participants were invited, but not required, to describe their ratings to their coach and to select one or more of these competencies to work on developing with their coach. At the end of the semester, after three or four coaching sessions, participants were provided with the same leadership wheel and asked to reassess their satisfaction in each competency. Of the 18 participants who completed the wheel the first time, eight participants completed the wheel the second time.

A comparison group of students also completed the leadership wheel twice, with approximately three months separating the first and second times (the same amount of time used with the coached participants). The comparison group comprised undergraduate students in the Zachry Leadership Program who volunteered to complete it. Like the coached participants, the comparison students were highly-motivated, successful students who had been selected for the competitive engineering leadership program. These students had been offered the opportunity to

work with coaches earlier in the semester but had declined. Like the coached participants, the comparison group was asked to report their satisfaction in each leadership competency on the same scale, and told that they'd be asked to do it again three months later. The comparison group was not coached on any of the competencies during the intervening three months. Twenty students completed the life wheel the first time, and 16 of those also completed it the second time.

Responses from both groups were analyzed to determine change by student from the beginning to the end, and also aggregated by leadership competency to determine average change across all participants in each competency. Not all coaches reported wheel data for their clients, and not all of the comparison group students completed the wheel the second time. For this pilot study, responses from eight coached participants, and 14 comparison students, were analyzed.

Results

Self-reporting of change in satisfaction in these leadership competencies demonstrated only a slight difference between coached participants and the comparison group, with comparison group students reporting a larger increase in satisfaction, on average, than coached participants. Coached participants reported an average increase in satisfaction across all ten competencies of 0.556, while the comparison group reported an average increase in satisfaction across all competencies of 0.663. The median increase in average satisfaction for coached students was 0.375, while for the comparison group the median increase in average satisfaction was 0.6.

Coached participants reported greatest increases in satisfaction in two competencies: Clarity/Focus and Communication. In each of those two competencies, participants rated their satisfaction higher by 0.813 points after coaching than they did before coaching. The control students reported greatest increases in Conflict Management (1.063, on average) and Organization Skills (0.938, on average). The complete list of average change for each competency for each group is included in Table 2, below, while the complete data is included in the Appendix.

Table 2: Average Change Across Leadership Competencies

Leadership Competency	Avg. Change Across Coached Participants	Avg. Change Across Comparison Participants
Academics/Work	0.375	0.250
Assertiveness/Confidence	0.750	0.313
Building Networks	0.563	0.750
Clarity/Focus	0.813	0.563
Communication	0.813	0.688
Conflict Management	0.500	1.063
Mental Toughness/Resilience	0.750	0.813
Organization	0.188	0.938
School/Work Relationships	0.625	0.375
Self-Regulation	0.188	0.875
MEAN	**0.556**	**0.663**
MEDIAN	**0.59375**	**0.71875**

Female coached participants reported higher average increases in satisfaction than did male coached participants. Three of the eight coached participants were women and they reported an average increased satisfaction across all competencies of 1.0. The five men reported an average increase across all competencies of 0.29.

Discussion

This pilot semester showed that coaching can be provided for a relatively small financial investment, and that participants can recognize growth in key leadership competencies. As the field of coaching grows, junior coaches are often willing to work with clients for reduced fees or even for free, in order to get experience and accrue hours needed for certification. After identifying coaches and pairing them with students, little administration is required as the coach and student work directly to establish goals, meeting schedules, and work plans. Therefore, it could be a relatively easy to implement, high impact developmental effort to include in engineering leadership programs.

However, a different research approach is needed to more precisely analyze the impact of coaching in leadership development. For example, it is unclear to the authors how meaningful were the changes in satisfaction or the difference between the coached and comparison groups. The authors were surprised that the comparison group reported greater increases in satisfaction than did the coached students because those results ran counter to other research that has shown coaching to be a highly effective developmental approach in an educational setting [9]. One

hypothesis is that this data is skewed by the small number of participants analyzed and by inconsistent instruction provided to comparison students, or that this method was not well-suited to this research question. The uncoached students in the comparison group may have filled in their wheels quicker and without as much personal reflection, possibly influencing the data. Whereas coached students filled out their leadership wheels in the presence of their coaches, the comparison students received and submitted their wheels via Google Form. One of the of the comparison students, for example, scored his satisfaction as a 9 in all ten competencies during his second assessment. Coached students were told that these competencies represented things they could work on with their coaches, while the comparison group of students may have viewed it as more of a survey and put less thought into their responses. Future studies could provide the leadership wheel self-assessment to comparison group students in-person, rather than electronically, and students could be instructed to think carefully through their responses and given an opportunity to ask questions about the competencies of the wheel.

Also, because the coached participants had volunteered for coaching, while the comparison students declined to participate, the coached participants may tend to believe they have more to work on, relative to students in the comparison group. A multi-faceted assessment that involves participant interviews and data collected from friends or colleagues of the participants may provide better information to assess coaching efficacy. For example, it would be interesting to further investigate the perceived differences in growth between female and male participants. More participants and more complete data is needed to further investigate this difference.

Future research could also include a larger number of participants over a longer period of time. Many coaching engagements last at least six months, so the time between assessments may not have been long enough for participants to recognize growth.

In summary, coaching seems to have had a positive impact on the undergraduate engineering leadership students and recent graduates, and it is a relatively easy practice to introduce, but further research is needed to better quantify the impact.

Conclusion

Unfortunately, this pilot study did not allow a comprehensive answer to the original question, "How much will students perceive themselves to grow in various leadership competencies after working with a coach?" It did demonstrate that coaching could be incorporated into a leadership development program with minimal resource and time investments required, and it allowed researchers to identify weaknesses in this approach to assess its impact and begin to consider how to improve future studies.

The competencies that seem most relevant for development via coaching based on student responses are Clarity/Focus, Communication, Assertiveness/Confidence, and Mental Toughness/Resilience. An interesting future approach might be to have students develop a wheel or other assessment tool themselves, either individually or corporately. However, other programs interested in incorporating coaching should carefully consider how they want to assess student growth, as the wheel may not offer definitive results. If a comparison group is desired or deemed important, they should also plan how to assess that group in a way that is as consistent

with the coached group as possible. Finally, allowing students more time to work with coaches, perhaps over two semesters instead of just one, may produce more meaningful change.

Appendix: Participant and Comparison Data

Coached Participants, Difference between first and second assessments (females italicized)

Student	Academics/ Work	Assertiveness/ Confidence	Building Networks	Clarity/ Focus	Comm. Skills	Conflict Mgmt.	Mental Toughness/ Resilience	Org. Skills	School/ Work Relationships	Self-Regulation
J.C.	-1	-1	0.5	0	0.5	0	0.5	1	1	0
A.V.	*0*	*2*	*1*	*0.5*	*0*	*1*	*1*	*0.5*	*1*	*0.5*
L.G.	1	1	0	-2	1	0.5	1.5	0	0	0
L.M.	1	0	-1	2	0.5	0	1	0	0	1
T.F.	0	0	1	2	0	0	0	0	0	0
B.N.	*2*	*2*	*3*	*0*	*2*	*2*	*2*	*0*	*2*	*1*
S.M.	-1	1	0	0	1	0.5	0	0	1	0
G.M.	*1*	*1*	*0*	*4*	*1.5*	*0*	*0*	*0*	*0*	*-1*

Comparison Students, Difference between first and second assessments (females italicized)

Student	Academics/ Work	Assertiveness/ Confidence	Building Networks	Clarity/ Focus	Comm. Skills	Conflict Mgmt.	Mental Toughness/ Resilience	Org. Skills	School/ Work Relationships	Self-Regulation
A.C.	*1*	*1*	*6*	*0*	*1*	*-1*	*1*	*5*	*1*	*0*
C.M.	*0*	*-1*	*2*	*1*	*2*	*1*	*0*	*-2*	*1*	*0*
C.E.	*0*	*-2*	*0*	*-1*	*0*	*-1*	*0*	*-1*	*-3*	*-3*
C.C.	1	0	1	3	-1	2	1	3	3	2
D.D.	2	0	2	6	3	5	2	5	-1	4
H.R.	*-1*	*1*	*0*	*1*	*1*	*1*	*1*	*-1*	*0*	*1*
H.M.	-2	-2	-2	1	0	2	-1	-1	-3	-1
J.S.	2	2	1	-1	0	-1	2	1	2	-2
J.L.	0	0	3	1	-1	-1	2	2	0	2
K.S.	*2*	*3*	*1*	*-2*	*1*	*3*	*2*	*1*	*2*	*3*
K.B.	*0*	*2*	*1*	*0*	*2*	*-3*	*0*	*0*	*2*	*5*
L.D.	*-2*	*0*	*2*	*1*	*0*	*3*	*3*	*0*	*-1*	*0*
L.R.	2	0	-2	-1	1	-1	-2	0	0	0
M.V.	*-1*	*0*	*-2*	*-1*	*0*	*4*	*1*	*0*	*1*	*1*
S.W.	*-1*	*-1*	*-4*	*-1*	*1*	*1*	*-1*	*1*	*0*	*1*
M.S.	1	2	3	2	1	3	2	2	2	1

Sources

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