

Evidence-Based Practice: What Flavor Would You Like? The Influence of Prior Team Experience on Leadership Style Preferences by Early College Engineering Students

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Introduction

This is an Evidence-Based Practice complete paper where we explored the preferences that early college engineering students identified for team leadership style and how these preferences might have been influenced by their prior team experiences. We did this to identify the extent to which prior team experience might influence the mindset of our students as they embarked on a project-based team experience in our foundational engineering course. Prior experience on a team, expressed through the recall of “critical incidents” involving teamwork does not necessarily indicate a specific viewpoint about the prospects for success with a future team, but it could influence a student’s preference for a certain type of team leadership. Prior team experience could also encourage or erode a sense of optimism that an upcoming team experience will be both successful and enjoyable for its members.

Common themes for team leadership styles in the literature are autocratic/authoritarian, democratic, transitional, and transformational [1], [2], [3], [4], [5], [6], [7]. The students were asked to choose among three team leadership preferences as part of the CATME® Team Maker Survey: a team with one strong leader, a team with a leader who solicits and acts on team input, or a team with shared leadership. From the literature, we found that having a strong leader reflected a preference for “autocratic” leadership, while the preference for shared leadership was “democratic” [1], [2], [5].

The style characterized as one leader who takes input from team members could be autocratic or democratic, depending on what needs to be done, how urgent the demand for results, and/or whether the leader has specialized expertise for the work [1], [2], [6], [8]. In a team that operates democratically, the leader acknowledges everyone’s input equally and analyzes it objectively before issuing directions for how to proceed. In the workplace, this style is often labeled as “transactional”, because the leader or supervisor assigns work, rewards, and consequences for performance and non-performance as a set of transactions between supervisor and subordinate [3], [7], [9].

By contrast, a transformational style of leadership contains actions by the leader that inspire the members to work above and beyond stated or implied expectations, through a vision or encouragement that generates intrinsic motivation [2], [5], [7], [8], [9]. This style could be manifested through either an autocratic or democratic approach, depending on how the members regard their leader and the circumstances surrounding the work to be completed.

Study Problem and Purpose

Many engineering educators want to provide appropriate guidance for team success at the early college level. The ability to work on a team constructively has been identified as an important skill in the engineering workplace and is a required Student Outcome for undergraduate engineering programs for ABET accreditation [4], [10], [11]. While many adults can recognize

different approaches to teamwork by fellow team members and modify their own expectations for individual member performance accordingly, many students in higher education are still developing these skills and could benefit from additional guidance [6], [11].

If educators of early college students understood the potential relationships between prior team experience and team leadership preference, they would be better informed to provide appropriate guidance and mentorship to their teams, especially if conflicts in individual member expectations for other team members arise. We assert that appropriate guidance from educators could be reinforced by an understanding about the influence of prior team experiences and how these experiences might or might not contribute to how team members want to be led.

This research question forms the basis for our study:

How do prior academic and/or work-related team experiences relate to preferred team leadership style by early college engineering students?

Background and Conceptual Frameworks

We sought prior studies in both team leadership styles and the value of recalling critical incidents to inform the exploration of our primary constructs, i.e., pre-college team experiences and preferred team leadership styles. The following sections contain information about the frameworks that support these two respective constructs.

Common Leadership Styles and Their Effectiveness

The “autocratic” or authoritarian leadership style is characterized by a single, strong leader who dictates what the team members will do through coercion and other non-democratic practices [1], [5]. This leader issues orders and expects them to be fulfilled without exception, and makes all major decisions unilaterally [1], [6]. While it sounds as though the value of the team members is discounted under this style, emergency situations or circumstances in which the leader alone possesses certain specialized and/or contextual knowledge necessary to complete the work may require this type of leadership [6]. These two cases provide examples of the exercise of situational or dynamic leadership, where the leader’s actions may change in response to a given situation [2], [8].

In contrast to autocratic leadership, a team may choose to follow a “democratic” form of leadership, in which all members participate in decision making, with either a single leader or a system of rotating or shared leadership [1], [2], [5], [6]. This style of leadership has been found to be valuable because of its flexibility, given the fact that team development and unpredictable situations may indicate a change in leadership style [1], [8]. In addition, a democratic approach to leadership may lead to greater intrinsic motivation on the part of team members, because they feel as though their contributions matter to the team’s success [6]. The democratic leader invites participation by all group members and offers help, which further encourages motivation and a willingness to commit to team success [5], [6].

Under “transactional” leadership, a leader provides clear expectations, rewards or consequences

for meeting or not meeting targets, and a reliance on extrinsic factors to foster motivation among team members [1], [9]. Some transactional team leaders appeal to the self-interest of their more productive team members through considerations such as recognition, additional support, and nominations for awards or advancement, where possible [9]. However, with a major emphasis on rewards for productivity and its downside of penalties for non-performance, the transactional style may stifle creativity, innovative thinking, and commitment to the welfare of the team. In the end, the transactional leader may employ techniques of the autocratic or democratic style, depending on how well either approach will produce the desired results.

“Transformational” leadership appears to offer a high probability for successful teamwork and productivity because a transformational leader appeals to team members’ self-interest as a motivating factor and therefore promotes interest in the success and welfare of fellow team members [3], [9]. Examples of such motivating techniques include genuine interest in each team member’s contributions as well as their value as people, and/or promoting critical and higher-level thinking through gentle stimulation [3]. This type of leader often conveys a vision for what the team should accomplish and may inspire members to adopt this vision through their enthusiasm, sense of commitment, and charisma [3], [7], [9]. The team members may then identify with the leader and aspire to be like them, at least as long as the leader provides the necessary support, encouragement, mentoring and whatever else the members may need to be successful [7], [9].

Recall of Critical Incidents Providing Influential Insights

The Critical Incident Technique was described by Flanagan during the early 1950’s as a method to capture important elements, i.e., “critical incidents” of USAAF officers’ experiences during WWII in order to improve the training requirements for pilots [12], [13]. Specifically, the investigator collects information about a well-defined situation using questions such as, “tell me about a time when....” and then explores the interviewee’s response with more specific prompts for the details about the incident that might further provide context, nuances in judgment, relationships, and other circumstances that would better define the incident and its implications [12], [13], [14]. The usefulness of this technique has been emphasized in the literature through its widespread use in a variety of workplaces and applications beyond its origins in military training, such as health care, customer service, communications, position descriptions and performance appraisals, and education [13], [14], [15].

The individual steps in the Critical Incident Technique resemble those of other forms of qualitative research [12], [13], [14], [16]:

1. Determine the objectives of the study
2. Establish one or more research questions
3. Plan how to collect and analyze the data
4. Obtain authorization to collect the data
5. Collect the data through direct observation, interviews, questionnaires, etc.
6. Collect enough data for a reasonable sample size
7. Analyze and interpret the data
8. Report the findings

Because of its widespread usefulness to qualitative research studies, we chose to use the Critical Incident Technique to collect data about students' prior team experiences.

Research Methods

This is an evidence-based study in which participants wrote short essays about their prior team experiences and completed a team formation survey containing a prompt about their preferred leadership style for their team. The prompt for the short essay was composed according to Flanagan's Critical Incident Technique to collect authentic responses based on prior teamwork experiences with teams in classroom and extracurricular settings. Themes emerging from the short essays were analyzed against the survey results to detect possible relationships between prior experiences and team leadership preferences.

Study Context and Participants

Our Institutional Review Board (IRB) determined that our study protocol (#26-203) "is not research involving human subjects as defined by HHS and FDA regulations." The study sample consisted of 170 first-year engineering students in their first full-time semester at our university. All of the students in the sample were enrolled in the first semester of a first-year interdisciplinary engineering foundations sequence. The students in the sample were registered among four sections, each containing approximately 60-70 students. Since the course contained projects pursued by non-self-selected teams of first-time-in-college students, we expected that prior team experience would influence preferences for team leadership style. We designed our study to prove or disprove this assumption.

Data Collection

Data were collected as a convenience sample from responses to a prompt in multiple choice format that was administered during the second week of the course as part of a CATME® Team Maker Survey. A screenshot of the CATME® prompt appears in Appendix A. The participants completed the prior team experiences short essay prompt by handwriting their responses on index cards which we then collected for analysis. Participation in the CATME® survey was required as a course assignment, in order to encourage greater participation for the best possible assignment to teams by CATME®. The participants were awarded participation credit for their responses to the CATME® survey.

During the fourth week of the course, we applied the Critical Incident Technique to a short essay, free-response prompt in order to explore the extent to which prior team experience influenced a student's choice of preferred leadership style. Would a positive prior team experience predispose a student toward a largely democratic style? Conversely, would a negative prior experience lead to a preference for an authoritarian style?

The short essay prompt was administered in class during the fourth week of the course. Responses were handwritten on 3- x 5-inch index cards within a 10–15-minute period. The details of this prompt were as follows:

1. Please print your name at the top
2. Please print your team's name on the next line
3. Skip one line
4. Answer this question: What has been your experience in working on a team in the past?
5. Write two or three sentences, or more if you wish

The CATME® Team Maker Survey results were downloaded from the CATME® website to an Excel spreadsheet. Data not relating to team leadership preference were removed. Additional columns were then added to the spreadsheet for codes and themes that were identified from the responses to the prior teamwork experiences prompt.

Data Analysis

Two rounds of emergent coding were conducted to analyze the short essays about prior team experiences in order to capture both specific examples of these experiences and the overall tone of the experience as indicated below. The rationale for emergent coding of the data in two rounds was to minimize potential bias in the assignment of the overall tone of each response until specific examples of prior teamwork were identified, as well as provide more salient descriptions of these experiences.

In the first round of coding, a single rater assigned one to four emergent codes to each response, based on keywords or phrases in the response. These codes were then organized into themes, which are listed in Appendix B with example codes and formed the basis for comparison against responses for preference in team leadership style collected through the CATME® Team Maker Survey. Both favorable and unfavorable codes were included under each theme, such as “balance in workloads” vs. “lack of balance in workloads.”

After the codes and themes were established, they were used to re-code the responses in a second round of coding. Each response was assigned any codes that were present, and each code was also assigned a tone of "positive" and/or "negative", according to the specific passage. Thus, each student could have multiple themes assigned, and each theme could have been represented by a positive experience, and/or a negative experience. Since certain responses could have contained both positive and negative experiences, they were coded as “mixed.”

Fisher's exact test was used to explore possible relationships between themes and preferences for team leadership styles. These results were tested for false positives with a Benjamini-Hochburg test. A Fisher's exact test was then performed to test for a relationship between preferred leadership styles and the themes for positive, negative, or mixed experiences, respectively.

Limitations to This Study

This study is limited by the size of the study population and study sample, as well as by the types and circumstances of our data collection. In some cases, students who were absent from class on the day that the short essay prompt was administered did not complete it. The survey prompts were administered in class and online, respectively. In addition, time frame and institutional space were limited factors, as the course duration in which the data were collected was limited to one semester, and each prompt was administered only once, at or near the beginning of the

course, prior to the formation of the project teams. Finally, the 170 sets of responses were collected as a convenience sample from the study population of approximately 260 students.

If a member of the study population described their prior team experience but did give examples of whether it was positive, negative, or mixed, and/or did not respond to the CATME® survey prompt, all of their responses were removed from the study. This caused a reduction in the number of potential responses due to a prompt that did not explicitly request specific examples of teamwork that could be coded as positive, negative, or mixed.

Participation in the short essay about prior team experiences was voluntary, while the CATME® survey prompt was required, which resulted in a potential response bias. Finally, the CATME® survey prompt stipulated only one choice among the three available preferred team leadership styles, even though students might have preferred more than one style.

Results and Discussion

There were totals of 120 Positive responses (70%), 13 Negative responses (8%), and 37 Mixed responses (22%) for the short essay responses about prior team experiences. The CATME® leadership preference results contained a similar skewed distribution among preferred leadership styles: 9 responses for One Strong Leader (5%), 59 responses for One Leader with Team Input (35%) and 102 responses for Shared Leadership (60%).

The largest number of participants indicated a preference for the shared leadership style, regardless of their prior team experience as Positive, Negative, or Mixed. The popularity of the shared leadership style might, or might not, have resulted in successful team operation and high product quality. There is evidence in the literature that shared leadership results in greater member satisfaction and more effective team operation [2], [4]. This would be an appropriate focus for future study, since we would be able to examine the team's project deliverables for indications of high or low overall quality, as well as performance evaluation data by individual team members.

The “leader who takes input from everyone” style was also popular, especially among certain participants who had Positive prior experiences. Overall, relatively few students preferred to be a strong leader or a strong follower, regardless of whether their prior experience was Positive, Negative, or Mixed.

We noticed that the autocratic and democratic leadership styles were described in the literature in more or less absolute terms [1], [2], [3], [6], [7], [8], [9]. However, our experience with student project teams has shown that student leaders recognize that leadership in action will sometimes be autocratic or democratic, depending on context and team dynamics [8].

The distribution of themes from the analysis of prior team experiences, as listed in Appendix B, are shown by team leadership preference according to positive expression and negative expression in Figures 1 and 2 below:

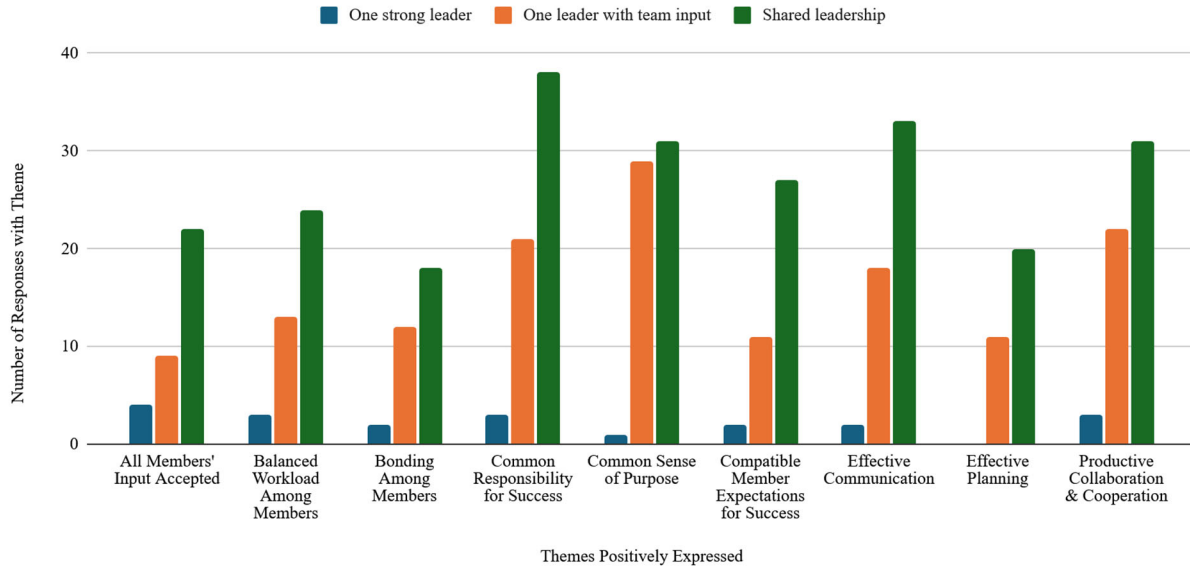


Figure 1: Counts of themes expressed as a positive experience by team leadership preference

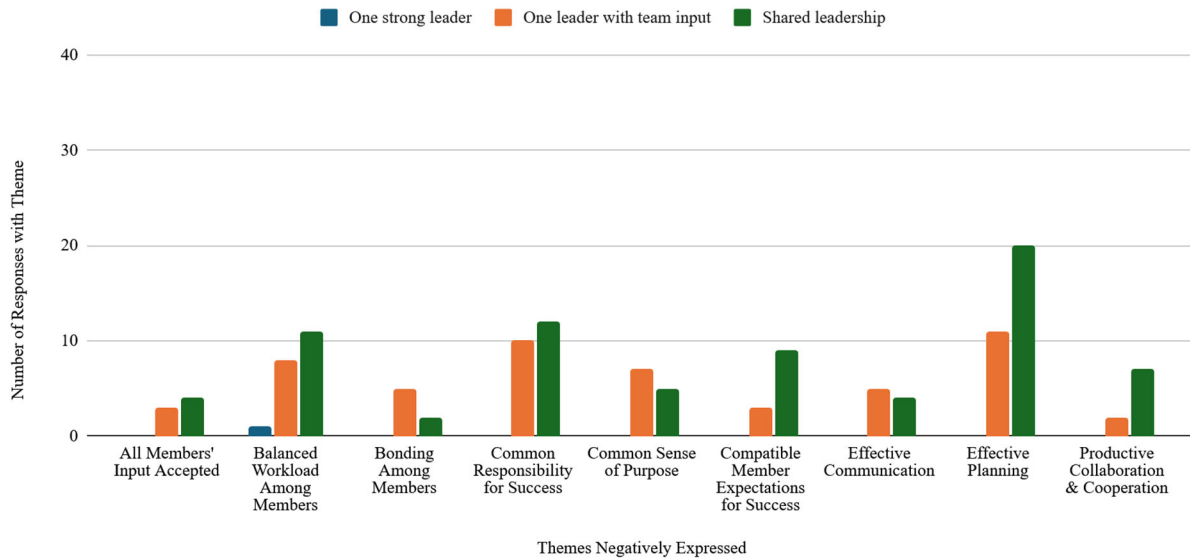


Figure 2: Counts of themes expressed as a negative experience by team leadership preference

Attributes of positive prior team experiences were found to be as expected from both the literature and our own experience in working with student teams. For example, effective communication contributes to good cooperation and collaboration, which in turn may be intrinsically motivating [2], [3], [4], [9]. Similarly, common expectations and responsibility for success, and bonding among team members were frequently mentioned in these prior experience responses. We found that the most common themes for positive experiences were “common sense of purpose”, “common responsibility for success” and “productive collaboration and cooperation”, along with “effective communication.” Since we also found that “bonding among

team members” was reported nearly as often as “balanced workload”, it is possible that the teams with bonding among the members were more likely to share the work equitably.

For negative prior experiences, it could be inferred that the same lack of communication and cooperation left one member “doing all of the work” as reported in a large number of the negative responses. However, the most common themes for this group of responses were a lack of both “common responsibility for success” and “common expectations for success”, along with unfavorable impressions of “productive collaboration and cooperation” and “balanced workload among members.” There was also little mention of bonding except where it was detrimental to the progress of the work.

For mixed experiences, the most common theme was “common responsibility for success”, followed by “common expectations”, “common sense of purpose”, and “balanced workload”. In addition, an atmosphere of open-mindedness, where it was reported, encouraged all team members to readily offer their own ideas and feedback, encouraged by a democratic approach to leadership [4], [5]. Curiously enough, there was very little mention of bonding among members, whether positive or negative, in the mixed prior experiences.

Statistical Testing for Possible Relationships Between Prior Experience Themes and Leadership Preferences

The results for statistical tests for relationships between themes and leadership preferences are given in Table 1 below. These results revealed one possible rejection of the null hypothesis for the positive experiences of a common sense of purpose. However, given the considerable number of comparisons being made, there was a considerable risk of false positives. To account for this, we applied the Benjamini-Hochberg procedure, which suggested that this was indeed a false positive. Similarly, we found no evidence of a relationship between overall tone of the prior experience responses and team leadership style preferences ($p = 0.3857$).

Table 1: Results of Statistical Analysis

Themes for Each Type of Expression	One Strong Leader		One Leader with Team Input		Shared Leadership		p value	BH Adjusted p
	n	%	n	%	n	%		
Themes for Positive Expressions								
All Members' Input Accepted	4	50	9	15.3	22	21.4	0.0729	0.3282
Balanced Workload Among Members	3	37.5	13	22	24	23.3	0.5989	0.8963
Bonding Among Members	2	25	12	20.3	18	17.5	0.6971	0.8963
Common Responsibility for Success	3	37.5	21	35.6	38	36.9	1.0000	1.0000
Common Sense of Purpose	1	12.5	29	49.2	31	30.1	0.0186	0.1672
Compatible Member Expectations for Success	2	25	11	18.6	27	26.2	0.5405	0.8963
Effective Communication	2	25	18	30.5	33	32	0.9595	1.0000
Effective Planning	0	0	11	18.6	20	19.4	0.5721	0.8963
Productive Collaboration & Cooperation	3	37.5	22	37.3	31	30.1	0.6328	0.8963
Themes for Negative Expressions	n	%	n	%	n	%		
All Members' Input Accepted	0	0	3	5.1	4	3.9	0.7915	0.3282
Balanced Workload Among Members	1	12.5	8	13.6	11	10.7	0.7762	0.8963
Bonding Among Members	0	0	5	8.5	2	1.9	0.1562	0.8963
Common Responsibility for Success	0	0	10	16.9	12	11.7	0.4423	1.0000
Common Sense of Purpose	0	0	7	11.9	5	4.9	0.2038	0.1672
Compatible Member Expectations for Success	0	0	3	5.1	9	8.7	0.7463	0.8963
Effective Communication	0	0	5	8.5	4	3.9	0.4573	1.0000
Effective Planning	0	0	0	0	4	3.9	0.4217	0.8963
Productive Collaboration & Cooperation	0	0	2	3.4	7	6.8	0.6724	0.8963

Conclusions and Recommendations

There are many factors that contribute to the success of a student-led early college project team in addition to the influence of prior experiences and preferred leadership style. Examples of additional factors include diversity in learning style, culture, and a common habit of early college students to view their experiences subjectively more often than objectively.

Our major contribution to the body of knowledge about early college student teamwork was the identification of a relatively large number of themes in team dynamics that educators could address during the process of guiding their students toward becoming more effective team members and leaders. Using the Critical Incident Technique to prompt for prior team experiences enabled students to provide rich descriptions that yielded numerous and diverse themes for educators to emphasize when they discuss the elements of effective teamwork.

We plan to continue our study by exploring the ramifications of our prior experience and team leadership preference results for the teams in which this study's participants served during the study period. Prior team experience and preferences in team leadership style may or may not be found to be contributing factors to eventual team success. Study variables could include the quality of a team's deliverables, team member attendance in class, and individual team members' motivation for high overall academic success in the first-year engineering foundations course, which contains measurable performance indicators on both an individual and team basis.

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Appendix A: Prompt for Team Leadership Preferences

Week 2: CATME® Team Maker Survey



[Help](#)
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[Logout](#)

Question Editor

Question Manager

Title: Leadership Pref

Question: Which of the following team leadership structures do you prefer?

Type: Multiple Choice, Choose One

Advanced Settings

Answers

Display Text: Teams with one strong leader

Stored As: Single Leader

Display Text: Teams with one leader who gets lots of team input

Stored As: One Leader w/ Input

Display Text: Teams where leadership is shared equally among all team memi

Stored As: Shared Leadership

Wed Feb 18 08:38:45 2026 / aCABrwxioKTdFPK7ly6h8

https://catme.org/faculty/question_editor?id=50

Appendix B: Codes and Themes for Short Essays about Prior Team Experiences

<i>Theme</i>	<i>Examples of Favorable Codes for Each Theme (unfavorable codes are the opposite)</i>
Effective Communication	• keeping the team on track • democratic approach • everyone has a role • get to know fellow team members • serve as a team leader
Productive Collaboration	• willingness to compromise • interdependence on other team members • learned to work with others • checking members' work • share work online
Common Sense of Purpose	• everyone helps everyone else • team cohesion • everyone contributes to the work • highly productive • leadership
Compatible Member Expectations for Success	• similar work ethic • setting expectations for the work • timely product delivery • everyone contributes to the work • team has a sense of order
Common Sense of Responsibility for Success	• how to work on a team • no slacking by team members • everyone working together • help struggling team members • everyone has a role on the team
Balance of Workload Among Members	• members working to their strengths • balance of compatible skills • team members accept roles on the team • leader checks everyone's work • helping other members
All Members' Input Accepted	• initiate ideas • learning from others • teaching other members • democratic approach • take ideas from peers
Bonding Among Team Members	• working with friends on a team • getting along well with everyone on team • interdependence among members • team cohesion and closeness • getting to know other members
Effective Planning	• effective time management • meeting internal and external deadlines • addressing issues with the team • team has a sense of order • delegate tasks effectively