Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025 ASEE
Paper ID #48914

How Personality Impacts Academic, Professional, and Social Activity Preferences of Engineering Students

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Abstract

Engineering students with different personalities may benefit from different types of support activities, though the impact may vary based on individual preferences and needs. Although introversion and extroversion are the personality traits most commonly known to the general public, traits such as agreeableness, conscientiousness, and assertiveness also play a role in how students are perceived and interact with the world. Some students may prefer environments that allow for deep analysis and design, while others may find more satisfaction in activities that involve collaboration and communication, such as participating in engineering competitions or social events. Those with different personalities may succeed in engineering by coming together and finding activities that align with their strengths and interests. Engineering is inherently collaborative, and all personalities bring valuable skills to the field. Therefore, the key is for students to engage in activities that help them grow personally and professionally, regardless of their natural predilections. The main purpose of this study is to identify how different personalities in students affect their enjoyment of and participation in professional and academic development to better cater activities to the majority of students.

To assess student personality, the IPIP (International Personality Item Pool) was administered to a group of engineering students participating in an NSF S-STEM Program. Student participants then answered additional survey questions to measure their participation in and enjoyment of different types of academic support, professional development, and social activities. The key findings of this paper show that there is no correlation between extraversion and participation in program or informal activities, but there is a positive correlation between extraversion and enjoyment of activities. These findings provide insights for tailoring social and academic experiences to better support students on both ends of the extraversion/introversion spectrum. The survey results also suggest that there are other factors besides one's personality that affect the enjoyment and participation of activities. Future research may examine the role of personality dimensions not explored in the present study.

Introduction

Personality significantly influences how one engages with and enjoys various activities [1]-[2]. To ensure events are designed to appeal to a diverse student body, it is important to understand which activities resonate with different personalities. A study by Murphy et. al highlights that "extraversion-introversion (E-I) differences impact how students become engaged" [3]. The study notes that extroverted students thrive on "a high level of stimulation to remain interested," while introverted students "work best when given time to reflect and process". Recognizing these differences shows the importance of understanding different personalities and how they relate to the enjoyment of activities.

Personality also shapes the way that people interact with one another, influencing their ability to build connections and foster a sense of belonging [4]. For instance, extroverted individuals may find it easier to engage socially and be in a group, while introverted individuals may seek more in-depth relationships to cultivate the same sense of belonging. Just as teaching styles may be tailored to suit various learning preferences, different interactions and activities may be adapted to align with individual personalities, fostering more effective communication and collaboration [5].

One of the most commonly-known personalities is extraversion. Extraversion, characterized by energy, sociability, and enthusiasm, is strongly associated with a preference for group activities and roles involving interaction with others. Research shows that extraverted students often thrive in leadership roles, student government, and team-based activities like sports or debate teams [6]-[7]. Conversely, introversion is often marked by a preference for solitude and reflective activities and aligns with independent and technical pursuits. Engineering students with introverted tendencies may gravitate toward extracurriculars that allow them to work autonomously, such as coding hackathons, robotics teams, or individual research projects [8]. Extraversion was the focus of this study because of its easily observable and quantifiable behaviors, as well as its practical applications in educational settings. The more that is known about how extraverts and introverts engage with different academic and social events, the better educators will be able to cater their instruction and programs to students [9].

Differences in personality are particularly apparent in groups of students from diverse academic and cultural backgrounds, making STEM programs an ideal context for exploring these dynamics. STEM students often work collaboratively under high-pressure, problem-solving environments that demand creativity, discipline, and resilience. This unique setting provides a compelling reason to study their personalities specifically, as these traits may influence both their academic success and professional development in ways that differ from students in less technical or collaborative fields. This research involved a group of STEM students participating in a $1.5M National Science Foundation (NSF) funded scholarship program at Louisiana Tech University.

Overview of the S-STEM Program and Activities

S-STEM, or Scholarships in Science, Technology, Engineering, and Mathematics is an NSF Program that seeks to increase the success of low-income, academically talented students through academic, financial, and social support. S-STEM participants receive a university scholarship of up to $10,000 annually while benefiting from additional activities and resources [10]-[15]. While various academic and support resources are included in the implementation of the S-STEM Program discussed here, this paper's focus is the correlation between the participation in and enjoyment of certain program activities that are implemented for the students' benefit.

The SUCCESS Scholars program began in fall 2022 with 24 first-year students (Year 1 cohort) and expanded in fall 2023 with 22 additional first-year students (Year 2 cohort). By winter 2024, when this research was conducted, the program consisted of 16 students in the Year 1 cohort and 20 in the Year 2 cohort. Participants were selected from a pool of low-income, academically talented applicants meeting S-STEM Program criteria. The program aimed to combine best practices from other S-STEM initiatives, providing tiered support through nine key elements. Initially, the focus was on direct academic support. As students advanced, the emphasis shifted to professional development, including career preparation, interview skills, resume writing, and job applications. A social component was also introduced, with optional weekly professional development lunches and planned social activities to foster community, build connections, and balance academic and professional growth with social engagement.

Activities. Throughout the SUCCESS Scholars program's duration, both faculty and students have organized and led social activities for participants in the S-STEM program. These activities, which play a vital role in fostering community and supporting mental health, are considered "an essential component to creating culturally competent, well-rounded engineers" [14]. Not only were the program social events taken into account for this study, but informal social events that the students planned outside of the program were also analyzed. Below is a list of activities analyzed in this research, all occurring over the 2023-2024 school year:

1. Weekly professional development lunches
2. Industry field trip
3. Career fairs
4. Solar eclipse field trip
5. Halloween party
6. Christmas party
7. End of year party
8. Informal social events outside of the program

Research Questions

This study uses the IPIP (International Personality Item Pool) scale to quantify extraversion and uses the results to explore the following hypotheses:

- Hypothesis 1: Extraversion is positively related to participation in program social activities.
- Hypothesis 2: Extraversion is positively related to higher enjoyment of program social activities.
- Hypothesis 3: Extraversion is positively related to participation in informal social gatherings with fellow program members.

Methods

A variation of the IPIP was administered to the students of the S-STEM program through an anonymous online Qualtrics survey, which was used to determine a student’s extraversion score on a scale of 20 to 100. The remaining questions consisted of randomized multiple-choice and

scaled questions regarding student enjoyment and participation in designated cohort events. The survey was designed to tailor questions based on the cohort students belonged to, ensuring alignment with the specific activities offered to each group. No demographic information was collected from the participants to ensure that anonymity was kept.

The IPIP is an open-source scale used to determine personality traits. It was chosen because of its easily accessible items and scoring systems, as opposed to proprietary tests such as the NEO Personality Inventory. The version administered for this research was 20 questions long, with 10 positively keyed questions and 10 negatively keyed questions. For positively keyed items, the response “very inaccurate” is assigned a value of 1, and “very accurate” a value of 5. For negatively keyed items, the scoring is flipped, the response “very inaccurate” assigned a value of 5 and “very accurate” a value of 1. Once numbers are assigned for all of the items in the scale, the values are summed to obtain a total scaled score, with very extraverted individuals scoring high and very introverted individuals scoring low. The questions are listed in Table 1.

Table 1. *IPIP Survey Questions*

Positively keyed items	Negatively keyed items
I feel comfortable around people	I have little to say
I make friends easily	I keep in the background
I am skilled in handling social situations	I would describe my experiences as somewhat dull
I am the life of the party	I don’t like to draw attention to myself
I know how to captivate people	I don’t talk a lot
I start conversations	I avoid contact with others
I warm up quickly to others	I am hard to get to know
I talk to a lot of different people at parties	I retreat from others
I don’t mind being the center of attention	I find it difficult to approach others
I cheer people up	I keep others at a distance

The remaining questions in the survey focused on the enjoyment of and participation in the activities. For these questions, students entered numeric values indicating how often they

attended an event and their level of enjoyment. The maximum attendance value corresponded to the total number of events held, while enjoyment was rated on a scale of 1 to 5, with 5 representing the highest level of enjoyment. Table 2 lists the activities that were asked about in the survey.

Table 2. *Participation and Enjoyment Survey Questions*

How often did you participate in each of these activities or events during all three terms last year (Fall, Winter, Spring of 2023-24)?	**How much did you enjoy participating in each of these SUCCESS Scholars Program activities during all three terms last year (Fall, Winter, Spring of 2023-24)?**
Solar Eclipse Trip	
Weekly Lunches	
Career Fair	
End-of-year Party	
Industry Field Trip	
Professional Development	
Halloween Party	
Christmas Party	

Students were also given an open-ended question where they were asked to provide the average number of times per week they engaged informally with other students in their cohort.

Students who responded that they attended less than one-half of the maximum number of events were prompted with a question as to why that was. That question with the possible answer choices is shown in Table 3.

Table 3. *Follow-Up Question Regarding Limited Event Attendance*

You answered earlier that you attended fewer than half of *event type* last year. Please select all the reasons you didn't participate in the sessions.	
Sick	Out of town
Time conflicted with work	Studying
Had other things to do	Not interested
Wasn't comfortable going	Other reason

The analysis of the survey coding is described in the results section below.

Results

After removing incomplete responses, the final sample consisted of 31 respondents. Of these, 12 (39%) were from the Year 1 cohort and 19 (61%) from the Year 2 cohort. In terms of participation by cohort, 75% of the Year 1 cohort (12 out of 16) and 95% of the Year 2 cohort (19 out of 20) completed the survey. Demographic information was not collected to maintain respondent anonymity.

Summary statistics for self-reported **participation in each program** activity are provided in Table 3. Descriptive statistics for **enjoyment of each program activity** are provided in Table 4. The lunches were offered weekly (27 total lunches), and students participated in 22 on average. Fewer students attended the solar eclipse event (19 of 31 students or 61%) and the industry visit (22 of 31 or 71%). Students took part in a minimum of 2 different activities; all 31 students attended at least one of the weekly lunches and one Career Fair session (minimum values above 0 in Table 1). Overall, most students attended every event at least once ($M = 6.1$, median = 7).

Table 4. *Participation in Each Program Activity*

	Lunch	Industry Visit	Career Fair	Solar Eclipse	Halloween Party	Christmas Party	End of Year Party	Count of Event Types [a]
N	31	31	31	31	31	31	31	31
Median	25	1	1	1	1	1	1	7
Mean	22.09	0.71	1.39	0.61	0.87	0.84	0.90	6.1
Std. Dev.	6.46	0.46	0.50	0.40	0.34	0.37	0.30	1.3
Possible Range	0-27	0-1	0-2	0-1	0-1	0-1	0-1	0-7
Minimum	4	0	1	0	0	0	0	2
Maximum	27	1	2	1	1	1	1	7

[a] Count of Event Types is the number of different program events attended at least once.

Table 5. *Enjoyment of Each Program Activity*

	Lunch	Industry Visit	Career Fair	Solar Eclipse	Halloween Party	Christmas Party	End of Year Party
N	31	22	31	19	27	26	28
Median	5	5	4	5	4	5	5
Mean	4.6	4.7	3.9	4.9	4.1	4.5	4.5
Std. Dev.	0.7	0.8	1.0	0.3	0.9	0.8	0.8
Possible Range	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Minimum	2	2	1	4	2	2	2
Maximum	5	5	5	5	5	5	5

Sum of the percent of sessions in which the respondent participated, summed across seven program activities.

After reverse coding the 10 negatively worded items, all 20 IPIP items were summed to create a single extraversion score for each respondent. The Cronbach α for the extraversion scale was 0.94, indicating strong internal consistency. Participation in the weekly lunches and the biannual Career Fair were converted into a percentage of the total possible events (27 and 2 respectively). Participation in the industry site visit, the solar eclipse event, and the three social events (Halloween, Christmas, and end of year parties) were coded as dichotomous yes (1) or no (0) variables. Having coded all program activities on a 0 to 1 scale, scores from the seven activities were summed to form a single measure of participation with a possible range of 0 to 7. Overall enjoyment of program activities was calculated by averaging ratings from the activities in which the respondent participated. Ratings for each activity were scored on a 5-point scale with 1

representing “not at all” and 5 “a great deal.” Participation in informal social events or meetings with other S-STEM scholars (i.e., activities outside those organized by the program faculty) was also measured. Respondents entered the average number of times per week they took part in informal activities or meetings with others in their cohort during the previous fall term. Students were asked to include both on- and off-campus activities in their estimates.

Descriptive statistics were calculated for the variables used in the analysis: participation in and enjoyment of each program activity, participation in informal social events with other S-STEM scholars, and the IPIP extraversion scale. The summary statistics for participation in and enjoyment of activities as well as for the IPIP extraversion scale are in Table 6.

Table 6. *Descriptive Statistics for Study Variables of Participation, Enjoyment, and Extraversion*

	Participation			
	Program Activities [a]	Informal Activities [b]	Enjoyment [c]	Extraversion [d]
N	31	31	31	31
Median	6.0	3.0	4.4	63.0
Mean	5.4	20.2	4.4	65.0
Std. Dev.	1.3	72.8	0.5	14.4
Possible Range	0-7	0-400	1-5	20-100
Minimum	1.9	0.0	2.9	44.0
Maximum	7	400	5	99

[a] The number of different activity types in which the respondent participated.
[b] Number of informal meetings or social events in which the respondent participated in the prior term.
[c] Average rating of enjoyment on Program Activities attended, collected on a 5-point scale.
[d] Sum of responses to 20 IPIP items, collected on a 5-point scale.

The bivariate correlations between the extraversion scale and participation in and enjoyment of activities are provided in Table 6. Consistent with Hypothesis 2, extraversion significantly and positively correlated with enjoyment of program activities ($r = 0.36$, $p = 0.04989$). Extraversion was not significantly correlated with participation in program activities or informal activities. Hypotheses 1 and 3 were not supported.

Table 7. *Correlation between Extraversion and Activities*

Variable	Extraversion
Participation in Program Activities	0.04
Participation in Informal Activities	0.22
Enjoyment of Program Activities	0.36*

* $p < .05$

In addition to the quantitative results that were determined from the survey, there were a few open-ended response questions that were included in the survey. For each singular program activity a student did not attend, or if a student attended less than half of the meetings of a recurring activity, they were asked to indicate the reason(s) why. Across activities, the most frequently mentioned reasons were schedule conflicts due to work or classes. One might expect participation to be even higher than observed had some events not conflicted with students' work and course commitments.

Discussion

The hypotheses introduced in the beginning of this paper yielded mixed results, with some failing to show statistical significance. This outcome highlights the complex nature of personalities. Potential reasoning for these results are examined in this discussion.

One possible reason why extraversion was not significantly correlated with participation (why Hypothesis 1 was not supported) could be that students feel a social responsibility to attend events presented by faculty, as it would be a faux pas to decline an invitation to a program event, even if it is not mandatory. Since the SUCCESS Scholars program supports the students financially, academically, and socially, they may feel that their attendance at these events is expected. Another potential reason has to do with the connections formed between the students. The students within the program have known each other since the beginning of their freshman year, and strong connections have been formed between the students and the faculty within the program. Due to these possible connections to the program and their peers/mentors, even if students do not particularly enjoy an event due to their personality, they may still attend because they value their relationships within the program.

A possible explanation for why extraversion was not significantly correlated with participation in informal activities (why Hypothesis 3 was not supported) is that the students were the ones that planned the informal activities. Because of this, students would not likely feel obligated to attend these events unless they genuinely wanted to and would be more likely to enjoy an event that they orchestrated themselves.

Conclusions

The research results show that extraversion is positively related to higher enjoyment of program social activities but not positively related to participation in program social activities or participation in informal social gatherings with other student participants. These findings provide insights for creating more effective, engaging, and inclusive program activities that cater to a broad spectrum of student personalities. By understanding the nuances of how personality traits influence student enjoyment, motivating factors and potential barriers may be identified and addressed for future events. For instance, activities may be tailored to accommodate individuals who may be more introverted and prefer structured, smaller group settings, as well as those who thrive in larger, social, and dynamic environments. Furthermore, integrating personality insights into activity planning may help create a more balanced program lineup that fosters a sense of belonging, encourages diverse participation, and ensures that no single group feels excluded. This approach has the potential to enhance the overall experience for students, improving both attendance and enjoyment.

Acknowledgement of Support and Disclaimer

This material is based upon work supported by the National Science Foundation under Grant No. 2221638. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. The authors would like to express their gratitude to the SUCCESS Scholars who participated in the survey for this research - without them, this work would not be possible.

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