WORK-IN-PROGRESS: INVESTIGATING ON-CAMPUS ENGINEERING STUDENT ORGANIZATIONS AS MEANS OF PROMOTING ETHICAL DEVELOPMENT

1. ABSTRACT

Ethics is and should be intrinsic to engineering. However, many engineering students do not recognize that every engineering decision contains ethical dimensions and that underlying values and current sociopolitical and cultural contexts can influence those decisions. One potential way to enhance engineering students' ethical development is through extra-curricular activities (ECAs). ECAs can include many topics and interests, such as student societies (e.g., fraternities and sororities) and cultural and social organizations (e.g., Society of Hispanic Professional Engineers, Latinos in Science and Engineering, Society of Women Engineers). Previous studies emphasize that participation in student organizations plays an important role in the ethical development of students. Despite this important role, it is not clear whether some student organizations are more successful at enhancing ethical development of engineering students than others, or if it is the act of participation in these organizations itself has an effect on students' ethical development. We hypothesize that the more organizations students participate in, the higher their ethical development will be. As such, we ask, does participation in more organizations enhances students' overall moral development? To respond to this question, we distributed a survey to senior engineering students (n=165) at one Midwestern university in the spring of 2020. The survey captured demographics information, membership in student organizations, and the standardized Defining Issue Test-2 (DIT-2), which measures students' ethical developmental indices (Personal Interest, Maintaining Norms, Post-conventional Thinking Score, and N2Score). The preliminary results suggest that there are significant differences between the groups of students who participated in one organization and two organizations as well as between one organization and three or more organizations, with the largest difference between those who participated in one organization and those who participated in three or more organizations. This suggests that it is possible that students with low PI scores become involved in more student organizations. This project studies student organizations as key sites for ethical learning. The research suggests that students should be encouraged to participate in more student organizations in order to promote their ethical development.

2. KEYWORDS

Engineering Ethics, Ethical Development, Student Organizations

3. INTRODUCTION

Engineering education tends to focus on teaching technical content over ethics to students; focusing on building technical background alone is not enough, however, because engineers must consider broader impacts that their projects have on society [1] [2]. In fact, focusing only on technical background while neglecting ethical decision-making has led to multiple engineering disasters (e.g. the Union Carbide explosion in Bhopal in 1984, the Chernobyl nuclear accident in 1986, and the explosion of the Challenger space shuttle in 1986) [3]. Promoting ethical development alongside technical development should be a goal of engineering programs.

Ethical development in engineering is defined as the progression towards achieving awareness of technical decision and judgements made by engineers, professional relationships between engineers and other groups, problems confronting members of the profession as a group in their relation to society, and technological policy decisions at the societal level [4]. To illustrate the importance of taking ethical development seriously in engineering practice, consider an engineering project to improve refugee camp infrastructure as an example. This project required engineers to understand the needs and perspectives of the refugees in this camp towards the project [1] [5]. If the engineers move forward without understanding the needs of the refugees, it will lead to the inaccurate planning and the project may face resistance from some refugees .This example illustrates a complicated and interdependent relationship between technical and ethical aspects of engineering work [5]. In addition, it reveals the importance of ethics in engineering work and the need to focus on broad societal impacts in engineering ethics education [1]. Here, the lack of macroethical understanding of the context of the engineering project led to the engineers facing resistance from the refugees.

Current engineering education tends to focus on technical aspect and issues internal to engineering practice (e.g., relationship between individual engineers, or between the engineers and their clients) [1]. Even though ethics is intrinsically part of engineering work, this focus on technical aspects has led to many engineering students not recognizing that every engineering decision contains ethical dimensions. In fact, underlying values and current sociopolitical and cultural contexts can influence their decisions [6]. For example, an engineer might regard some indigenous knowledge as "non-scientific" because of their Eurocentric perspectives.

One potential way to promote ethical development in students is through extra-curricular activities such as participation in on-campus student organizations [7]. There is a well-established tradition of extra-curricular activities (ECAs) in higher education, spanning many areas and interests, such as student societies (e.g., fraternities and sororities) and political and multicultural organizations (e.g., Society of Hispanic Professional Engineers, Latinos in Science and Engineering, Society of Women Engineers). Previous studies emphasize that extracurricular activities play an important role in enhancing ethical and professional competencies in students, such as cognitive moral development [7], enrichment of ethical standards and understanding of humanitarian technologies [8], and building social ties and developing social capital [9]. Organizations with different missions might promote ethical development in different ways [10] [11]. For example, some student organizations focus on competitive activities (building teamwork skills and enhance professional relationships) and developing leadership skills, while others focus on creating a supportive social environment for minoritized students (providing social capital and enhancing awareness of diversity). However, we still do not know whether the rate of participation in student organizations (e.g., the number of organizations a student participate in) is important in promoting overall ethical development among engineering students. As such, we ask, does participation in more organizations enhance students' ethical development?

To address the question, we distributed a survey to senior undergraduate engineering students (n=165) at a Midwestern university in the spring of 2020. The survey captured

demographics information, membership in student organizations, and the standardized Defining Issue Test-2 (DIT-2). DIT-2 is an instrument for activating moral schemas that includes ethical dilemmas such as: (1) a father contemplating stealing food for his starving family from the warehouse of a rich man hoarding food; (2) a newspaper reporter deciding whether to report a damaging story about a political candidate; (3) a doctor deciding whether to give an overdose of pain-killer to a suffering but frail patient [12]. Our preliminary results show that there are significant differences between the groups of students who participated in one organization and two organizations as well as between one organization and three or more organizations. We found the largest difference between those who participated in one organization and those who participated in three or more organizations. This suggests that it is possible that students with low Personal Interest scores become involved in more student organizations.

BACKGROUND

3.1.Participation in Extracurricular Activities

One of the most common ways for students to become engaged in their campus community is to participate in ECAs. Research has demonstrated the impact of participation in these activities on education, offering consistent and strong support for the value of student organizations to both student and the universities that sponsor them (see ***Figure 1***) [10, 11, 13-24]. Participating in student organizations—a subset of ECAs-- leads to increased student retention as this participation involves students more directly in college life [19]. In other words, the social integration involved in this participation enhances student commitment to stay in school [19].

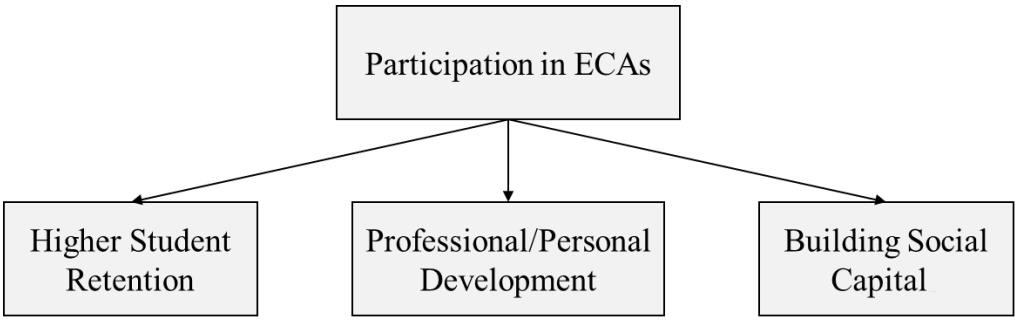

Figure 1: Some benefits of participating in ECAs [10, 11, 13-24]

Beyond student retention in school, many studies suggests that ECAs in general [14] [15] [17] [21] [23], and student organizations in particular [10] [13] [16] [11] [18] [20] [22] [24], have numerous benefits for student professional development (e.g., leadership skills), and personal development (e.g., building friendship and empathy). Participation in student organizations serves a variety of purposes ranging from friendship opportunities to practical experience [11]. For instance, students who reported serving as an officer of a club or organization and student who reported spending more hours per week in extracurricular clubs and organizations scored significantly higher on the Socially Responsible Leadership Scale, an instrument to measure and identify leadership capacities [14] [15]. In addition, a study showed that students who were involved in student organizations rated themselves higher on a series of

related leadership traits such as confidence, honesty, optimism, persistence, and responsibility [22]. This same study shows that, in terms of relational leadership behavior, these students also rated themselves significantly higher in regards to having stronger people skills, serving as a model for others, dealing well with stress and failure, resolving conflict, communicating clearly, working effectively in teams, and being a good listener [22]. This study also shows that students involved in more than one organization rated themselves higher overall in the development of personal traits and behaviors [22]. A related study suggested that students who were members of student organizations exhibit better interpersonal skills than those who were not members of student organizations [21]. Another study on the impact of student organizations on the psychosocial development of college students suggested that students who actively participate in student organizations reported higher development in moving through autonomy toward interdependence (i.e., becoming more emotionally independent) and establishing and clarifying purpose (i.e., more competent at making and following through on decisions, even when they may be challenged), while uninvolved students had consistently lower developmental scores [24]. In addition, this study suggests that students who joined or led organizations reported higher development than those who just attended a meeting [24]. Participation in student organizations was also associated with satisfaction with job market preparation, further study preparation, and overall experience [23].

Another study on empathy and involvement in student organizations suggested that high participation in student organizations leads to growth in empathy [17]. Empathy has been suggested to play an important role in ethical decision-making processes and ethical development of engineering students [25] [26] [27]. This paper contributes to this knowledge by investigating whether participation in more organizations enhances students' ethical development.

Student organizations are also a way for students to develop social capital [16] [28]. A study examining campus organization involvement of international students as a mechanism for social capital development suggested that students who participated in major-based organizations had larger, less dense, more diverse networks that lead to social network, which are particularly advantageous to social mobility [16]. In addition, students who participated in campus organizations related to their own cultural heritage had networks of friends from many different cultures, leading to a greater sense of belonging and attachment to the university [16]. This paper contributes to expanding this knowledge by investigating whether participation in more organizations might play an important in the ethical development of students.

3.2.Student Organizations and Ethical Development

Research has suggested that some knowledge is best acquired by doing, i.e., through socially engaging learning activities that connect with the real world [29]. This is true particularly when it comes to obtaining skills of ethical awareness and judgment because these are capabilities that develop through experience [30]. For instance, a study on religious student organizations as agents of spiritual and moral development among South African undergraduate students showed that students involved in religious organizations had a stronger sense of belonging which is a predictor of moral and ethical outcomes because they become more engaged with their

communities [31]. Another study suggested that there is a strong connection between involvement in student organizations and higher levels of development on several indicators of psychosocial development (e.g., establishing and clarifying purpose, cultural participation, life management…) which might contribute to ethical development [24]. In addition, the same study suggested that students who joined or led an organization tended to have higher levels of psychosocial development than those who just attended a meeting [24].

Racial/ethnic student organizations, in general, aim to promote support for students of color to facilitate integration, sense of belonging, and persistence. Many of these organizations also aim to promote civic growth because the majority of college students is at a critical developmental stage in their lives where they are particularly open to growth associated with diversity experiences [13]. In fact, 1st-year students are generally from racially and socioeconomically homogenous backgrounds and student organizations can provide them with more opportunities to be exposed to different opinions and situations that are often incompatible with their pre-existing stereotypes and worldviews [13]. In addition, these student organizations also act as safe haven from which minoritized students can reach out to members of other racial/ethnic communities, the broader campus community, and their community at large [13]. The activities in these racial/ethnic student organizations can reduce racial bias by exposing students to content-related knowledge and/or intergroup contact approaches [13]. On the one hand, exposing students to content-related knowledge increases understanding and empathy towards others or to one's own role and responsibilities in bringing about social change; on the other hand, intergroup contact provides students with structured interactions between minoritized and non-minoritized groups [13]. Thus, these diversity activities act as gateways for accessing mediating processes in student, including cognitive aspect regarding the ways people think about others and emotional aspects regarding the ways people feel about others; these, in turn, affect students' civic development (e.g., participating in volunteer work and charitable donations, affecting social change, keeping up to date on politics…) by increasing cultural awareness and reducing racial bias [13]. This paper, thus, hypothesizes that engineering student organizations represent critical learning sites of ethical development because they offer informal and socially rich opportunities for experiential learning. There are few previous studies of how engineering students benefit from involvement in student organizations, and that those previous studies did not consider whether the type and number of student organizations affect moral development. In addition, because it is unclear whether different student organizations affect students' ethical development differently or whether it is the rate of participation that is important for ethical development rather than the types of student organizations, this paper addresses this gap to contribute to the effort of identifying ways to promote ethical development among engineering students.

4. METHOD

4.1.Survey Deployment and Analyses

We distributed a Qualtrics survey to senior undergraduate engineering students list-serve (n=165) using an anonymous link at one Midwestern university in the spring semester of 2020. We obtained the list of senior students through and with permission of the Engineering Student Council. The Qualtrics survey captured demographics information, including age, gender, sex,

race, political view, class standing, majors, and family income. Relevant to this study, the survey focused on membership in student organizations and a modified standardized Defining Issue Test-2 (DIT-2) (see appendix for survey information). We selected only engineering student organizations that are recognized by the Engineering Student Council at this campus (87 organizations total). We focused on the modified, shorter DIT-2 and membership in student organizations portions of the survey in this paper. The full-length DIT-2 has six scenarios. However, to reduce the time the respondents have to spend on the survey, we modified the DIT-2 to include only scenario 1, 2, and 4 according the instruction from the Center for the Study of Ethical Development at the University of Alabama [32]. The modified DIT-2 takes approximately 30 minutes to complete. The survey underwent review by the Institutional Review Board at Iowa State University (IRB #19-602-00). The DIT-2 survey data was sent to the Center for the Study of Ethical Development at the University of Alabama for scoring.

4.2.The Defining Issues Test-2 (DIT-2)

Similarly to the Kohlberg's moral judgment interview to measure moral development, the DIT-2 uses six scenarios to focus the participant on a moral dilemma [12] [33]. On the DIT, participants are asked to rate and then rank 12 short issue statements for each scenario. These statements are the defining features of the moral dilemma; more specifically, the participants taking the DIT-2 will read the story and then decide what the protagonist must do [12] [33]. DIT-2 is an objective recognition task in which one's ethical development is evaluated by the rating and ranking of certain items about a moral dilemma [33].

From these ratings and rankings, the three important developmental indices could be calculated: Personal Interest (PI), Maintaining Norms (MN), Post-conventional Thinking (P-Score) [12] [33]. PI, which is the lowest level of ethical reasoning measured by the DIT-2, focuses one's personal welfare or benefits of family and close friends [12] [33]. MN, the medium level of moral reasoning measured by the DIT-2, takes the next step from PI by focusing on people's adherence to the laws and societal principles [12] [33]. P-Score, the highest level of moral reasoning measured by the DIT-2, represents the ability to consider an action decision from the perspective of intuitively appealing ideals [12] [33]. In addition to PI, MN, and P-Score, the DIT-2 also produces N2Score which shows the participant's emphasis of a higher post-conventional thinking and de-emphasis of thinking in terms of personal interest; that is, the higher the N2Score, the higher the P-Score, and the lower the PI score (See appendix ***Table A2-1***) [33].

4.3.Hypotheses

Using PI, MN, P-Score, and N2Score from the DIT-2 as means of measuring of ethical development among students, we tested a set of hypotheses (Ha) as follow:

Ha: There are differences in developmental indices (PI, MN, P-Score, and N2Score) between students who do not participate in student engineering organizations (None), students who participate in one student engineering organization (1 Org), in two student engineering organizations (2 Org), and in three or more student engineering organizations (3+ Org).

Ha-1: There are differences in the mean PI scores between None, 1 Org, 2 Org, and 3+ Org.

Ha-2: There are differences in the mean MN scores between None, 1 Org, 2 Org, and 3+ Org.

Ha-3: There are differences in the mean P-Scores between None, 1 Org, 2 Org, and 3+ Org.

Ha-4: There are differences in the mean N2Scores between None, 1 Org, 2 Org, and 3+ Org.

4.4.Analysis of Variance (ANOVA)

To test the hypothesis that there are differences in developmental indices between students who participate in student engineering organizations and students who do not participate in student engineering organizations, we use single-factor ANOVA. We then performed the post-hoc test, Dunnett's test, to identify where the differences are. We chose participation in 1 organization as the reference point of comparison.

4.5.Limitation of the study/Future Work

We recognize that the sample sizes are small (N=165); however, by focusing on senior students who are assumed to have had the chance to participate in student organizations for an extended period of time rather than freshmen or sophomore students who might not have been in students organization for an extended period of time, our study most likely represents a more accurate view of how participation in extracurricular activities such as student organizations might help to promote ethical development. We also suggest looking at cross-institution comparisons different institutional cultures might affect students differently. Future work should further investigate whether Religious Orthodoxy, Humanitarian/Liberalism, and other demographic factors might be influencing the developmental indices of the students. In addition, we believe that gender, race/ethnicity, and other demographic factors might have an influence on DIT-2 scores and participation in student organizations. Future work will also investigate the effect of these demographic factors. Lastly, as this is a work-in-progress, we are yet to be able to establish causality.

5. RESULTS

5.1.ANOVA—Differences in Developmental Indices by Participation in Organizations

The survey captured the number of organizations students participated in by allowing them to select to which organization(s) they belong. The survey had a response rate of 5.67% (total senior engineering students = 2907). The low response rate was expected because this was sent out to senior engineering students at the beginning of the COVID-19 pandemic. **Table 1** and **2** shows the summary statistics for PI score and participation in organizations. **Figure 1** shows test for normality. For this test, H0: the sample follows a normal distribution and H1: the sample does not follow a normal distribution. As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0. That is, the sample follows a normal distribution. Incomplete responses were excluded.

To test the set of hypothesis proposed in the method section 4.3 (**Ha**), single-factor ANOVA (α=0.1) was conducted to investigate the differences in developmental indices by participation in organizations. ***Table 1*** compares the developmental indices between four groups of students: no participation in organizations, participation in one organization, participation in two organizations, and participation in three or more organizations. The results suggested that

the mean PI scores are different among the four groups with a P-value of approximately 0.026 (***Table 1***).

Table 1: Summary statistics by Personal Interest Score

Variable	Observations	Minimum	Maximum	Mean	Std. deviation
Personal Interest	149	0.000	70.000	28.126	15.363

Table 2: Summary Statistics by participation in organizations

Variable	Categories	Frequencies	%
Participation	1 Org	64	42.953
	2 Orgs	38	25.503
	3+ Orgs	26	17.450
	None	21	14.094

Figure 1: Test for Normal Distribution

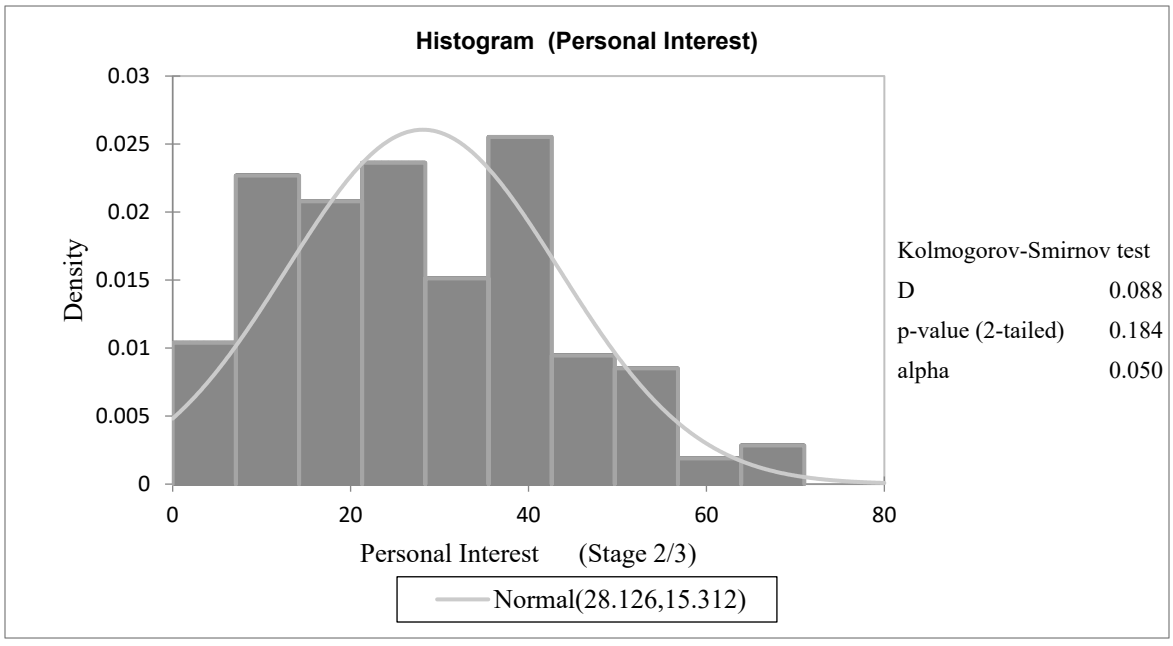

***Table 1*:** Differences in Developmental Indices based on Participation in Organizations

	Sum of Square	df	Mean Square	F	P-value
Personal Interest					
Between group	2162.388	3	720.7959	3.189261	***0.025591***
Within group	32771.04	145	226.0072		
Sum	34933.43	148			
Maintaining Norms					
Between group	990.8692	3	330.2897	1.691247	0.171498
Within group	28317.58	145	195.2936		
Sum	29308.45	148			
P-Score					
Between group	716.5413	3	238.8471	1.22133	0.30418
Within group	28356.66	145	195.5631		
Sum	29073.2	148			

5.2.Dunnett's Test

Table 2: Dunnett (two sided) / Analysis of the differences between 1 Org and the other categories with a confidence interval of 90%

Contrast	Difference	Standardized difference	Critical value	Critical difference	P-value	Significant
1 Org vs 3+ Orgs	9.387	3.121	2.114	7.392	***0.005***	Yes
1 Org vs 2 Orgs	6.911	2.143	2.114	6.509	***0.085***	Yes
1 Org vs None	2.102	0.556	2.114	7.993	0.913	No

Dunnett test was performed to identify where the differences are between the four groups (***Table 2***). The result from this test suggests that there are significant differences between the groups of students who participated in one organization and two organizations as well as between one organization and three or more organizations, with the largest difference between those who participated in one organization and those who participated in three or more organizations.

6. DISCUSSION

The present study tests the general pattern of DIT-2 with college senior engineering students and compares the differences between students who participate in on-campus engineering organizations and students who do not participate in on-campus engineering organizations with regard to developmental indices. We found that the mean PI scores are different among the four groups (students who do not participate in student engineering organizations, students who participate in one student engineering organization, in two student engineering organizations, in three or more engineering student organizations). This is consistent with another study that suggests that greater levels of student involvement may have particularly powerful effects on personal moral development early in the college experience [24]. In addition, post-hoc test (Dunnett's test) showed significant differences between the groups of students who participated in one organization and two organizations as well as between one organization and

three or more organizations (***Table 2***). It is possible that students with low PI scores become involved in more student organizations. This leads to an interesting question for future study of whether the act of participation in student organizations (or willingness to spend more time on this specific extracurricular activity) might play an important role in promoting overall moral development, as hinted by Astin (1984).

Astin's theory of involvement states that the more effort and time students put into their college experience, the more they will get back in terms of learning [35]. Much research has supported this theory, suggesting that students who are more engaged with their college community enjoy benefits such as better student experience (leading to higher student retention), professional development (including social, ethical, and leadership skills as well as awareness of diversity), and building social capital (see ***Figure1***) [10, 11, 13-24]. Here, our result is consistent with the way Astin defines student involvement, which characterized student participation by two concepts: (1) the amount of physical energy students exert and (2) the amount of psychological energy they put into their college experience. Here, the amount of effort students invest in participating in organizations corresponds to the number of organizations in which student participate. Our study hints at the possibility that students with low PI scores become involved in more student organizations. Personal Interest focuses on one's personal welfare or benefits of family and close friends and is the lowest level of overall moral development. Thus, encouraging students to actively participate in more organizations might be helpful in terms of promoting overall moral development. Whether the act of participation in student organizations might play an important role in promoting overall moral development and whether different types of engineering student organizations could affect students' ethical development differently remain to be investigated. Our future work aims to address these issues.

7. CONCLUSION

The significance of this project lies in its study of engineering student organizations as key sites for ethical learning. We analyze differences in developmental indices between groups of students who participate in one organization, two organizations, and three or more student organizations, and no organizations. We found that the mean PI scores are different among the four groups—students who participate in one student engineering organization, in two student engineering organizations, in three or more student engineering organizations, and students who do not participate in student engineering organizations. The largest difference being between the group of students who participate in one organization and the group of students who participate in three or more organizations. The research provides insights into using extra-curricular activities as the means to promote ethical development by suggesting that it is possible that students with low PI scores become involved in more student organizations. We believe that encouraging students to participate actively in more organizations might be helpful in terms of promoting ethical development

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10. APPENDIX

A1. Survey Information

Introduction/Consent Form

We are interested in understanding how participation in on-campus engineering student organizations/clubs influences student understanding and awareness of engineering ethics.

This survey is divided into three parts:

- In part one, you will be asked to read 3 stories concerning 3 different social problems. After each story, there will be 3 questions representing different issues that might be raised by the problem. You will be asked to rate and rank the questions in terms of importance.
- In part two, you will be asked questions related to your participation in on-campus engineering student organizations/ clubs.
- In part three, you will be asked questions related to your demographic information.

The questions should take you approximately 40 minutes to answer. Once fully completed, you will have a chance to enter a drawing for 1 of 3 iPads (10.2-inch, 32 GB, Wi-Fi) or 1 of 3 Amazon gift cards worth $100.

Your participation in this survey is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like more information or to discuss this research, please contact Luan Nguyen (nguyenl@iastate.edu) or the Principal Investigator, Dr. Cristina Poleacovschi (poleacov@iastate.edu).

There are no foreseeable risks to your participation in this survey. The potential benefits include contribution towards improving participation in on-campus engineering student organization experience for future students and better fostering an ethical culture at Iowa State University.

PLEASE BE ASSURED THAT YOUR RESPONSES WILL BE KEPT COMPLETELY CONFIDENTIAL AND ALL IDENTIFYING INFORMATION WILL BE REMOVED PRIOR TO REPORTING THE RESULTS.

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are at least 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

Note: this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

- *I consent, begin the survey*
- *I do not consent, I do not wish to participate in this survey*

Q1-9 DIT-2 Portion

Q10 Which engineering student organizations/clubs on campus are you associated with? Please select all that apply (Ctrl/⌘ + Select). ☒ *None* ☒ *3D Printing and Design …*

Q11 Why do you participate in these organizations? Please explain.

_____
_____
_____

Q12 How often do you participate in their activities?

	Very frequently	Frequently	Occasionally	Rarely	Not at all
None	◙	◙	◙	◙	◙
3D Printing and Design	◙	◙	◙	◙	◙

Q13 What is/are your role(s) in these organizations/clubs?

Organization	Roles
None	*President/Co-President, Vice President, Secretary, Treasurer, Member, Other*
3D Printing and Design	*President/Co-President, Vice President, Secretary, Treasurer, Member, Other*

Q14 Why did you decide to take on this/these leadership role(s)? Please explain.

_____
_____
_____

Q15 How often are moral principles (e.g. responsibilities of engineers to clients, colleagues, community, and the environment) discussed in your organizations' meetings?

	Very frequently	frequently	Occasionally	Rarely	Not at all
None	◙	◙	◙	◙	◙
3D Printing and Design	◙	◙	◙	◙	◙

Q16 What is your current class standing at Iowa State University? (*a) Freshman (b) Sophomore (c) Junior (d) Senior*

Q17 Are you a transfer student? If yes, please specify from where did you transfer to Iowa State University? *(a) No (b) Yes* _____

Q18 How long have you been at Iowa State University? Select from the list.
▼*> 8 Semesters*

Q19 Are you a first-generation college student? *(a) Yes (b) No (c) Prefer not to respond*

Q20 What is/are your engineering major(s)? Please select all that apply (Ctrl/⌘ + Select to select multiple). ☒ *Undecided* ☒ *Aerospace Engineering*…

Q21 Please explain why you chose the above major(s)? (Skip if undecided)

_____
_____
_____

Q22 Do you have other non-engineering major(s)? If yes, please list the major(s) and briefly explain why you chose this/these major(s). *(a) No (b) Undecided (c) Yes*_____

Q23 Do you have a minor/certificate? If yes, please specify. *(a) No (b)Yes* _____

Q24 Where do you live while classes are in session (prior to COVID-19)? *(a) My house (a house I own) (b) My parent's house (c) Off-campus apartment (d) On-campus dormitory/apartment (f) Other (Please Specify)* _____

Q25 Do you live with a roommate (prior to COVID-19)? *(a) Yes (b) No*

Q26 With what gender do you identify? *(a) Man (b) Woman (c) Prefer not to respond (d) Other (Please specify)* _____

Q27 What is your age? Select from the list. ▼ *Prefer not to respond*
Q28 What is your identified race/ethnicity? Please select all that apply. *(a) American Indian or Alaska Native (b) Asian (c) Black or African American (including African and Caribbean) (d)Native Hawaiian or Other Pacific Islander (e) White (Including Middle Eastern) (f) Hispanic or Latinx (g) Prefer not to respond (h) Other (Please Specify)* _____

Q29 Which of the following statements do you agree with? *(a) "I consider myself a lot more religious than other engineering students" (b) "I consider myself more religious than other engineering students" (c) "I consider myself as religious as other engineering students" (d) "I consider myself less religious than other engineering students" (e) "I consider myself a lot less religious than other engineering students"*

Q30 How would you describe your political views? (*a) Very Conservative (b) Conservative (c) Moderate (d) Liberal (e) Very Liberal (f) Prefer not to respond (g) Other (Please Specify)* _____

Q31 In which state did you grow up? Choose from the list. ▼ *Alabama*

Q32 What is your country of citizenship? Please select all that apply. (Ctrl/⌘ + Select to select multiple) ☒ *Afghanistan*

Q33 How many languages do you speak? Choose from the list. ▼ *1*

Q34 Do you have any international experience? Where did you go? Please describe. (Skip if not applicable)

_____
_____
_____

Q35 How would you classify the area you grew up in? *(a) Urban (b) Suburban (c) Rural*

Q36 What is your marital status? *(a) Single, never married (b) Married or domestic partnership (c) Widowed (d) Divorced (e) Separated (f) Prefer not to respond*

Q37 Do you have any siblings? *(a) No (b) Prefer not to respond (c) Yes (Please specify how many)___*

Q38 Do you have any children? *(a) No (b) Prefer not to respond (c) Yes (Please specify how many)___*

Q39 What is your or your family's approximate annual income range? (*a) <$19,999 (b) $20,000-$34,999 (c) $35,000-$49,999 (d) $50,000-$74,999 (e) $75,000-$99,999 (f) >$100,000 (g) Prefer not to respond*

Q40 Do you have a part/full time job while attending classes? *(a) Yes, part time (Please Specify) _____(b) Yes, full time (Please Specify)____ (c) No (d) Prefer not to respond*

Q41 How often do you participate in community services? *(a) Very frequently (b) Frequently (c) Occasionally (d) Rarely (e) Never*

Q42 What are your career goals? Where do you see yourself working in the future? Please explain.

_____
_____
_____

Q43 Do you agree with the following statements?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
"It is important to foster a healthy, professional relationship between individual engineers, or between engineers and their clients."	◙	◙	◙	◙	◙
"It is important that engineers address concerns that the community has about their projects."	◙	◙	◙	◙	◙
"It is important for engineers to actively participate in policy making."	◙	◙	◙	◙	◙
"Protection of public safety, health, and welfare should be a top priority when planning a project."	◙	◙	◙	◙	◙
"Sustainability and protection of the environment should be a top priority when planning a project."	◙	◙	◙	◙	◙

Q44 Lastly, do you consider yourself more or less ethical than many other engineering students? *(a) A lot more (b) More (c) About the same (d) Less (e) A lot less*

Q45 What are some ways that engineers could address the COVID-19 pandemic? Please explain.

_____
_____

Q46 How important is it that engineering classes focus on challenges in today society, such as the COVID-19 pandemic? Please explain.

_____
_____
_____

A2. Explanation of Information Provided by the DIT-2

***Table A2-1*:** Explanation of the DIT-2 developmental indices

Developmental Indices	Description
Personal Interest (PI)	The lowest level of moral reasoning measured by the DIT-2. PI focuses on one's personal welfare or benefits of family and close friends.
Maintaining Norms (MN)	The medium level of moral reasoning measured by the DIT-2. MN takes the next step from PI by focusing on people's adherence to the laws and societal principles.
Post-conventional Thinking (P-Score)	The highest level of moral reasoning measured by the DIT-2. P-Score represents the ability to consider an action decision from the perspective of intuitively appealing ideals.
N2Score	N2Score shows the participant's emphasis of a more post-conventional thinking and de-emphasis of thinking in terms of personal interest (the higher the N2Score, the higher the P-Score, and the lower the PI score).