WIP: Accomplices and Allies: The Role of Chosen Family in Empowering Engineering Students

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Abstract:
This work-in-progress research paper investigates the trait differences of individuals supporting engineering students. This paper is part of a larger study investigating the intersectional inequalities engineering students face and how barriers to their participation are mitigated through the help of their chosen families. "Chosen family" is a term used to describe the families' students choose as opposed to the families they are born with (traditional family). Emerging literature suggests that students, especially those who are from (multi)marginalized groups, seek out chosen families to obtain resources that they are unable to access otherwise, leading students to greater success in college. Our work has identified chosen family as individuals outside of the person's traditional family with individual or organizational power who use that power to genuinely, and empathetically, support and uplift the person leading to stronger feelings of belonging. A crucial component of our definition, the use of power, has led us to explore the strength of one's power usage in supporting students. Literature refers to these individuals amongst two categories: "allies" and "accomplices." Here, allies provide support and attempt to empathize with one's situation. Meanwhile, accomplices go out of their way, putting themselves in intellectual, social, or even physical danger to provide support and actively uplift. We theorize that many of the chosen family members in our work act as accomplices to students to help them succeed in engineering and daily life.

Building upon previous work, we utilize the results from a pilot survey administered to mid-Atlantic engineering students to investigate our hypothesis. In our original survey, we identified who students saw as part of their families, and to what degree via a series of social justice-oriented traits that we linked to our definitions of allies and accomplices. Through regression, we aim, in the present study, to understand the trait differences students identify between chosen and traditional families. Understanding engineering students' support systems and the traits of the people whom they identify as making a difference could lead to university initiatives that may lead to increased student retention and performance.

Introduction

Support systems are crucial for students going through engineering, if not any college program. These support systems often provide students physical and financial support, as well as emotional support, and a sense of belonging. It is incredibly important for students to develop an engineering identity and feel a sense of belonging as they go through their engineering education. According to Maslow's Theory of Human Motivation a sense of belonging is key to survival. We need to be accepted by others and be a part of some sort of group (1962). When people feel a sense of belonging they are more likely to experience more success, better academic performance, and positive outcomes on their mental health (Dost & Mazzoli Smith, 2023; Gopalan & Brady, 2020; Hoffman et al., 2002). There are many different definitions of belongingness and ways it can be experienced. In Baumeister and Leary's definition of belongingness they include connectedness, social support, and experiencing a sense of care, and emphasize belongingness as a driver for human motivation (1995). Goodenow (1993) conceptualizes belonging in schools as students feeling a sense of inclusion and respect. This

definition draws attention to the emotional aspect involved in belongingness. Especially in engineering culture where emotion is often seen as a negative trait and left out of discourse, it is crucial for students to fill this need for emotional support in some way (Lonngren et al., 2020). Both engineering identity and a sense of belonging in engineering can help improve students' performance and help them feel safe in engineering and in turn may increase student persistence (Baumeister & Leary, 1995; Doran & Swenson, 2022; Verdin et al., 2018). Students often connect and form social groups through sharing similar backgrounds, interests and attitudes (Allen et al., 2021; Claridge, 2018). Having a solid support system and being accepted by peers has also been attributed to creating a sense of belonging (Buckley et al., 2023; Freeman et al., 2007).

Additionally, students from (multi)marginalized groups may face more struggles in engineering programs than students from dominant groups and may have different needs for developing a sense of belonging. In essence, belongingness will have different definitions for different populations. For example, first-generation students (students whose parents did not attend a four-year university) may face challenges and lack familial support, unlike their peers whose parents attended college and understand the process (Liptow et al., 2016). In another example, Dortch & Patel conducted a study exploring Black women's sense of belonging at predominantly white institutions (PWI) (2017). These women experienced many microaggressions and isolation due to there not being as many students of a similar background in their field (Dortch & Patel, 2017). Underrepresented or minoritized students may need extra institutional support, or social support to feel like they belong in engineering. Engineering as a field remains dominated by white men (NSF, 2023), and very few women of color are awarded engineering degrees. It is, therefore, very important for these students to find a sense of belonging because they are more likely to feel unwelcome in the classroom setting (Strayhorn, 2018). Vaccaro and Newman (2016) highlight that more privileged students just see belonging as more "fun" (p. 932), whereas for minoritized students, it is about "fitting in" and "feeling comfortable" (p. 931). Research also indicates that context and environment plays a large role in belonging (Chiu et al., 2016; Verdín, 2021). Students from various backgrounds can face different struggles at the university and at home that can affect their academic performance. If students do not feel like they belong or are supported they are less likely to persist in their program (Doran & Swenson, 2022). This claim highlights the need to better understand how students find support systems and what types of support serve them best.

While it is commonly thought that a traditional family is ones' biggest support system, many students find that their traditional families do not provide all the resources they need to succeed. In our work, when we refer to the term traditional family, we mean the families that one is born or adopted into (Weston, 1997). Because a traditional family may not provide all the resources (financial, physical, and emotional) and support a student needs, we find students will often seek out a support system with people who provide these needs which we refer to as a chosen family (Major, 2022). Chosen family, a term that came to the forefront as a result of Kath Weston's work, describes the role that close friends play in the lives of those in the LGBTQ+ community (1997). This concept can be extended to anyone who does not get the support they desire from their traditional family. From our work, we came to define chosen family as "a person outside of the person's traditional family with individual or organizational power who genuinely and empathetically supports and uplifts them disrupting the person's place amongst the structure-

agency dialectic, and in turn, instilling a strong sense of belonging." That is, we see chosen family as empowered individuals who seek to change the lives of those they care for. Compared to a general support network, chosen family seek equity as an outcome. Students may seek out these found family members to help gain resources that they need to be successful. For example, through narrative inquiry Major (2022) explores the story of a low-income engineering student "Samantha". Samantha is an example of a student who faced many difficulties and did not have the most supportive family, she described having a lack of money and being emotionally and financially abused by her stepfather. However, her story takes a positive turn and she starts to succeed after finding a close and tight-knit support system of friends and faculty who actively make strides to help her grow. The journey Samantha goes through is not uncommon to other students, and these stories highlight the importance of having a chosen family in order to succeed in engineering. In Samantha's story coming across chosen family members who go out of their way to help are the catalyst for change in her life.

We viewed these family members as displaying accomplice behavior. An accomplice will go out of their way to provide support and uplift others (Suyemoto et al., 2021). Accomplices focus on actively trying to remove systemic barriers to help liberate a marginalized group or person (Clemens, 2017). Allies on the other hand could be anyone who empathizes with a struggle and may make an effort to fight for justice by standing with an individual or group (Clemens, 2017; Suyemoto et al., 2021). Allies are often seen as performative, or only offering limited support, and providing this support for personal gain (Jones, 2021). Accomplices differ in that they are complicit in trying to bring forth more equitable situations. In the case of chosen family this could be seen as someone who takes a risk in providing support in a way that actively betters a student's situation. For the context of this work, we look at different social justice traits and how students ranked their chosen and traditional family members and how those align with being an ally or an accomplice. To better understand this, we explore the following research questions:

RQ1: What types of trait differences exist between chosen and traditional families?

RQ2: To what degree do chosen and traditional family members align with being accomplices or allies for students?

Gaining a better understanding of how these two families vary when it comes to how they support students, and what kind of needs they serve for students and which students seek out more chosen family members can help universities create better institutional support that could help satisfy some of these needs as well.

Methods

This work is part of an Institutional Review Board approved pilot study aimed at investigating and understanding the chosen families of engineering students. For our study at large, we define chosen family as "a person outside of one's traditional family with individual or organizational power who genuinely and empathetically supports and uplifts them and instills a strong sense of belonging." Within the context of this work, we also incorporate the definitions of an ally and accomplice into chosen family.

The pilot survey was administered via Qualtrics to students at a mid-Atlantic institution in Spring 2023. All students were 18 years of age or older. We collected information regarding the student's home life prior to entering college, what resources were available to them, and who

they identify in their support systems (chosen and traditional family). Additionally, we collected data on students' demographics which included their race/ethnicity, gender, year, sexual orientation, disability/ability status, and major. The demographic information regarding the students is shown in Appendix A. In this work we focused on the responses to the social justice-oriented trait questions that were part of the pilot survey.

In our survey students were asked to identify chosen and traditional family members. They were also asked to rate these individuals on a series of questions (Appendix B). A specific set described questions related to social justice orientations. Students were then asked to identify to what extent they agree with each statement (on an anchored scale from 1-7 where 1= strongly disagree and 7= strongly agree) about each member of their traditional and chosen families aligned with these traits. This process was repeated for each member individually. We computed the average score on each question across each student's traditional and chosen families. We then used Welch's two-sample t-tests to identify differences between the two kinds of support groups. In that, each trait that we compare is an average score across the members of that respective traditional or chosen family. All results were evaluated at the α=0.05 level.

Additionally, in order to understand what level their chosen & traditional families aligned with being Allies or Accomplices we created an Ally and Accomplice score (AA score). This AA score utilizes our value scale that students used to rank their family members and created a new scale that went from 1-21 where the lower end of the scale was the ally traits, and the upper end indicates accomplice traits. This Ally and Accomplice scale was created by qualitatively sorting the different social justice-oriented trait questions (Appendix B) from the survey into one of three categories: Ally, Accomplice, and Neither. We utilized the previously mentioned definitions of allies and accomplices to make these decisions. Questions that fell into the "neither" category were not factored into the AA score. The primary author led this sorting; the second author checked over this sorting process. Both authors resorted till they were in agreement. We put allyship at the lower end of our scale leading into being an ally because research has suggested that being an ally may be a step towards becoming an accomplice (Suyemoto et al., 2021). In making this scale, for simplicity we also assumed that there is no overlap in the traits that we counted towards being an ally towards being an accomplice. In reality there is more nuance involved and accomplice is likely to be an ally as well but goes a step further.

Results

The results in Appendix C show that chosen families had higher averages when it came to being sympathetic when the student is upset (TF Mean = 5.319; CF Mean =6.397; p = < 0.001, d= 0.86), creating an inclusive environment (TF Mean = 5.263; CF Mean =6.096; p = 0.006, d= 0.68), addressing important social justice issues(TF Mean = 3.995; CF Mean =5.139; p = 0.009, d= 0.64), and more sensitive to difficulties (TF Mean = 5.087; CF Mean =6.044; p = 0.012, d= 0.62) Students also had higher comfort levels with chosen family when it came to discussing personal problems (TF Mean = 5.337; CF Mean =6.308; p = 0.002, d= 0.77), seeking help (TF Mean = 5.888; CF Mean =6.471; p =0.013, d= 0.61), and socializing (TF Mean = 6.129; CF Mean =6.595; p =0.032, d= 0.52). Appendix D shows that the chosen families had higher averages of accomplice traits (TF Mean = 4.692; CF Mean =5.467; p =0.010, d= 0.64).

Additionally, the Ally and Accomplice (AA) score shows that chosen family exhibited a score more indicative of accomplice attitudes.

Appendix C also shows that traditional families on the other hand had higher averages when it came to looking like the student (TF Mean = 5.50; CF Mean =3.698; p = < 0.001, d= 1.04), and being seen as a role model (TF Mean =5.861; CF Mean =5.184; p = 0.027, d= 0.54).

Concluding Discussion

The results of our t-tests indicate that students ranked that they felt more comfortable going to their chosen family members for emotional needs such as discussing a personal problem, social justice issues, or when they want to talk to someone who will be more sensitive or sympathetic. The results also indicate that students also felt like their chosen families created a more inclusive environment for them. These results also had medium to large effect sizes indicating that students perceive there is a meaningful difference between chosen and traditional family attitudes when it comes to these emotional needs that chosen families seem to provide more of (RQ1).

The results also show that these students' chosen families do not look like them as much whereas their traditional families do. It is common that one's traditional family would look like them, but it interesting that students did not seek out as many people who look like them in their chosen families. This potentially suggests that even though they do not look like these people they still found shared experiences that brought them to feeling a sense of belonging and care. It could also mean that minoritized students seek out those who do not look like them (non-minoritized privileged people) who have more agency to change the student's life.

The ally and accomplice traits comparison showed that students' chosen families exhibited more traits that were aligned with accomplice attitudes than their traditional families (RQ1). This finding aligns with our hypothesized idea that chosen families go out of their way to help disrupt students' place and raise them up, just as an accomplice would.

While our analysis included data from a pilot survey, we do find our work shows the importance of emotional support for engineering students. It also highlights that emotional support may not be something these students have receive as readily from their traditional families. Forming a chosen family who can be there for you to talk when things are difficult and help you without judgement is clearly important.

In future work, we will readminister an updated survey to a larger population. In separate efforts, we are piloting more AA questions This survey will include more direct questions about ally and accomplice traits that their chosen and traditional family members have. We expect this work will help us to better understand the differences between these two families and give us insight into which students seek out what traits in their chosen family members.

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Appendix

Appendix A. The demographics of the single-institution sample (n = 56).

Grouping	Count	%
Gender		
Women	24	42.9%
Men	34	60.7%
Transgender	≤ 5	< 8.9%
Non-Binary	≤ 5	< 8.9%
Did not disclose	1	1.8%
Race/Ethnicity		
American Indian	≤ 5	< 8.9%
Asian	7	12.5%
Black or African-American	≤ 5	< 8.9%
Hispanic, Latino, or Spanish origin	≤ 5	< 8.9%
Middle Eastern or North African	≤ 5	< 8.9%
White	44	78.6%
Did not disclose	1	1.8%
Intersectional Groupings		
Hispanic Women	≤ 5	< 8.9%
Hispanic Men	≤ 5	< 8.9%
Hispanic Non-binary	0	0.0%
Black Women	≤ 5	< 8.9%
Black Men	0	0.0%
Black Non-Binary	≤ 5	< 8.9%
Middle Eastern Women	≤ 5	< 8.9%
Middle Eastern Men	0	0.0%
American Indian or Alaskan Native Women	≤ 5	< 8.9%
American Indian or Alaskan Native Men	0	0.0%
American Indian or Alaskan Native Non-Binary	0	0.0%
White Women	25	44.6%
White Men	19	33.9%
White Non-Binary	≤ 5	< 8.9%
Asian Women	≤ 5	< 8.9%
Asian Men	≤ 5	< 8.9%
Asian Non-Binary	≤ 5	< 8.9%

NOTE: Sample sizes less than 5 (8.9%) have been redacted to protect our participants

Appendix B. Social Justice Oriented Questions and Accomplice or Ally Alignment.

Trait Type	*Questions*
	I feel comfortable talking about a personal problem with ___.
	I feel comfortable talking about a problem with my academics with ___.
	If I had a reason, I would feel comfortable seeking help from ___.
Accomplice	I feel that ___ would be sensitive to my difficulties if I shared them.
	I feel comfortable socializing with ___.
	I feel that ___ tries to understand my problems when I talk about them.
	I see ___ as a role model.
Accomplice	___ cares about social justice.
	___ is like me.
	___ wants me to succeed in engineering.
	I feel that ___ would be sympathetic if I was upset.t
	I feel that ___ would take the time to talk to me if I needed help.
Accomplice	___ tries to create an inclusive environment for me.
Accomplice	___ addresses social justice issues that are important to me.
Accomplice	___ addresses issues of sexism.
Accomplice	___ addresses issues of racism.
Accomplice	___ talks about social justice issues with me.
	___ looks like me.
	___ has had experiences that are like my own.
Ally	___ is knowledgeable of issues of sexism.
Ally	___ is knowledgeable of issues of racism.
Ally	___ is aware of social justice issues that are important to me.

Appendix C. T-test results comparing SJO traits of CF and TF.

Item	Mean TF	Mean CF	df	t	*p*	Sig.	Cohen's *d*
I feel comfortable talking about a personal problem with ___.	5.337	6.308	61.877	-3.242	0.002	**	***0.77***
I feel comfortable talking about a problem with my academics with ___.	5.777	6.221	65.67	-1.601	0.114		***0.37***
If I had a reason, I would feel comfortable seeking help from ___.	5.888	6.471	61.303	-2.565	0.013	*	***0.61***
I feel that ___ would be sensitive to my difficulties if I shared them.	5.087	6.044	62.733	-2.625	0.011	**	***0.62***
I feel comfortable socializing with ___.	6.129	6.595	60.771	-2.199	0.031	*	***0.52***
I feel that ___ tries to understand my problems when I talk about them.	5.833	6.360	65.494	-1.930	0.058	.	***0.48***
I see ___ as a role model.	5.861	5.184	67.807	2.258	0.027	**	***0.54***
___ cares about social justice.	4.675	5.308	66.352	-1.625	0.109		***0.39***
___ is like me.	5.717	5.708	66.045	0.029	0.976		0.00
___ wants me to succeed in engineering.	6.416	6.471	66.636	-0.245	0.807		0.06
I feel that ___ would be sympathetic if I was upset.	5.319	6.397	62.981	-3.611	<0.001	***	***0.86***
I feel that ___ would take the time to talk to me if I needed help.	6.125	6.279	67.854	-0.585	0.560		0.14
___ tries to create an inclusive environment for me.	5.263	6.096	66.747	-2.835	0.006	**	***0.68***
___ addresses social justice issues that are important to me.	3.995	5.139	67.369	-2.683	0.009	**	***0.64***
___ addresses issues of sexism.	4.759	5.353	65.929	-1.539	0.128		***0.37***
___ addresses issues of racism.	4.648	5.264	67.322	-1.495	0.139		***0.36***
___ talks about social justice issues with me.	0.412	5.063	67.39	-1.548	0.126		***0.37***
___ looks like me.	5.5	3.698	59.756	4.323	<0.001	***	***1.04***
___ has had experiences that are like my own.	5.129	5.284	67.335	-0.429	0.668		0.1
___ is knowledgeable of issues of sexism.	5.449	5.544	60.317	-0.267	0.790		0.06
___ is knowledgeable of issues of racism.	5.532	5.558	64.11	-0.077	0.938		0.02
___ is aware of social justice issues that are important to me.	4.689	5.360	66.541	-1.570	0.121		***0.38***

Significance: $p < 0.10$ ".", $p < 0.05$ "*", $p < 0.01$ "", and $p < 0.001$ "***"**

Appendix D. Ally and Accomplice T-Test Results.

	Mean TF	Mean CF	df	t	p-value	Sig	Cohens *d*
Accomplice	4.692	5.467	64.575	-2.653	0.010	*	***0.64***
Ally	5.224	5.487	59.307	-0.783	0.436		0.19
AA	16.915	17.955	60.663	-1.712	0.092	.	***0.41***

Significance: $p < 0.10$ ".", $p < 0.05$ "*", $p < 0.01$ "", and $p < 0.001$ "***"**