



## **Motivation of Latina Students Leading to Retention in Engineering**

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# Motivation of Latina Students Leading to Retention in Engineering

## Abstract

Females and underrepresented ethnic minorities earn a small percentage of the engineering and computer science bachelor's degrees awarded in the United States, receive an even smaller proportion of graduate degrees, and are underrepresented in the engineering workforce. Considerable research has examined the aspects of postsecondary engineering education that impede the achievement of underrepresented populations. However, this research used a positive perspective to recognize the motivating factors that promote the retention of Latina students in engineering, rather than identifying factors that lead to attrition.

This action research study at a large public university used a qualitative approach to examine the characteristics and experiences of Latina students who pursued a bachelor's degree in engineering as part of the 2008 first-time full-time freshman cohort. The researcher conducted two semi-structured individual interviews with seven undergraduate Latina students who successfully persisted from their first to their fourth year in engineering. The study aimed to understand what characteristics made Latina students successful and how their experiences motivated their persistence in an engineering major.

The data collected in this study revealed that the parents' consistent expectations for success and high academic achievement was a significant motivating factor in the Latina participants' persistence in an engineering degree program. From the data collected, the researcher provides suggestions for engineering programs to implement and adapt activities and support systems that can improve the retention and graduation rates of undergraduate Latinas in engineering.

## Introduction

In 2006, women earned 19.5% of engineering bachelor's degrees awarded in the United States<sup>1,2</sup>. As a result of this low degree attainment, the presence of women in the engineering workforce is also minimal. In 2008, females represented only 9.5% of the nearly 1.5 million engineers employed at the bachelor's degree-level in the United States<sup>3</sup>. Similarly, Hispanics (male and female) earned 7.8% of all bachelor's degrees and only 7.2% of bachelor's degrees in engineering. This limited representation becomes even more apparent considering that Latinos comprise 13.5% of the American labor force, but only 5.8% of the engineering workforce<sup>3</sup>. Given these statistics, it is not surprising to find that Latinas (female Hispanics) earn only 1.7% of all engineering bachelor's degrees. This gender and ethnic disparity among engineering degree-earners must be addressed to thwart further discrimination, tap into a population that can fill the growing need for engineers, and provide diversity within the field that can lead to stronger solutions for our engineering challenges.

Over the coming years we face a shortage of engineers<sup>4</sup>. This demand may be the result of baby boomer retirement, the widespread growth of the global technology, or a combination of both. In any case, the United State has not adequately utilized women or ethnic minorities to meet the growing demand in the engineering workforce. In this global economy, where fewer than half of American patents were awarded to foreign companies in 2009, the problems addressed by engineers will inevitably become increasingly complex and unfamiliar<sup>5</sup>. Consequently, more

women and minority engineers are needed to meet the demand for a larger and more diverse engineering workforce that can address the needs of customers from around the world <sup>6</sup>. According to Battles, “[t]he attrition of women from the STEM fields represents a loss of talent from these key disciplines, limiting their access to respected, well-paid jobs and affecting our technological competitiveness as a nation” <sup>7</sup>.

### **Motivation for the Study**

Although substantial progress has been made toward gender parity in biological and natural sciences, females continue to be underrepresented in the fields of engineering and computer science. Therefore, further research is needed to advance the STEM achievement of women from a Hispanic background—an ethnicity that accounts for more than half of the population growth in the U.S. since 2000 <sup>8,9</sup>. An extensive body of research has examined the perceptions, culture, curriculum, and pedagogy that impede women and underrepresented ethnic minorities in engineering and computer science (e.g., Baker, 2010; Ceci & Williams, 2007; Hall & Sandler, 1982; Margolis & Fisher, 2003; Seymour & Hewitt, 1997; Tonso, 2007). However, limited research has exclusively focused on Latinas in engineering. Similarly, considerable research has focused on the attrition of minority students, examined all students in STEM fields, or investigated why students leave a specific field of study. In contrast, this study focused on why successful engineering students persist in their engineering major. By exploring the strengths and motivators of Latina persisters, this research informs further efforts to build on those positive characteristics and experiences.

Two research questions guided this study:

- What are the characteristics of successful Latina persisters in engineering? Characteristics may include traits that are developed over time or natural, intrinsic attributes.
- How do the experiences of Latina students influence their persistence toward a bachelor’s degree in engineering? These experiences may have molded the students’ characteristics or may have directly influenced their decisions to persist.

Qualitative methods allow researchers “to get at the inner experience of participants, to determine how meanings are formed through and in culture, and to discover rather than test variables” <sup>10</sup>. Beyond the problem of high attrition rates of Latinas in engineering and computer science, the researcher sought to understand how Latinas respond to the culture of engineering, which drives many students away. To further understand how the engineering culture can cultivate or dissuade Latina persisters, it was most beneficial to invest in students who successfully navigated and persisted in the field of engineering, rather than to focus on those who did not persist in engineering.

As an engineering administrator, the researcher felt it necessary to demonstrate an *ethic of care* and to listen to the expressed needs of the students being served <sup>11</sup>. Noddings explains the ethic of care:

If my expressed needs are not treated positively, or at least sensitively, I will likely not feel cared for. Attempts to care frequently misfire this way. Would-be carers think they know what the cared-for needs and act on their inferences in the name of caring. (p. 148)

Postsecondary administrators often implement initiatives based on the perceived needs of a population or because a program has had success in another area. As Noddings discussed, there

is a definite difference between the expressed and inferred needs of students. This study served as an opportunity for Latina students to express their needs in a safe environment and to partner with an administrator who can serve as a sponsor for change.

### Methodology

The researcher queried the university student database for all students whom identified as “female” and “Hispanic/Latino,” were admitted as first-time full-time freshmen in the fall 2008 semester, and were still enrolled in an engineering major as of October 2011. Of the 44 female Latina students who were admitted to engineering in fall 2008, only 19 were still enrolled in an engineering discipline three years later at the time of recruitment for this study. Walden and Foor<sup>12</sup> describe *persisters* as students who were directly admitted and enrolled in a STEM major, *internal resettlers* as students who switched from one STEM major to another, and *in-switchers* as students who began their college career as a non-STEM major and switched into a STEM major later. All interview participants were persisters who were directly admitted to an engineering major. Seven of the 19 students who were contacted agreed to participate and a summary of the participants is detailed in Table 1.

Table 1  
*Participants by Major with Demographic Data*

<b>Student</b>	<b>Fall 2011 Major</b>	<b>Heritage</b>	<b>Residency</b>
Gabriela	Aerospace Engineering	Mexican	Non-Resident
Rosa	Chemical Engineering	Mexican	Resident
Paloma	Civil Engineering	Mexican	Resident
Isabel	Electrical Engineering	Mexican	Resident
Adriana	Industrial Engineering	Mexican	Resident
Yolanda	Industrial Engineering	Peruvian	Resident
Salma	Mechanical Engineering	Mexican	Resident

Data were collected by conducting two individual interviews with each of the seven participants. The researcher collected data through more than one interview to gradually build her rapport with participants, to introduce new themes at a pace that was consistent with the level of trust between the researcher and participant, and to avoid time constraints that could have inhibited the thorough investigation of each topic. An interview protocol helped ensure that the research questions were addressed during the interviews and that all participants were asked the same questions to elicit reliable responses. The researcher developed her interview protocols with influences from Margolis and Fisher<sup>13</sup> and Vasquez<sup>14</sup>, who studied the persistence of women in computer science and the persistence Latinos in engineering, respectively. Additionally, the researcher referenced Eccles Expectancy Value Model of Achievement-Related Choices when adapting and designing interview questions<sup>15</sup>.

During and after data collection, the researcher analyzed her field notes and interview transcriptions to identify themes among participant responses and occurrences at the student organization executive board meetings. The researcher used qualitative data analysis software to review raw text, document memos and diagrams, and code the data. The researcher reviewed each transcription to select and label text relevant to the research questions, identified repeating ideas among the relevant text, and categorized the repeating ideas into concepts and categories.

## **Findings**

Throughout the interviews, participants often referenced their roles as daughters, sisters, granddaughters, and family women. Three of the seven women listed a family role in the “I am” activity, an exercise in which each participant was given 60 seconds at the beginning of the first interview to write a list of self-descriptors to finish the sentence, “I am \_\_\_\_\_.” Tatum (1997) recommends using this exercise to identify the parts of our identity that capture our attention first.

In the “I am” exercise, Adriana described herself as a good sister; Salma identified as a daughter, a sister, and an aunt; and Yolanda distinguished herself as a daughter and wife. These familial ties and the role of their families in motivating them to persist in engineering became increasingly apparent throughout the course of each interview. Although grandparents, aunts, uncles, and siblings had an important role in the participants’ childhoods, the participants’ parents were most instrumental in guiding their educational and career paths by establishing an extensive set of expectations. These expectations were a key motivator in the participants’ original decisions to pursue a degree in engineering and later encouraged their persistence in the field. The findings explain how the participants’ parents defined success through their educational achievement, describes the parents’ rationale for their expectations, delineates parental expectations for financial success through educational success, and illustrates how these expectations affected the participants’ educational decision making processes.

### *Success Through Education*

Many participants sensed their parents’ expectations to be successful early in their childhood, but “success” was defined differently in each family. In some cases, students were expected to earn “A” grades, while other students were expected to give their full effort toward accomplishments. And some students were expected to utilize the knowledge they gained in the classroom in a real-world atmosphere. For all participants, however, success revolved around their performance in school and required all of their effort in academic undertakings and doing well in classes.

For students like Salma, academics ranked highest among the priorities in her household. “My parents always stressed education when we were young. That was always the main focus growing up: do well in school.” She explained that her parents established their expectations early by enrolling her in Head Start, a childhood development program for low-income families. As Salma got older, her parents chose not to send her sister to the local junior high because of the weak academics and reputation for “troublemakers,” so Salma and her sister enrolled in a charter school that their parents hoped would provide a better quality education for their daughters. Salma’s parents also used her teachers as a medium through which they rewarded her academic achievements.

I remember my parents they would—we didn’t know it at the time—but after every school year they would give us trophies at the end of the year. They didn’t give it to us directly, they were given to the teachers, and the teachers would give them to us while we were in class. We thought we were so cool and special because we got trophies.

Salma's parents continued to pursue the best educational opportunities, maintained high expectations of her to perform well in her classes, and rewarded her academic accomplishments. She described her parents' expectations for college: "They never said, 'You have to go to college,' but they never—there was never a question. They were encouraging me to go to school and to do well." Given these expectations, Salma consistently performed well in school and remained dedicated to her studies, as not to fall short of her parents' expectations and to participate in all of the opportunities for which her parents worked so hard to provide.

Similarly, Yolanda's parents also had high expectations for her academics. While living in Peru until age 11, she attended a private school where she received a strong educational preparation. Yolanda's father regularly helped her with math homework, and her dedication and work ethic spread to other subjects and quickly became a way of life. "They definitely always have pushed me to do better...I just kinda developed that, that want to be—to do good in school...They really kinda embedded that in me." Because Yolanda's parents established the importance of education early in her childhood, she carried their expectation "to do good in school" throughout her studies in the United States. Although her parents rarely supervised her homework later in her academic career, Yolanda remained motivated to earn good grades and to complete her degree in engineering so that she could surpass the educational expectations that her parents stressed throughout her childhood.

Adriana explained that her parents' expectations of her became her educational guide. "I think my parents always pushed me to be good or expected it. That's the word, *expected* me to do good always, always, always...Now by myself, I expect myself to do good and to be good." The ideas of "doing good" and "being good" encompassed more than just her academics and were further developed in the private school that Adriana attended. She described her school as "one of the best ones" in Mexico and excelled "for teaching you values—how to be a good person and all the ethical aspects of it." For Adriana, the academic expectations of her parents reached beyond her performance in the classroom, encouraging her to use the skills and knowledge that she learned to improve society.

For many of the participants, their parents' expectations surfaced through their educational endeavors. Whether students were told to "do well in school," "do good in school," or "to do good and to be good," their parents' messages were clear: education was important and they expected their daughters to achieve greatness. Though the participants' parents expressed their expectations early in the participants' childhoods, in most cases, their parents' academic expectations were not articulated after elementary school. However, these expectations continued to motivate the students to pursue an education after high school and to persist toward completing a degree in the rigorous field of engineering.

#### *Rationale for Educational Expectations*

The parents' expectations for their daughters to become academically successful branched from one of three core justifications. First, the parents viewed education as a venue through which their daughters could gain access to future opportunities for success. Second, parents wanted to offer opportunities to their daughters that were not available when they grew up. Finally, parents aspired for their daughters to thrive in areas in which they were not able to succeed themselves. And in some cases, a combination of these motivations helped parents to form their expectations.

Adriana's parents emphasized the importance her academic performance, because they viewed school as a mechanism that could open doors and provide opportunities in the future.

My dad has always—he says that if one thing he'll make sure that we have is education. He'll do anything to pay for it, or to help us with it, and to have it. Because he thinks that's what we'll—that's what our future depends on.

Adriana's father believed her educational choices would affect her ability to find a job, support herself, and be happy in the future. Consequently, he encouraged her to attend a university in the United States because he thought there were more opportunities for employment after earning her degree in engineering in the U.S. than in Mexico.

Though Adriana's parents' goals were very clear, other participants' parents were less transparent about the reasoning behind their expectations. For example, Salma reflected on why her parents emphasized academics.

I think part of it might have been the way they grew up, and they didn't have very many opportunities in Mexico. Maybe when they came here and they had us, they wanted us to take advantage of the opportunities that were here.

Salma noted that her mother earned her GED diploma after moving to the United States in the early 1980s, and both of her parents worked a variety of jobs before they founded their own cleaning business. As she noted, Salma's parents moved to the U.S. to find more opportunities for success, and her parents often enrolled her in a variety of educational support systems and sought the best resources available for their daughters.

But unlike Salma, Rosa was raised in an atmosphere where education was an opportunity not afforded to women. The women in her family were factory workers, field workers, or stay-at-home mothers. Rosa's mother finished only a first-grade education before Rosa's grandfather withdrew her from school. As a result, Rosa's mother never imparted any academic expectations to her and was blatantly unsupportive of her educational endeavors, often telling Rosa, "You're gonna get pregnant. You're gonna drop out of high school." However, Rosa later learned of a decision her mother made that enabled Rosa and her siblings to enroll in an educational experience that she never received.

When I was younger and my dad left us cause he was in jail, she [my mom] had the opportunity to go back to Mexico and be taken care of by my grandpa, and she said, "No, my kids need to go to school."

Because Rosa's grandfather removed her mother from school after the first grade, Rosa's mother was concerned that her children would also be taken from school if they moved to Mexico to live with Rosa's grandparents. As a result, Rosa's family struggled for many years and her mother was a single parent and sole provider for several years of Rosa's childhood. However, Rosa's mother chose this path because she recognized the importance of educating Rosa and her siblings. Although Rosa's mother never believed that she could achieve the level of educational

success that she did, her mother's choice provided Rosa and her siblings with educational opportunities, career choices, and financial resources that their mother never received.

In other cases, the participants' parents were given some educational opportunities, but could not reach the expectations set by their own parents. Consequently, the participants' parents urged their daughters to succeed in the same areas in which they were unable to be successful. For instance, the expectations of Gabriela's grandmother influenced the standards that her father conveyed to her.

My grandmother was very, "You will get an education, you will do good, if you don't, you are not leaving this house until you do." My dad kind of put that emphasis on me, that's why he went to college. With the whole family-supporting thing, he couldn't do it. My dad's like, "You will graduate high school, and you will graduate with a high GPA. You will get 'A's.'"...Of course, I'm expected to graduate college, and I will be the first to do so.

Gabriela's father spent only two years enrolled in an electrical engineering degree program before dropping out to support his family. As a result, Gabriela felt even more motivated to persist in her engineering degree program. This pressure to succeed in an area in which her father had not succeeded weighed heavily with Gabriela and served as a key motivator throughout her undergraduate academic career.

#### *Financial Benefits of Educational Success*

Most parents also saw education as a means for their daughters to achieve financial stability. Gabriela portrayed her father's expectations as, "He just wanted me to be successful—make enough money so that I didn't have to work several jobs to pay off bills. He's like, 'make enough money so you could live comfortably.'" Though Gabriela's parents wanted her to be financially independent so that she could avoid future economic burden, Gabriela also perceived the need for economic security to have long-term implications on her ability to repay the debt to her family.

Then, of course, the whole thing is that you always take care of your parents afterwards. Right now they're helping me pay through college. Of course, all the money that they spent as I was growing up. Now it's like, as soon as I get a job, I'm expected that I start paying them back in some form or another.

Gabriela explained her family structure, as her grandmother's three sons each cared for her grandmother in a different way: one takes her on trips, another provided her with a house, and the third son cares for her everyday needs because he lives the closest. The expectation to provide her parents with "a little add-on house" on the property of her future home and to sustain a higher standard of living was a constant motivator for Gabriela to persist with her studies in engineering. She acknowledged that a degree in engineering would prepare her with the skills necessary to secure a career that could support this profitable lifestyle.

Similarly, the need for financial stability and resources to take care of her parents also played an pivotal role in Salma's initial decision to major in engineering.



I wasn't like oh, I'm out to make a lot of money and stuff. It was more like, you can live comfortably and not have to worry. Also I would like to, in the future, just be able to provide for my parents too. They're not going to be working forever.

Like Salma, few participants enrolled in engineering for the wealth. Instead, they understood that a degree in engineering would lead to a comfortable lifestyle in which they could provide for their parents, which was often referenced as the norm in Hispanic culture. This expectation that the participants would financially care for their parents motivated the students to not only enroll in engineering, but also to persist.

### *When Expectations Conflict with Desires*

While each of these students felt the weight of their parents' expectations to be successful, to perform academically, and to become financially stable, the students also faced difficult decisions when the expectations of their parents conflicted with their cultural expectations or when the expectations of their parents conflicted with their own dreams and goals. In some cases, the participants' career paths aligned with the visions of their parents, and their parents' expectations reinforced their choices throughout college. In other situations, the students' ambitions may not have entirely fulfilled their parents' expectations, and they were forced to weigh their own desires against the wills of their parents.

In both interviews, Salma described the numerous times that she considered dropping out of engineering. Salma was the only participant to change her major within engineering and she was the least sure of all participants about her future career in engineering. She discussed the numerous art classes she took in high school and recounted how, "I always thought I'd go down that field [of art] or maybe architecture or something." However, her parents encouraged her to pursue engineering and continued to encourage her persistence within the field. "If I ever mentioned switching my major, my mom was like, 'No, no, no.' She wouldn't have it." The voice of her mother and the obligation she felt to her parents served as motivation to persist whenever she considered leaving engineering:

Every time I thought about I wanna switch out [to a different major], part of the thing that kept me in engineering was the fact that my parents were really proud to have—for me to be in engineering. I think they might see it as a waste. And other people might see it as a waste of like, "Oh, you're so smart, and you don't want to be in engineering?"

In addition to living up to her parents' pride in her accomplishments, Salma also faced pressure not to "waste" her talents or potential. Because this opportunity to pursue engineering was not a viable option for many of her Hispanic friends and family, Salma disregarded her self-doubts about her place in engineering and was motivated to continue towards her bachelor's degree so that she could fulfill the expectations of her parents, fully utilize her talents and intellect in a rigorous field, and represent her gender and culture with respect.

For Paloma, the differences between the expressed expectations of her parents and the expectations of her culture caused an internal struggle in deciding which career path to pursue. Paloma began dancing as a child, and it remained an important part of her life throughout high

school. Her parents supported her interests by financing dance classes at a local studio. However, her love for dance was tested while choosing a major that would prepare for a career as a dance teacher or as an engineer. On one hand, her parents were very accepting and supportive of her passion to dance, placing emphasis on her happiness rather than her financial longevity:

They were always, even my dad, was always really open. “Oh, whatever you want. If you wanna do the dance teacher or whatever, just do whatever makes you happy.” They weren’t really pushy about, “Oh, are you gonna go to college? How are you gonna pay for it?” They were like, “Oh, you can do whatever you want. If you wanna go, if you don’t wanna go, it’s fine.” As long as I did something above high school.

Paloma’s parents expected her to go to college and do “something above high school,” but the decision she faced in choosing a major forced her to weigh the long-term feasibility of her interests against the cultural expectations of the Latino community to provide for her family.

Then I was like oh well, I do wanna do the dance thing, but I’m not gonna be able to help my parents with it in the future. ‘Cause I’m—so as Hispanics, we take care of our parents once we’re older. Since I’m the oldest, I all of a sudden, well, all my life I always took the responsibility, and I always knew that I was gonna—I know that once they’re older I’m gonna take care of them. I’m gonna have that responsibility, plus my family. So I was like, well, I should do something then with—and since I like that kind of math—do something with math.

While this expectation to care for her parents influenced her decision to major in engineering, she did not abandon dance completely. Paloma decided to make a practical and culturally-sound choice for her major and a personal choice for her minor.

Then I started thinking about oh well, how is [dance] going to affect me in the future? How long am I gonna be able to dance? And is that actually going to support me? Do I want to not be able to support myself, or only myself? A lot of questions started rising, so I was like well, for now I’ll just do the minor and do a major in engineering.

At one point, Paloma tried to balance her personal desires and parental expectations by double majoring in engineering and dance, but was unable to complete the required milestones for the dance major. Reflecting on her experiences, Paloma did not believe that she would have been able to handle both of these different fields simultaneously and was thankful that she chose the engineering major, as engineering could afford her a more sustainable career. However, she also fulfilled her personal goals by completing the requirements necessary to earn a minor in dance.

Not only did the expectation to care for their parents affect the participants’ decisions to pursue and persist in engineering, but it also had implications on whether they continued their educational path to pursue graduate studies or entered the engineering industry immediately after graduation. For example, Rosa discussed her conflicting desires and familial obligations.

I wanna go to industry, but at the same time I really do want to get a Ph.D. I feel kind of selfish a little bit, because I know that my family is struggling a lot now, so if I go to Ph.D. that's five more years that I can't help them with money. But, I could just work now and help them now. But, I could help them more when I have a Ph.D. later. But it's kind of something that, I guess I don't know if it's just for every Hispanic. Mostly I guess it is a culture thing that you always have this need to help your family, which is kind of like breaking me a little bit.

Even without a strong support network, Rosa's concerns for her family continued to influence her everyday choices and the future of her career path.

I guess that's one of the—one of something very important for me is my family, to make sure that they're doing okay, so that's always been in the back of my head when I make a decision is my family.

Rosa's responsibility to provide for her family was a motivating factor for her success and progress toward engineering degree achievement, but this expectation also spurred internal dissonance. She questioned and compared the best choice for her family, the best choice for herself, the choice that provided the best immediate payoff, and the choice that provided the best long-term benefit. With all of these factors, Rosa did her best to make decisions that balanced the needs of herself and her family. Though her parents were often unable to understand her priorities, Rosa worked to show her parents the advantages of her decisions so that they would learn to trust her instincts and be more supportive of her younger siblings' abilities to make their own decisions.

Given the stories of these participants, parental expectations played an important role in their educational decision-making and their choices to pursue a bachelor's degree in engineering. Parental expectations to be successful, become high achieving students, become financially independent, and care for their parents weighed heavily with these Latina engineers. In some situations, these expectations clashed or diverged from their own goals; however, these expectations served as a key motivator in the participants' decision to pursue engineering and persist in the field.

### **Implications for Practice**

The purpose of this study was to gain insight into the characteristics and experiences of successful Latina persisters in engineering majors. Equipped with the data collected in this study, it is important to then identify the implications for improving activities, programs, and resources within engineering. Given these findings, the researcher recommends expanding recruitment and retention efforts to better include parents and family members, in addition to better educating faculty and staff about the influential role of parents and family in the persistence of Latinas.

Because the expectations of parents were integral to the participants' initial decisions to pursue engineering and their persistence within the field, it is imperative that engineering administrators acknowledge the role of family in the success of Latinas. This acknowledgement must include more education and training of faculty and staff who work directly with recruiting and retaining

students from all backgrounds. Prepared with the findings of this study and sensitivity to the cultural needs of the Latina population, engineering educators can then collaborate with parents and encourage students to persist, despite earning a low grade in an engineering class or being discouraged by a classmate, advisor, or professor. This partnership will ensure that students receive positive and consistent encouragement from their family and the engineering community.

Furthermore, engineering educators must increase efforts to recruit and retain the parents of incoming Latina engineering students, not just the students. In preparing for college, Rosa's mother did not understand the value of a higher education, nor did she know whether her daughter was capable of succeeding in a collegiate environment. She often told Rosa that she was "wasting time" on college admission and scholarship applications. Rosa's network of support from teachers, counselors, and friends' parents provided her with the financial assistance, rides to and from school, and support needed to successfully prepare her to become an engineering student. With more multicultural students, staff, and faculty representatives who speak Spanish and who identify with these populations, engineering schools across the country can educate unaware and unsupportive parents about the long-term benefits of an engineering education. With more parental support, students who consider dropping out of college or changing majors may be more likely to persist in an engineering program. University administrators must work with the community to encourage parents to set high expectations for their children and create a culture within their family that encourages the children's successes throughout their educational journey.

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