

## **Keeping Calm and Staying Balanced: Exploring the Academic Pressures Faced by Engineering Students to Attain High Grades and Their Impact on Mental Health**

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# **Keeping Calm and Staying Balanced: Exploring the Academic Pressures Faced by Engineering Students to Attain High Grades and their Impact on Mental Health**

Studies reveal that grades have a short-term impact on students' self-efficacy, motivation, and decision making. Earning high grades has become a focal point for engineering students to secure three types of opportunities: internships, post-graduation employment, and graduate school acceptance. Nonetheless, the desire to attain a competitive grade-point-average may lead to negative psychosocial effects such as increased mental exertion, physical exhaustion, anxiety, and overall lack of work-life balance. In this paper, the authors extend their prior study on the impact of grades in engineering education. The first study was conducted in the spring of 2019 at a tier one, small private research university in Texas with the intention of understanding the mindset on grades before, during, and at the end of the semester. The study extended herein aims to explore the emotional and academic impact grades have on engineering undergraduate students in a minority-serving institution, and further understand the issues plaguing engineering disciplines such as retention, completion, and overall well-being. In this regard, a self-developed, open-ended survey was conducted with a cohort of 60 students enrolled in Rigid Body Dynamics and Engineering Analysis to understand their perspective on grades before, during, and at the end of the semester. The Beck Anxiety Inventory was implemented to determine anxiety levels of the participants. Preliminary results reveal every student presented some sort of common symptoms of anxiety such as the inability to relax, fear of worst happening, nervousness, feeling scared, fear of losing control, hot/cold sweats, and indigestion at the beginning of the semester. Twenty-five students responded feeling mildly nervous but were not bothered much, eleven students felt moderately nervous which was not pleasant at time, while ten students were severely nervous about grades and were extremely bothered at the beginning of the semester. During the semester, students expressed being uncomfortable and disappointment when grades were not as expected. 51% of the participants indicated the need to study more, 25.4% needed to pay more attention during class, while 10% stopped caring for the class.

## **I. BACKGROUND AND MOTIVATION**

Attaining high grades in higher education has become a focal point for students across engineering disciplines. Such academic achievement generally propels undergraduate students towards securing internship opportunities, research positions, post-graduation employment, and graduate school admission. Although a large number of engineering students participate in a variety of co-curricular activities to gain additional professional experience, a competitive grade-point-average (GPA) remains a catalyst in experiencing success during matriculation and post-graduation. Nonetheless, a continual desire of attaining high scores has generated negative effects amongst students. Several effects include anxiety, physical fatigue, and increased mental exertion. Marquez and Garcia reported that 60% of students enrolled in an introductory engineering course experience anxiety regarding grades at the beginning of the semester, prior to any assignment [11]. Such data suggest that maintaining a competitive GPA renders a preceding psychological effect which may

dictate the academic performance of engineering students for the remainder of the semester, or even throughout matriculation.

Anxiety, according to the literature, is defined as a psychological and physical response to a self-concept that is characterized by subjective, consciously perceived feelings of tension [21], [23]. Studies associate various academic and personal factors with anxiety. For instance, Schneider reported that 62% of engineering students affront anxiety due to curriculum challenges, cultural and race issues, expectation, and prolonged study hours [8], [19], [20], [22]. A factor that leads to anxiety, which is often precluded, is the cultural and race issues experienced by students. Oftentimes referred in the literature as ‘cultural shock,’ students have difficulties adjusting to various academic climates due to the lack of culturally relevant knowledge and skills [9]. In this regard, Ollendick and King recorded a high prevalence of anxiety disorders among American youth [13]. Blazer *et al.* and Robins *et al.* reported higher phobia and agoraphobia rates particularly in African Americans [4], [16]. Barlow and Bell identified anxiety syndromes such as *Pa-Leng*, *Koro*, *Nervous*, and *Taijin Kyofusho* in assorted cultures [2], [3].

Abdi *et al.* further revealed that GPA and standardized testing affect long-term anxiety and self-efficacy [1]. According to Chapell and Blanding, test anxiety effectuates when being preoccupied by the possibility of negative score outcomes [5], [6]. As such, test anxiety is a detrimental component to the students’ overall academic achievement. In a study conducted by Chapell *et al.* in 2005, it was reported that one-third of the participants who had low test anxiety attained a letter grade higher than those with an elevated level of anxiety [6]. Additional studies concluded that students with elevated self-efficacy did not worry about exam scores as much as those with low self-efficacy. Pintrica and De Groot reported in 1990 that test anxiety negatively impacts memory function, particularly when retrieving information for exams [14], [15]. Hambree, Sapp, Durand, and Farrell identified academic performance decrements due to high levels of test anxiety [5], [10], [17], [18]. Chapell *et al.* categorized text anxiety as a multi-dimensional phenomenon involving emotionality and worry due to possible negative outcomes [6]. It has been demonstrated that test anxiety is not only detrimental to the overall academic success of students, but it is further detrimental to the emotional response and physical health. Cohen *et al.* and Mulkey *et al.* identified that anxiety increases heart rate and prompts a sweating outbreak when stressful situations arise [7], [12].

The literature further informs that anxiety is manifested when aspiring for high grades in a course becomes a strong inclination. In this regard, Singh and Jha identified depression, a sense of apprehension, and anticipating the worst as emotional factors experienced when grade expectations are not met by students [20]. These emotional factors are affecting learning aptitudes in engineering education. Marquez and Garcia conducted a study which revealed the perceptions, views, and attitudes of students towards grades during the span of a semester [11]. The study focused on the impact of grades on students’ self-efficacy, motivation, and decision making [11]. It was reported that learning was the most important aspect in higher education, however, grade anxiety led students to adapt various alternatives such as memorizing course material, or at times violating the honor code in an attempt to earn a specific grade letter.

## **II. PURPOSE OF RESEARCH**

In this paper, the authors extend their initial study on the impact of grades in engineering education. The first study was conducted in the spring of 2019 at a tier one, small private research university in Texas. The aim involved understanding the student mindset on grades before, during, and at the

end of the semester. The study extended herein, aims to explore the emotional and academic impact grades have on engineering undergraduate students in a minority-serving institution (The University of Texas Rio Grande Valley - UTRGV), and further understand the issues plaguing engineering disciplines such as retention rates, completion, and mental well-being. The study runs parallel to the one at tier one institution, in which the impact of grades is observed in a semester span (e.g., before, during, and at the end).

## **II.1 Socioeconomic Factors Correlated with Study**

The context of this study involves understanding the impact of grades on students pursuing engineering fields. However, student success in higher education is simultaneously associated, according to the literature, with academic and socioeconomic factors (social cognitive theory). Several socioeconomic factors identified by Bandura include racial gaps, school sector, school environment, and family conditions. These external factors are not considered in this specific study, but are necessary to delineate as the authors are in the process of studying the correlation between grades and socioeconomic factors. Studies conducted by Murnane and Wolf specify that instructor traits affect student learning and achievement rates [24], [25]. It was reported that high performing schools emphasize on consistent, effective teaching and invest a plethora of time on student performance [26], [27]. Nonetheless, it was observed that racial gaps remain a critical element in academic achievement. To this end, it was reported that test scores for Black and Hispanic students are relatively low compared to Asians and White students, even for those minorities enrolled in selective (public or private) institutions [28], [29].

According to the literature, student achievement is further dependent on the school sector, particularly the economic position of the institution. In this regard, the quantity of resources allocated per-pupil expenditure was completely associated with student success [30], [31]. Those institutions with larger endowments reflected higher performance and retention than those institutions allocating minimal resources. In addition, school size, climate, and collective efficacy were components reported in the literature which affected student success [32], [33]. Hoy and Tarter reported higher achievement rates from institutions who significantly emphasized on academics as well as faculty trust [34]. Less populated institutions reported higher achievement levels and higher retention patterns [35], [36], [37], while it was observed that institutions with higher standards of collective responsibility for learning experienced higher student performance rates. Coleman reported that more than 20% of student success is linked to the family, while Konstantopoulos and Borman specifically reported that family size, structure, and socioeconomic status are factor which influence student outcomes.

## **II.2 Research Motivation**

The research is motivated given the personal and academic challenges surrounding UTRGV students. UTRGV is the second largest federal certified Hispanic-serving-institution (HIS) of higher education in the United States and is located in southmost region of Texas called the Rio Grande Valley (RGV). The student population ranges above 30,000, of which 90% are of Hispanic descent. According to statistical data, UTRGV falls into the following categories: 1) ethnic enrollment, 88% Hispanics, 2) graduation rates in four years (Fall 2020: 24%) and six years (Fall 2020: 46%), 3) commuter school, approximately 60% of the student population, and 4) financial assistance (84.6% of the student population).

The UTRGV region consists of four counties (Cameron, Hidalgo, Starr, and Willacy), which have concerning statistical measures (Table 1) that are consistently and significantly below national

average. These statistical measures impact life quality outcomes and educational interests for youth and families. These indicators include: high concentration of poverty rates; low educational attainment and standards of inhabitants; historically underserved area with limited access to quality educational resources and programs; and low percentages of high school students enrolling in tier-one institutions.

**Table 1.** Social and Economic Factors of the Rio Grande Valley

<b>Social and Economic Factors</b>	<b>RGV</b>	<b>Texas</b>	<b>United States</b>
Children Eligible for Free/Reduced Price Lunch	85.26%	58.94%	52.61%
Population Below 200% of Federal Poverty Level	59.85%	37.22%	33.61%
Children Below 200% of Federal Poverty Level	70.56%	48.22%	43.29%
Population with Bachelor's Degree or Higher	16.67%	28.10%	30.32%
Population with Associate's Degree or Higher	21.73%	34.89%	38.49%
Income - Per Capita Income	\$15,142.00	\$27,828.00	\$29,829.00
Per Capita Income by Hispanic/Latino	\$13,512.00	\$16,640.00	\$17,323.00
Per Capita Income by Non-Hispanic/Latino	\$31,602.00	\$34,871.00	\$32,450.00

Given such statistical measures, and the fact that the majority of the student population at UTRGV are not solely focused on academics, but also in commuting to school and working part/full time, it is believed that that the notion of attaining high grades will not be greater than those students in tier one institutions, which mostly reside and dine on-campus.

### **III. METHODS AND ANALYSIS**

In this study, a mixed-methods research design was integrated to explore the impact of grades on engineering undergraduate students in a minority-serving institution. A self-developed, open-ended survey was conducted with a cohort of 60 students enrolled in Rigid Body Dynamics and Engineering Analysis to understand their perspective on grades before, during, and at the end of the semester. The survey, which consisted of a total of eleven self-developed questions, was administered in the spring semester of 2022 and allowed students to disclose their views and perspectives. As such, the Beck Anxiety Inventory was implemented to determine anxiety levels of the participants.

The study poses the following limitations: (a) small sample size; (b) self-developed survey instrument; (c) convenient sampling procedure. The following questions were administered on the survey:

**Question 1:** How do you feel about grades at the beginning of the semester?

**Question 2:** If your grades on homework and exams are good mid-semester how do you feel about grades moving forward?

**Question 3:** If your grades on homework and exams are not what you expected mid-semester, how do you feel about grades moving forward?

**Question 4:** How do you feel about grades at the end of the semester?

**Question 5:** How do you feel when you have high grades in your class?

**Question 6:** How do you feel when you have low grades in your class?

**Question 7:** When grades are not as expected in any of your classes, what will you most likely do?

**Question 8:** When the semester ends, are you most worried about good grades, or about how much you learn?

**Question 9:** What grade-point-average do you want to have senior year?

**Question 10:** What grade do you aim to earn when you complete the class?

**Question 11:** Why do you select specific courses?

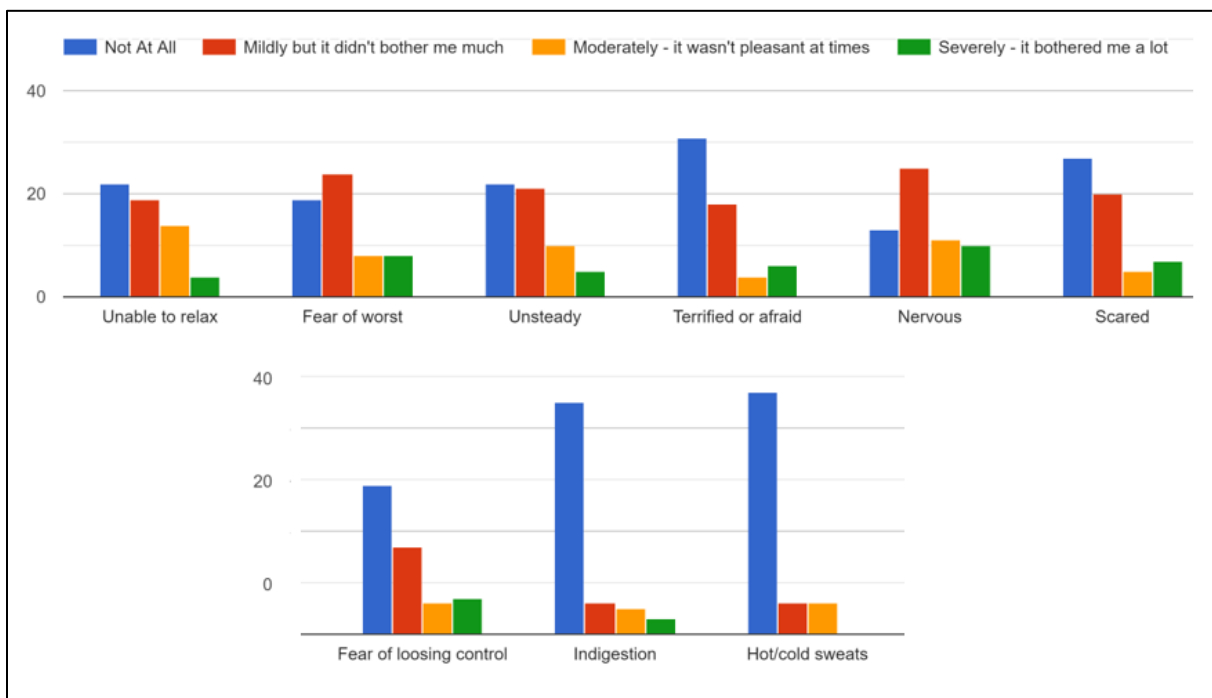
## IV. RESULTS & DISSCUSSION

**IV.1 Question 1:** How do you feel about grades at the beginning of the semester?

Figure 1 illustrates examples of the different emotions and feelings students have related to grades. The top responses felt by students were nervousness, fearful of uncertainty, unsteadiness and inability to relax.

According to participant responses, the major themes emerging from the aforementioned guiding questions included:

- Stressing over grades
- Concerns over mental health and physical well being
- Little concern over grades



**Figure 1.** Results of Question 1

**Stressing Over Grades.** The theme of stressing over grades was a major concern for many students in the study. Roughly 40.0% the student participants expressed that they felt stressed, anxious, or nervous about their grades at the beginning of the semester. One student response illustrated the feelings shared by other students: *“I have always been a good student with good grades, but I am always very anxious in the class. I get very scared easily when it comes to my grades. I know that I need to work hard in order to get good grades, but I get very nervous about it.”* Interestingly, several of the students that shared concerns about grades before the semester also noted that these feelings tended to diminish after becoming familiarized with professor and content being covered in the course, which served to boost confidence levels. Another student offered the following reflection: *“At the beginning of the semester, I knew it was not going to be easy so I was a bit nervous. Then after the first homeworks or two, I felt comfortable and understood everything. After the first exams I thought I was still ok but needed to improve. I know that it's better to start off with great grades because if not, it makes it harder to improve.”*

**Concerns Over Mental Health and Well Being.** A number of students also revealed that the concerns about grades impacted their mental and physical health. Research has shown increased levels of anxiety and negative physical effects related to academic stress and pressure to excel in courses. One student painted a deeply personal and alarming reality that generate cause for concern: *“I think I won't pass this course, which makes me feel awful and question everything career wise for a while as I feel it is affecting me mentally and physically. I was told I had a textbook seizure a while back, but I am still affected with waves of dizziness and the general feeling of feeling unwell. I felt like this course sadly didn't do much for "keeping my stresses low" as I was advised to do.”*

**Little Concern Over Grades.** Although a solid number of students expressed concerns regarding their grades, about 25% of the students also shared that they did not feel stressed or were concerned about their grades at the onset of the semester. One student shared his thoughts regarding grades that the beginning of the semester: *“At the beginning, it's like if you don't really stress about grades because you haven't experienced how grades are going to be. But when you get a bad grade on your first exam, now you are thinking only about grades and not about what we should be learning or studying.”*

**IV.2 Question 2:** If your grades on homework and exams are good mid-semester how do you feel about grades moving forward?

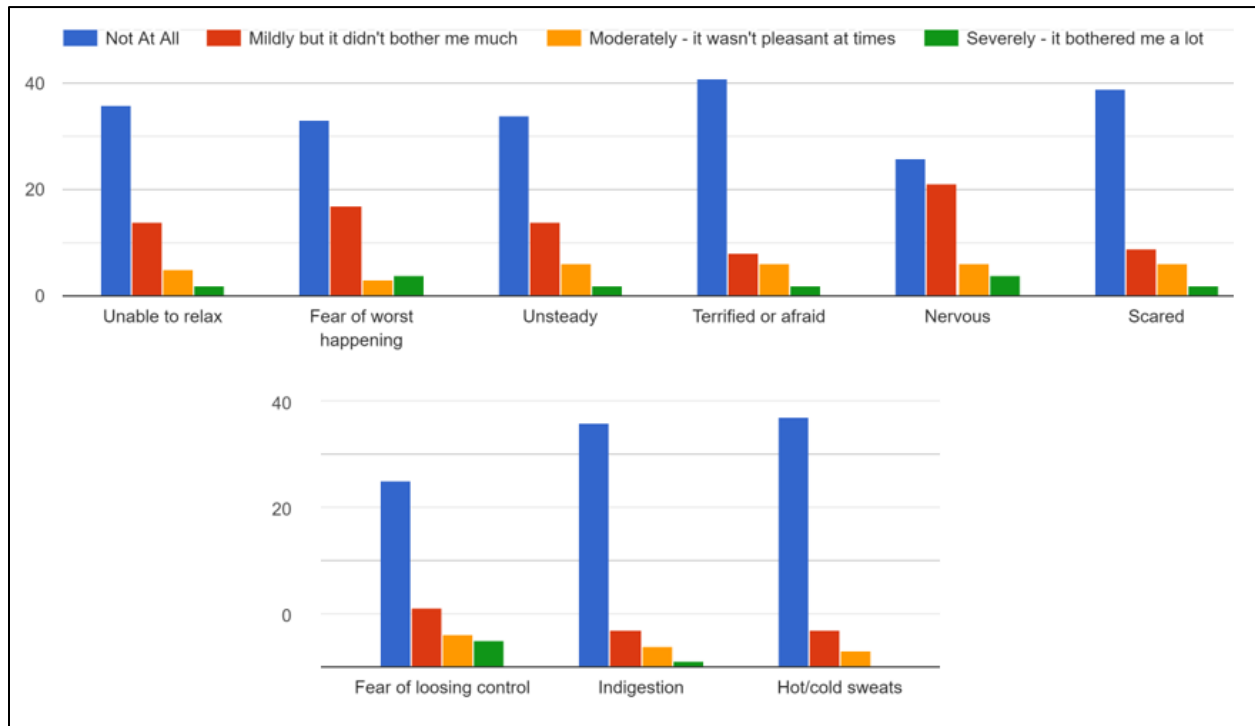
Figure 2 illustrates examples of the different emotions and feelings students have related to grades at mid-semester. The majority of students indicated having positive attitudes/emotions if they were successfully halfway done with the semester.

**Summary of Feedback and Guiding Question Two.** For the guiding question, “If your grades on HW and Exams are good mid-semester how do you feel about grades moving forward?” According to participants responses, the major themes emerging from the aforementioned guiding question included:

- Tempered Confidence

**Tempered Confidence.** The results indicate that most of the students would feel confident, yet not to overconfident if they had good mid-semester grades. One student shared the following thoughts: *“Assuming these conditions, I'd definitely feel more confident in my academic performance. My anxiety still wouldn't shake off completely, yet I'd know that if I handled half of the semester then*

*I'd be able to control the other half."* Another student echoed these thoughts: *"Even though I have good grades mid-semester, that can change in the second half of the semester, so I still feel stressed knowing that I might lose a letter grade and it would be more of a pain knowing I tried the first half of the semester to then drop to a lower letter grade."*



**Figure 2.** Results of Question 2

**IV.3 Question 3:** If your grades on HW and Exams are not what you expected mid-semester, how do you feel about grades moving forward?

Figure 3 illustrates examples of the different emotions and feelings students have related to grades at mid-semester. Most students indicated having moderate attitudes/emotions associated with stress and anxiety

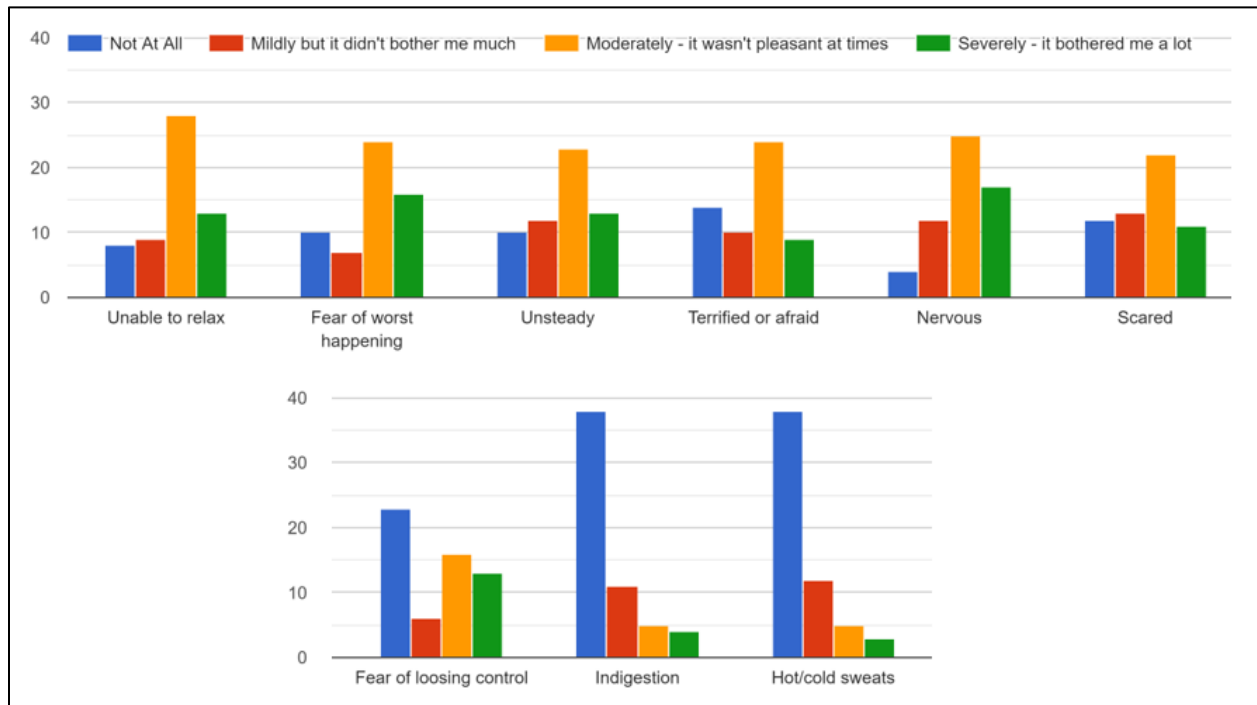
**Summary of Feedback and Guiding Question Three.** For the guiding question, *"If your grades on HW and Exams are not what you expected mid-semester, how do you feel about grades moving forward?"* According to participants responses, the major themes emerging from the aforementioned guiding question included:

- Extreme Levels of Stress and lack of self confidence

***Extreme Levels of Stress and Lack of Self Confidence.*** For question three, the overwhelming number of students shared that they would feel high levels of stress, anxiety, and other negative feelings if they were not meeting their academic expectations by mid-semester. Students indicated that they would genuinely feel very worried and stressed out about completing the course on a positive note and this would negatively impact their academic self-confidence. *"It sometimes makes me feel unmotivated and uncomfortable with my ability to succeed in the class. It makes me*



*doubt myself more and I struggle to believe in myself. So, I sometimes see a decline in grades past the midterm mark if I don't see any progress in my classes.”*



**Figure 3:** Results of Question 3

Another student added the following, *“Once I see bad grades and don't feel very comfortable with the course and the assignments being assigned, I get in my head and start committing self-sabotage.”* As evidenced above, not meeting academic expectations at mid-semester can deeply impact students' confidence, motivation, and ability to learn.

#### **IV.4 Question 4:** How do you feel about grades at the end of the semester?

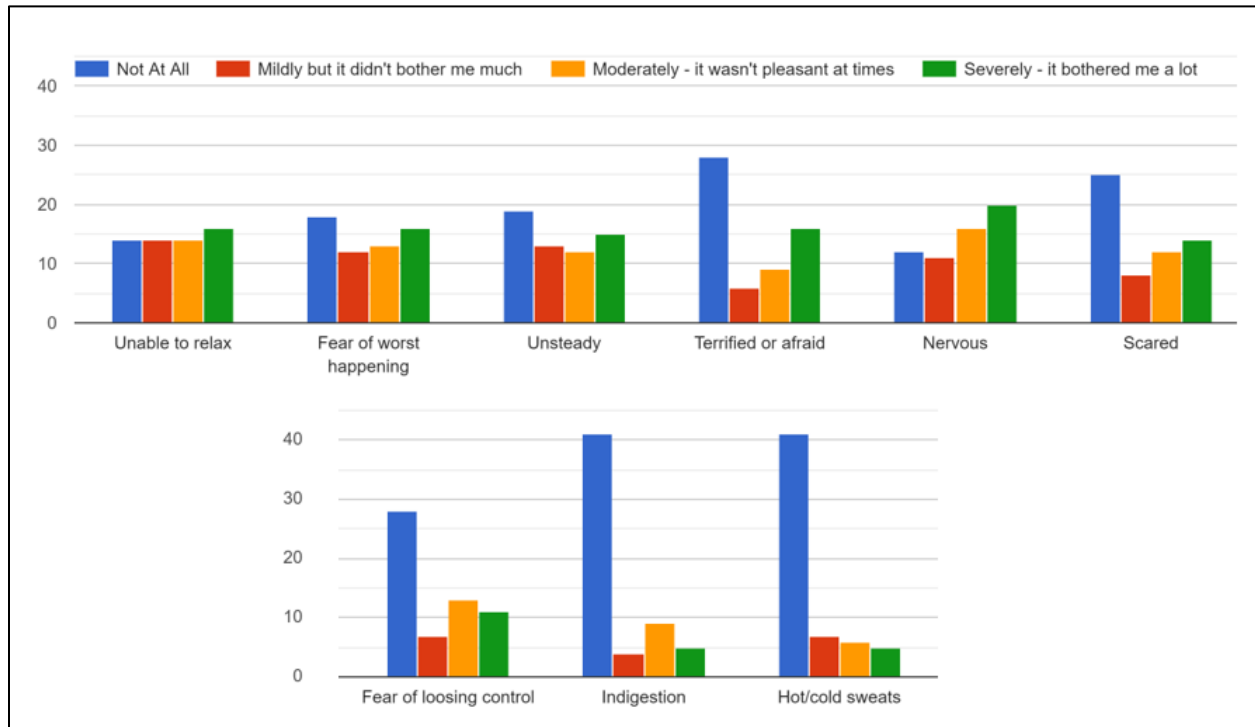
Figure 4 illustrates examples of the different emotions and feelings students have related to grades at mid-semester. As evidenced by the chart, the students experienced both mild and severe levels of stress associated with grades at the end of the semester.

**Summary of Feedback and Guiding Question Four.** For the guiding question, *“How do you feel about grades at the end of the semester?”* According to participants responses, the major themes emerging from the aforementioned guiding question included:

- **Feeling Fearful and Nervous**

**Feeling Fearful and Nervous.** The theme of nervousness and fear surfaced when students turned their attention to grades at the end of the semester. Although several students indicated that they feel a bit more relaxed at the conclusion of the semester, most of the participants expressed that they felt nervous and/or fearful about their grades. *“As finals come around, I'm usually super stressed and anxious about grades. Not about what I learned or how much information I actually*

retained. Just grades. I feel unless it's clear I have all As, I'm always on high stress with grades around the end of the semester.”



**Figure 4:** Results of Question 4

Another student shared the following statement: “I am very scared and nervous for my final grade given the grades I have so far. I am unsure of what my final grade will be, therefore, my anxiety has gone very high and have had multiple panic and anxiety attacks due to the grades.”

The students’ responses underscore several areas of concern for higher education leaders and faculty. The first is that students seem to prioritize grades over the acquisition of important information and knowledge essential to helping them to excel in engineering careers. Second, the thought of grades has a profound effect on student emotional and well-being. These are important topics for high education professionals to consider and help develop systems to address these areas affecting student learning.

#### **IV.5 Question 5:** How do you feel when you have high grades in your class?

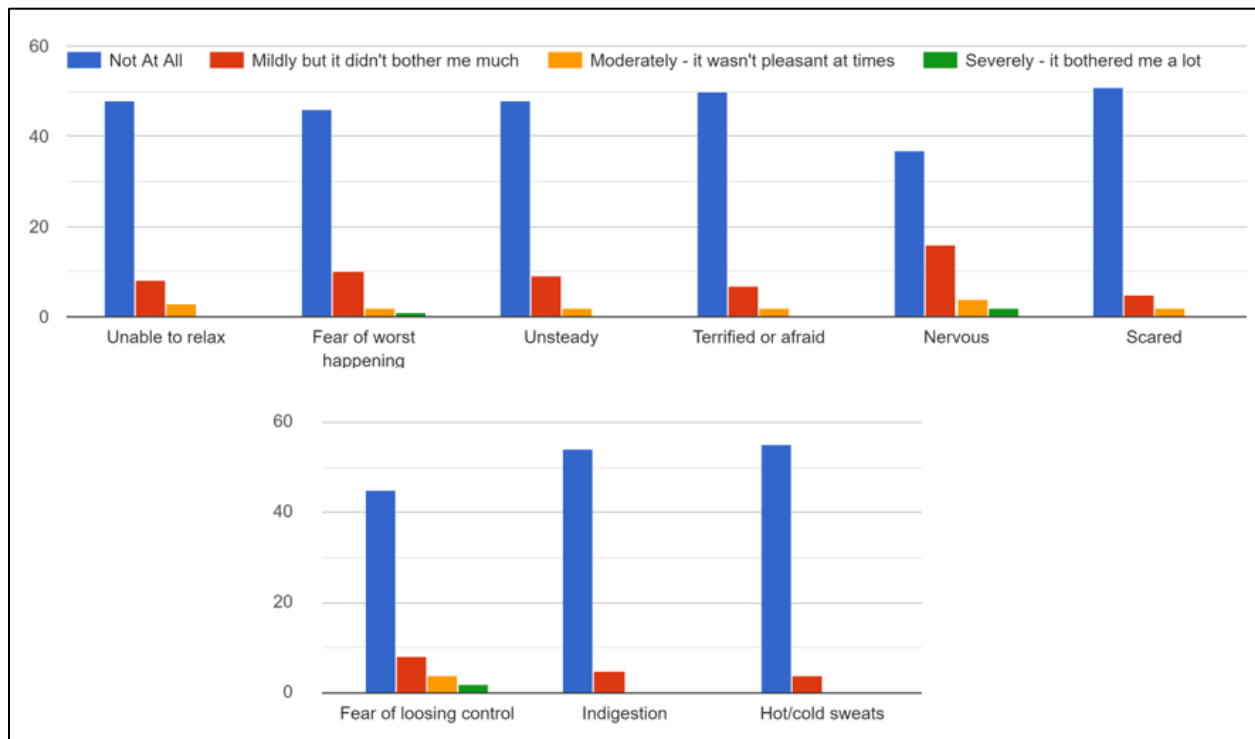
Figure 5 illustrates examples of the different emotions and feelings students have when doing well academically in a course. As evidenced by the chart, the students experienced low stress levels and general mild feelings of nervousness, fear, and anxiety.

**Summary of Feedback and Guiding Question Five.** For the guiding question, “How do you feel when you have high grades in your class?” According to participants responses, the major themes emerging from the aforementioned guiding question included:

- **Growing Sense of Pride and Confidence**

- **Increased Motivation**

**Growing Sense of Pride, Confidence, and Interest.** When asked how they felt when they have high grades in class, most of the students noted that they felt more confident and a greater sense of pride. One student shared the following statement: *“When I have good grades in my classes I feel extremely motivated and confident about myself and the course. It makes me feel extremely at ease.”*



**Figure 5:** Results of Question 5

Another student reported: *“When I get a high grade, I feel accomplished, yes on the grade, but that just means I'm doing something right in the way I learn, attain the lectures, or on how I study. I feel great, but I still humble myself and stay aware knowing that this might not go the same way in a couple of weeks or in the next exam.”*

One student simply expressed their opinion by sharing: *“Like a million bucks. Very proud of myself. Excitement for class grows as a function of time.”*

**Increased Motivation.** The students surveyed in the study also reported they felt a stronger sense of motivation to maintain their academic standing in class. *“When I get good grades on my exams especially after previously getting bad grades, it makes me want to try harder than getting bad grades because it makes me feel like it is possible and makes me want to maintain it.”* Another student added: *“Having good grades in a class is a motivational boost. It inspires me to think that I am heading in the right direction in my studying skills.”*

#### IV.6 Question 6: How do you feel when you have low grades in your class?

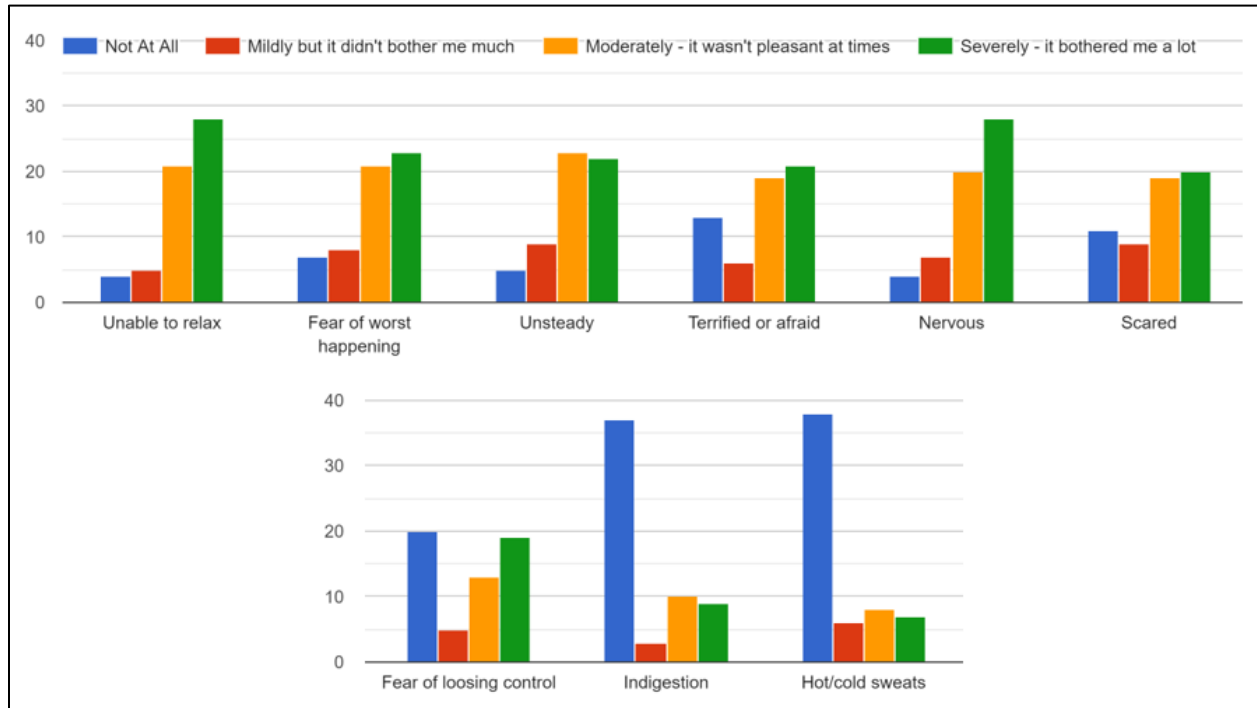


Figure 6: Results of Question 6

Figure 6 illustrates examples of the different emotions and feelings students have when not experiencing academic success in a course. As evidenced by the chart, the students experienced moderate to severe levels of stress, nervousness, and other related emotions.

**Summary of Feedback and Guiding Question Six.** For the guiding question, “*How do you feel when you have low grades in your class?*” According to participants responses, the major themes emerging from the aforementioned guiding question included:

- **High Stress/Low Confidence**

**High Stress/Low Confidence.** When asked how they felt when they have low grades in class, nearly all the students reported experiencing high levels of stress and decreased confidence. These responses would impair students’ ability to focus, study, and learn the material being taught in the course. One student shared: “*Worries me for not passing the course and stresses me out when taking an exam. Even if I study enough the panic would highjack my mind not able to concentrate and recall information that I studied.*” Another student added the following thoughts: “*Assuming these conditions, I’d take my low grade as a personal thought about myself concluding to low standards. Knowing this, I’d find a lack of confidence in myself as well as a lack of sleep and motivation at the time.*”

Several of the participants helped to put this scenario into perspective: “*I know grades are not all that matters, but they are important in certain aspects, and I feel bad if I do not at least get the minimum I had expected of myself. Also, it's a bit pressuring as it makes me feel like I need to do*

*much better afterwards so I can make up for those low grades.” Another student added: “If I have low grades, that’s all I think about. It makes me work harder and if I do not improve, I begin to question why and what’s going on. I don’t really feel like I’m losing control because I know there’s more to life, but it does make me feel like I’m losing control of school which is not the end of the world.”*

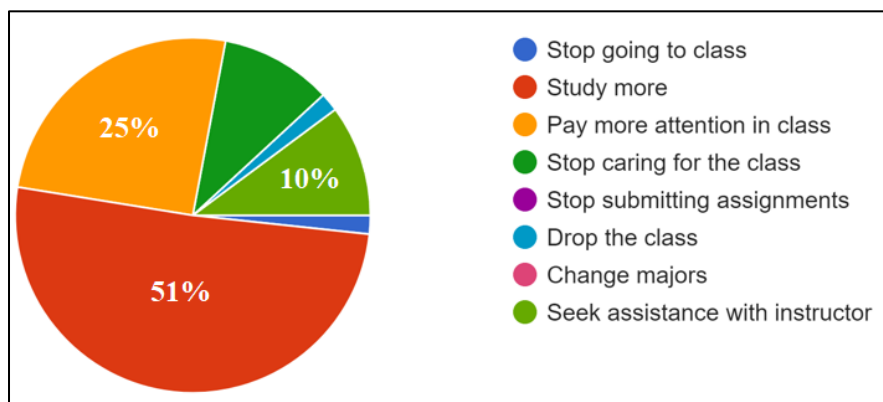
**Greater sense of pride.** One student shared the following statement: *“When I have good grades in my classes I feel extremely motivated and confident about myself and the course. It makes me feel extremely at ease.”*

Another student reported: *“When I get a high grade, I feel accomplished, yes on the grade, but that just means I’m doing something right in the way I learn, attain the lectures, or on how I study. I feel great, but I still humble myself and stay aware knowing that this might not go the same way in a couple of weeks or in the next exam.”*

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**IV.7 Question 7:** When grades are not as expected in any of your classes, what will you most likely do?



**Figure 7:** Results of Question 7

Figure 7 illustrates examples of the different actions taken by students when not experiencing academic success in a course. As reflected by the chart, 50% of the students indicated that they would study more, while 25% shared that they would pay more attention in class.

**Summary of Feedback and Guiding Question Seven.** For the guiding question, “*When grades are not as expected in any of your classes, what will you most likely do?*” According to participants responses, the major themes emerging from the aforementioned guiding question included:

- **Dedicate More Time to Studying Course Material**
- **Focus More During Class**

***Dedicate More Time to Studying Course Material.*** When faced with the challenge of improving academic standing in a course, 50% of the students indicated that they would dedicate more time to studying course material. “*When I get low grades in my class I first doubt myself in my ability to learn, but after that I start paying more attention to class or to examples and try to spend more time on the material. I try to see what's the most efficient way to study for the class knowing what I did last time might have not helped or been the best method to study.*”

***Adjusting Focus in Class and Study Habits.*** Students also noted that they need to put forth additional efforts focusing during class. When speaking about adjusting study habits, one student shared: “*Only one that can raise my grades is me and I usually pay attention in class so it's usually my studying habits that need adjustment.*” Another student provided the following reflection: “*Low grades, means I just have to find a different method to learn or spend more time studying. Usually when I get low grades it is because the teacher is not a great teacher, resulting in me using google and YouTube to learn the material a different way.*”

Interestingly, one student offered the following perspective: “*I've always been the underdog in all of my classes. My group of friends consist of mostly boys and for the most part they are very smart. They always start scoring very high while I get average grades. This motivates me to study harder and I always manage to show improvement from the beginning to the end of the semester.*”

**IV.8 Summary of Feedback and Guiding Question Eight.** For the guiding question, “*When the semester ends, are you most worried about good grades, or about how much you learn?*” According to participants responses, the major themes emerging from the aforementioned guiding question included:

- **Concern for Good Grades**

When asked about what is more important at the end of the semester, most of the students indicated that grades are more important than the material learned in class. Although several of the students did express concern for both, most the students candidly revealed they value high grades over acquisition of course information. One student bluntly noted: “*I'm most worried about grades. The school system has unfortunately taught us to focus on a scale of how good you are doing instead of what you actually learned. I feel sometimes it just feels like we are only learning just for what's right in front of us. But rarely for the bigger picture. In other words, I review for an exam because that's what I'm facing next but once the course is over I feel I lost most of the information.*”

Another student shared the following thoughts: “*I worry more about my grades. I have often times learned more from classes where I struggled a lot. I feel people learn by messing up. My mistakes really eat away at me and I try very hard not to repeat them. So, when I make a mistake that costs me points on an assignment, it stays with me and I don't forget it. I also don't repeat it, but I often feel my grades take a hit. Grades are always the biggest worry. It does not matter if I learn*

*anything if my grade is not good. I can know more, but the person with a better grade will have better opportunities down the road.”*

## **V. CONCLUSION**

This research study explored the emotional and academic impact grades have on engineering undergraduate students in a minority-serving institution, and further understand the issues plaguing engineering disciplines such as retention, completion, and overall well-being. To further understand the effects of grades on students' mental and emotional well-being, a self-developed, open-ended survey was conducted with a cohort of 60 students enrolled in Rigid Body Dynamics and Engineering Analysis to understand their perspective on grades before, during, and at the end of the semester. The Beck Anxiety Inventory was implemented to determine anxiety levels of the participants. Preliminary results reveal every student presented some sort of common symptoms of anxiety such as the inability to relax, fear of worst happening, nervousness, feeling scared, fear of losing control, hot/cold sweats, and indigestion at the beginning of the semester. Twenty-five students responded feeling mildly nervous but were not bothered much, eleven students felt moderately nervous which was not pleasant at time, while ten students were severely nervous about grades and were extremely bothered at the beginning of the semester. During the semester, students expressed being uncomfortable and disappointment when grades were not as expected. 51% of the participants indicated the need to study more, 25.4% needed to pay more attention during class, while 10% stopped caring for the class.

The findings of the study illustrated some the powerful effects grades can have on students' mental, emotional, and physical well-being. It also underscores how grades often take precedence over the acquisition of knowledge, content, and engineering related concepts needed to excel in post baccalaureate careers. This study provided greater insight into this research area and invites engineering leadership, professors, and instructors to address related issues and work towards developing effective systems to help students seeking engineering degrees effectively handle challenging situations. These systems and approaches can and should be developed both at the macro (institutional) and micro (classroom) levels to ensure that every student seeking an engineering degree is afforded the necessary support systems to complete degree requirements.

### **Future Work**

Future work of this study includes associating the impact of grades with the socioeconomic factors identified by Bandura which include racial gaps, school sector, school environment, and family conditions. A survey was created and administered in the Fall of 2022 with a cohort of students enrolled in a Rigid Dynamics course. Specifically, students were asked about the non-academic factors that affect their academic performance such as family responsibilities, employment, and financial issues. The data is under review, and more will be collected in the Spring 2023.

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