

# Performance and perception: A preliminary examination of factors that may motivate students to bounce back

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**Abstract**— This work in progress (WIP) uses a mixed methods approach to consider how student satisfaction and performance affect academic resilience. A previous study introduced a sink, struggle, and soar model to quantitatively assess positive adaptation after a poor exam performance. An underlying assumption was that quantitative measures of performance would align with a student’s perception that they need to bounce back. However, some students who performed well by external standards still exhibited a strong desire to positively adapt, while other students who performed relatively poorly appeared unmotivated to adapt. In both scenarios, there appeared to be a mismatch between external measures of performance and internal perceptions. As part of an ongoing study of resilience, in this WIP we qualitatively and quantitatively examine student satisfaction with their performance. Preliminary data suggest that students with lower satisfaction than performance tend to focus on factors within their control when evaluating their performance. By contrast students with higher satisfaction than performance tend to attribute their low performance to external factors outside their control. As we continue to explore academic resilience, we hope that considering student satisfaction will provide insights into how to understand and help subpopulations in the classroom.

**Keywords**—academic resilience, satisfaction, mixed methods

## I. INTRODUCTION

Resilience is broadly defined as adapting well after encountering adversity [1]. Academic resilience refers to how students bounce back from difficulties in their coursework [2]. Resilience skills can help students navigate the academic rigors of college and also better prepare them to overcome professional challenges after they graduate.

As shown in Fig. 1, we have adopted a tripartite model of resilience [3] that considers i) academic adversity or risk factors, such as a low grade on an exam, ii) protective factors that participants draw on to “bounce back” [4] from adversity, such as perseverance and help-seeking, and iii) positive adaptation following the initial adversity, such as improved grades. In a previously published quantitative analysis [5], we used improved grades as a marker of positive adaptation. We

observed that students who “soared” after an initial low exam performance generally had superior resilience characteristics, as measured on the Psychometric Project Resilience Test (PPRT) [6], than students who “struggled” or those who “sunk,” that is, students who continued to perform at the same level or students whose performance worsened over the course of the semester, respectively. Since conducting this study, we have implemented two additional surveys, the Connor-Davidson Resilience Survey (RISC-25) [7] and an adapted version of the Academic Resilience Scale (ARS-30) [8], which are more commonly referenced in the literature as a way for students to self-assess academic resilience. We are in the process of replicating our prior sink-struggle-soar analysis using data from the RISC-25 and the modified ARS-30.

Although we previously identified poor performance on an early exam to be an indicator of academic adversity and, therefore, the need to bounce back, in this WIP we explore the hypothesis that students may perceive adversity differently. For example, a relatively poor exam performance may not motivate all students to bounce back, while other students who perform relatively well may be motivated to bounce back to achieve an even higher grade. It is this potential disconnect between numerical performance and student perceptions that we examine in this study. If we find that student perceptions of adversity are not well-aligned with numerical performance, we may need to reconsider how we conceptualize adversity in our tripartite model of resilience. At a minimum, we need to better understand why student

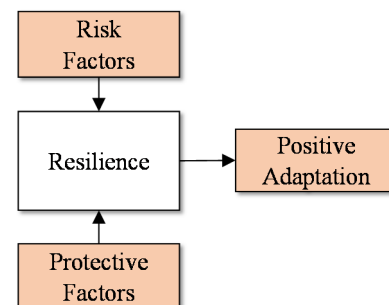


Fig. 1. Tripartite model of resilience proposed by Sarker and Fletcher (3).

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perceptions of adversity are sometimes not aligned with performance.

We explored students' perceptions of adversity by asking them about their level of satisfaction following the first midterm exam in a sophomore engineering statics class. We then used a mixed methods approach to consider alternate ways of identifying students who may need to bounce back. We also sought to understand how we might better operationalize the notion of resilience by identifying factors that may cause a disconnect between performance and satisfaction.

## II. PURPOSE AND RESEARCH QUESTIONS

The purpose of this study is to take into account students' own perceptions of satisfaction, rather than exclusively relying on academic performance when determining if a student needs to bounce back, as per the tripartite understanding of resilience. Research questions that flow from considering student perspectives include:

- 1) What relationships exist between performance and satisfaction?
- 2) Why are some students satisfied when they perform relatively poorly, while others are dissatisfied when they perform well?
- 3) Does low satisfaction more accurately represent the need to bounce back than low performance?
- 4) How do the sink-struggle-soar results change when we take satisfaction into account?

This WIP paper focuses primarily on the first two research questions. We also provide a preliminary finding for the third research question.

## III. METHODS

We administered the Connor-Davidson Resilience Survey (RISC-25) [7] and an adapted version of the Academic Resilience Scale (ARS-30) [8] to 95 undergraduate engineering students. These surveys were given after Exam 1, but before students received exam grades. Four weeks later, after students completed a rework of Exam 1 and had time to reflect about their performance, a supplemental survey was given that included Likert scale questions to assess students' level of satisfaction with their performance (e.g., "At this point I am satisfied with my performance in this class") and open-ended questions to allow for a qualitative assessment of satisfaction (e.g., "In what ways are you dissatisfied?").

The 95 respondents to the two surveys were enrolled in an engineering statics course. The respondents included 61 males and 34 females, spread across six programs of study.

In order to investigate the relationship between student satisfaction and performance (the first research question), we created a 3x3 grid and binned student's performance on Exam 1 onto the y-axis and their satisfaction with their performance onto the x-axis (see Fig. 2). Performance was ranked based on the number of standard deviations away from the mean

|             |          | Satisfaction |          |      |
|-------------|----------|--------------|----------|------|
|             |          | Low          | Moderate | High |
| Performance | High     | 3            | 6        | 22   |
|             | Moderate | 10           | 14       | 9    |
|             | Low      | 18           | 10       | 3    |

Fig. 2. Student distribution based on performance and satisfaction, showing two possible groups that might need to bounce back.

score.  $X < -0.5$  SD was categorized as a low score,  $-0.5 < X < 0.5$  SD a midrange score, and  $X > 0.5$  SD a high score. Student responses on a Likert scale to the question "At this point I am satisfied with my performance in statics" served as the differentiating factor for satisfaction. We assumed that students used their performance on Exam 1 and reflection when completing a rework of Exam 1 as a baseline for their perspective on satisfaction. Student responses were grouped so that "strongly agree" and "agree" were high satisfaction, "neutral" was moderate satisfaction, and "strongly disagree" and "disagree" were low satisfaction.

In order to investigate the second and third research questions, the 3x3 grid was consolidated, so that individuals who had a lower satisfaction than performance were grouped together and those that had a higher satisfaction than performance were also grouped together (see Fig. 3). We called these groups the "off diagonals." We used qualitative data analysis, specifically methods of constant comparison [9], to analyze the off-diagonal student responses to the question, "In what ways are you dissatisfied?"

As mentioned previously, in addition to the qualitative work reported in this WIP, we are also in the process of replicating our previous sink-struggle-soar analysis with the two different instruments and using satisfaction instead of grades as an initial indicator of adversity. As part of this analysis, we are also investigating if students in the two off diagonal groups have different protective factor profiles. We present an early finding from these exploratory analyses at the end of the results section.

|             |          | Satisfaction |          |      |
|-------------|----------|--------------|----------|------|
|             |          | Low          | Moderate | High |
| Performance | High     | 3            | 6        | 22   |
|             | Moderate | 10           | 14       | 9    |
|             | Low      | 18           | 10       | 3    |

Fig. 3. Distribution of students based on satisfaction and performance. We examine groups whose satisfaction and performance levels did not match.

## IV. RESULTS

### A. Relationships Between Satisfaction and Performance

Fig. 2 shows that over half of the students we surveyed (54 of 95) had levels of satisfaction that matched their level of performance: Twenty-two students had a high level of satisfaction and a high level of performance; 14 students had a medium level of satisfaction and performance; and 18 students had a low level of satisfaction and performance. The remaining 41 students had levels of satisfaction that were higher or lower than their performance. These “off diagonal” groups are examined in more detail below.

As indicated earlier, students were asked an open-ended question about how they were dissatisfied with their performance. Our qualitative analysis revealed interesting differences in responses from students who had lower satisfaction than performance as compared to students who had higher satisfaction than performance.

### B. Higher Satisfaction than Performance

**The individuals in this group tended to attribute the reasons for their shortcomings to external factors, such as limited time on exams, the time-consuming nature of the homework assignments, and structure of the course.** For example, one student wrote that, “It is very difficult for me to complete the homework because of the large amounts of time it takes to complete. I would start earlier but this semester has been very busy with other classes as well as family responsibilities.” Similarly, another student wrote, “It still takes me a long time to think through some problems; I always run out of time on exams.” Other students in this group addressed the structure of the course itself, “I’m not really seeing the grades that reflect how much I know on the tests as I do in the homeworks.” Another student claimed the source of their dissatisfaction was: “The mystery of what final grades will be. Is there a grading scale for the class or are we competing solely against each other?”

Students who did accept responsibility for their performance attributed their low scores to “simple mistakes.” For example, one student stated that, “I still make simple mistakes on problems that should not be as difficult as I make them seem”; while another wrote, “I’m making small mistakes on tests.” Other students were more direct with their wording, “Most of the points off for my tests were from easily-fixable mistakes, so I don’t believe my current grade reflects my understanding of the course.”

Overall, the tone of the students in the higher satisfaction/lower performance group was critical of structural features of the class (e.g., amount of homework, exam time, or grading) or described a disconnect between the effort they were putting in and their level of understanding. While there were exceptions to this pattern, students generally expressed anxiety about factors that were outside of their control as the root of their low performance.

### C. Lower Satisfaction than Performance

**The individuals in this group tended to focus on factors within their control when analyzing their performance.** While some students with these characteristics

still expressed frustration with “simple mistakes,” they often supplemented this sentiment with a desire to adjust personal performance. For example, one student stated, “I am dissatisfied in my carelessness in calculations. I feel as though many of the points I have gotten off are due to simple and careless mistakes and don’t directly correlate to my understanding of the material. I need to be more careful in my work.” Other students in the *Higher performance than satisfaction* category expressed disappointment in their performance, but also included optimism for their future success. One student stated, “I have been dissatisfied with my test performance in Statics so far. Even though I’ve been pretty good based on the difficulty of the material, I know I could be doing better.”

Often students in this category were not focused on their letter grade but on wanting to succeed in a more general sense. As one student commented, “I can still do better, I want to pass this class with the best grade I can achieve at this point and I know I can push myself harder.” Similarly, another student wrote, “I feel unprepared still and feel like there is still A LOT that I have yet to master.”

Overall, the students in this group expressed a more optimistic and hopeful tone than the *Lower performance than satisfaction* group. They placed the responsibility on themselves and suggested taking action or changing their mentality to improve their performance.

### D. Relationship Between Satisfaction and the Need to Bounce Back

Our third research question asks, “Does low satisfaction more accurately represent the need to bounce back than low performance?” While a full account of the answer to this question is beyond the scope of this paper, in Fig. 4 we present a preliminary finding that provides insight on using satisfaction instead of performance as an indicator of the need to bounce back. Fig. 4 compares students’ resilience scores measured on the Academic Resilience Scale (ARS-30) for the factor called “Reflecting and Adaptive Help-Seeking.” This figure shows that students who had lower satisfaction than performance scored higher on this factor than students whose satisfaction was higher than their performance. An unpaired t-test was performed assuming equal variances and yielding

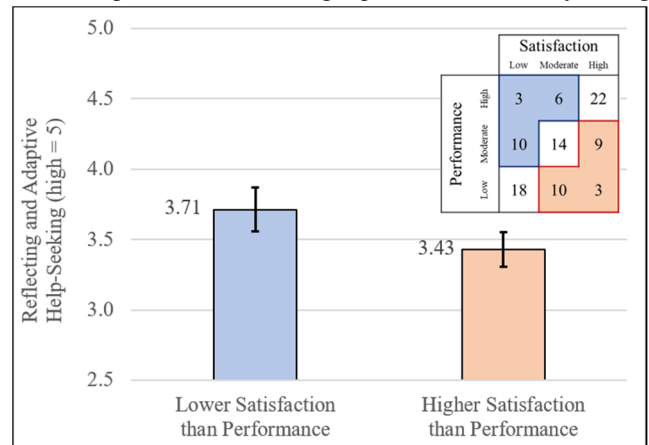


Fig. 4. Reflecting and adaptive help-seeking for subgroups, quantitative results are consistent with the observed pattern in qualitative results.

a p-value of 0.153 for the null hypothesis. This result is consistent with our qualitative analysis, also suggesting that students with lower satisfaction than performance group is more likely to take responsibility for their performance.

## V. DISCUSSION

The tripartite model of resilience suggests that when people experience adversity, their ability to positively respond to that adversity is mediated by a range of protective factors. In this WIP, we focused on and explored what constitutes academic adversity, which we argue will inform how the tripartite model can best be operationalized in engineering education. While grades are the most obvious marker of adversity, they are an external indicator and may not reflect students' internal experiences. Our qualitative analysis of the two off diagonal groups indicates that grades do not always correlate with internal experience and, therefore, may not motivate the same efforts toward positive adaptation. For example, students who had lower performance than satisfaction tended to externalize their challenges (i.e., point fingers), while students who had higher performance than satisfaction were more likely to take ownership of their academic difficulties (i.e., point thumbs).

These results suggest that considering a combination of performance and satisfaction may provide more nuance to studies, including ours, that use the tripartite model of resilience to investigate how students respond to academic setbacks in engineering. An example of this nuance is provided in Fig. 4, which shows that students who had lower satisfaction than performance scored higher on one of the four protective factors measured on the ARS-30, "Reflecting and Adaptive Help-Seeking," than students who had higher satisfaction than performance.

This finding might indicate that the former group's low satisfaction constituted an experience of academic adversity which, in turn, inspired them to bounce back by activating protective factors such as reflecting on their performance and seeking help. Our prior analysis approach [5] would not have identified these students as needing to bounce back because they received average to above average grades on early assessment items (i.e., they were not numerically "at risk"). Similarly, students who instructors may objectively identify as needing to bounce back may not be motivated to do so because they are satisfied with their performance.

## VI. CONCLUSION AND FUTURE WORK

A qualitative analysis of student satisfaction with their performance has provided the research team with insights that may help us better identify students that need to bounce back after an early exam. Perhaps students that are satisfied with lower performance should be excluded from future studies of positive adaptation while students that are unsatisfied with higher performance should be included. As we move forward, we will consider low satisfaction as an alternate measure to low performance for the need to bounce back. Further we will consider using satisfaction and performance data together to refine the cohort of students that need to bounce back.

The qualitative analysis presented in this WIP might also provide additional insight into the findings from our prior

study that followed students who "sunk," "struggled," or "soared" from an initial academic setback in an engineering statics class. More specifically, in future work we will explore if students who sunk or struggled also had lower levels of satisfaction than those who soared.

In future work, we will investigate how the sink-struggle-soar results change when we take satisfaction into account (the fourth research question laid out above). We will also continue to survey students using a modified version of the ARS-30, the RISC-25, and the satisfaction survey. In order to validate the "points fingers" or "points thumbs" pattern reported here, we will conduct interviews with students who fall into the off-diagonal groups to gain a deeper understanding of what they attribute their level of satisfaction to. We are also considering including items from the growth and fixed mindset literature [10] and/or from attribution theory [11] to further investigate the characteristics of the off-diagonal groups. We are conscious, however, of the need to respect the time of our students [12], i.e., to not over survey them, and so these future plans are still being discussed in the research team.

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