The Influence of Environmental Context on Cognitive Performance in High School Students

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Abstract

Academic performance is usually a result of accuracy and the time taken to complete given cognitive tasks. However, these measures do not always represent how students respond when they encounter academically challenging and cognitively demanding tasks (pushing persistence, frustration, specific strategy use, and/or disengagement).This study examined the associations among students' emotional states, perceived task difficulty, self-efficacy beliefs, and performance on cognitive tasks. The study was guided by theories based on stress-management, self-efficacy, and mindset theories. In this study, the associations between task perception and performance were measured. We compared the Pre-Task 1 (growth-mindset) and Pre-Task 2 (fixed-mindset) groups to examine differences in students' experiences of the task. Completion time was not significantly related to any of the emotional or self-efficacy measures, meaning that the hypothesis that more positive cognitive appraisals would lead to faster completion was not supported. However, several strong relationships were found among students' perceptions of difficulty, frustration, task demand, capability, improvement, and feeling stuck. Accuracy was lower among students who reported greater difficulty and frustration, and was higher among students who reported more positive feelings, improvement, ability to figure things out, and capability. The Pre-Task 1 group had higher accuracy and feelings of capability, all while having fewer negative sentiments. The Pre-Task 2 group reported higher perceived difficulty and task demand. These findings suggest that students' experiences with and perceptions of academic challenges can be related to academic performance. The results draw attention to the potential value of learning environments that challenge students while simultaneously allowing them to feel capable of improving and working through difficulty.

Background and Rationale

In today's world, a lot of students across various levels of schooling are going through more documented levels of stress (AIM Youth Mental Health 2025, Bott et. al. 2018). A movement is currently taking place in which student stress is being accounted for in determining and predicting academic achievement. Student stress is caused by a variety of factors, including students' cognitive appraisal, course workload, and peer-to-peer competition (Kaufman et. al. 2016; AIM Youth Mental Health 2025). In the United States, and specifically, in the Bay Area, these factors all culminate during students' high school years (AIM Youth Mental Health 2025, Bott et. al. 2018). Due to the relevance of factors that impact student performance, understanding the true correlation between student emotional regulation and emotional reactivity with academic achievement and performance is crucial. This is also in part due to the increasing relevance of understanding student stress and its factors. Ultimately, understanding student emotional states and their correlation to student academic performance and achievement can help school districts and physicians come together and prevent students from burning out to states that may be medically unsafe and even critical (Li et. al. 2025, Moons et. al. 2017, Schroder 2020).

These are the driving factors that explain why, with this study, we focus on student emotional states and their correlations to student academic performance. (Li et. al. 2024).

While conducting this study, the psychological lenses of stress-management models and mindset models were considered, as well as the concept of “grit” (Lee et. al. 2021). Stress-management models refer to a set of models that have been used to circumnavigate stress-based emotions, whereas mindset models refer to models that hypothesize the impact of mindset on self-realized feelings of capability. The concept of “grit” from an educational standpoint refers to a student’s ability to persevere through unfavorable situations, which this study simulated (further details in the Methodology section). “Grit”, like the field of developmental psychology, is attributed to environmental and genetic conditions (“nurture” vs. “nature”, respectively) (Lee et. al. 2021). In this study, the environmental factors of “grit” were tested.

Additionally, a large proportion of students' academic performance is tied to stress management. Stress has been viewed in today’s world in two different ways: distress and eustress. Distress contributes to the health detriments associated with stress, whereas eustress promotes task completion and performance. Considering the impact that stress and “grit” have on student academic performance, it can be theorized that students are more likely to display “grit” in academic situations when their learning environments exhibit challenging but manageable levels of stress. This allows students to maximize their academic potential and performance, and helps promote the idea of displaying learning environments that reflect eustress and not distress.

Specifically, in this study, the question that was investigated was: how does feeling frustrated vs. feeling hopeful affect student academic performance? When examining this question, students’ experiences were the main factor being considered, leading to the following hypothesis: participants who have a positive cognitive appraisal of self-efficacy will complete these tasks faster, and with greater self-confidence, there will be an association to greater academic performance. As a result of viewing the issue of student academic performance through the lens of cognitive appraisal models and stress-management models, a further research question arose: how do various types of cognitive appraisals within students affect their ability to perform well academically, and how can we possibly address negative cognitive appraisals? To theoretically answer the second research question that was presented, the following hypothesis was presented: participants who are contented and relaxed will complete cognitive tasks better and more efficiently than participants who are frustrated and distressed due to their shortcomings. Building off of these questions, a further aim of the study was uncovered, which was to understand the impact of self-efficacy on academic performance. From this, it was theorized that participants in an environment that diminishes their self-efficacies and self-worth will perform cognitive tasks more erroneously and with more struggle than participants in an environment that promotes their academic abilities.

To sum it up, this study allows us to understand the ties between student mindset (specifically, student frustration vs. no induced student frustration) and academic performance. This study can also possibly allow us to understand mindset-based situations that are ideal to foster learning and wellbeing as opposed to mindset-based situations that are detrimental to student mental health (therefore making them detrimental to student academic performance).

Methodology

Participants

The study received 104 results, with 8 being ineligible due to age-related restrictions, leaving 96 eligible responses. All 96 of the respondents were aged between 13 and 18, and were all from the Bay Area. Out of the 96 respondents, 54 (56.3%) were Asian Indian, 23 (24.0%) were Asian, 11 (11.4%) were White/Caucasian, and 8 (8.3%) were African-American. This study utilized an anonymous set of surveys that mimicked growth-mindset and fixed-mindset environments. Both correspondingly included cognitive pre-tasks of varying levels of difficulty (one being difficult, and the other being simple), followed by similar tasks as the original pre-tasks. To end this study form, a survey at the end of the forms asked questions regarding participants' self-efficacies, as well as about participants' levels of stress while completing the tasks.

Materials/Measures

Pre-Task 1 was a Simple Attention Span Test, and Pre-Task 2 was a Sustained Attention-to-Response Task. The actual task that was administered to all participants was a rendition of the Gonzaga PVT (Psychomotor Vigilance Test). The post-task survey questions were derived from the PSS-4 (Perceived Stress Scale, 4th Edition), GSE-6 (General Self-Efficacy Scale, 6th Edition), GASE (General Academic Self-Efficacy Scale), and RSES (Rosenberg Self-Esteem Scale) scales (which are psychometrics for stress, self-efficacy, and self-confidence).

Procedures

This is an experiment, in which cognitive appraisal (measured through scales of student self-efficacy and stress) will be correlated to student academic performance (measured through time to complete the cognitive tasks).

To start the study form, the following age-based and consent-based questions were asked of participants: "Are you over the age of 13 and under the age of 18?" and "Being under the age of 18, you will need consent from a parent or guardian. Do you have this approval?" Further consent requirements were met, with a page declaring the following: "This page is solely to ensure consent from a parent/guardian. By clicking past this page, you have confirmed that you have received adequate consent from a parent/guardian, and understand that, being under the age of 18, you need this consent".

After this stage, the form transitioned into demographic questions asking participants about their race/ethnicity, and whether they were from the Bay Area or not.

As the study sought to explore the motivational differences between individuals who selected a more challenging option and those who opted for an easier task, participants were given a written description of each task and were assigned their preferred task. The task descriptions were written to differentiate those who intentionally sought a more challenging task from those who preferred an easier task.

The description for Pre-Task 1 (objectively easier option) was as follows: Previous research has consistently classified this version of the cognitive task as highly demanding, requiring sustained attention, rapid decision-making, and exceptional inhibitory control. Historically, only approximately 5% of participants have achieved performance levels that meet the established benchmark for successful completion. As a result, many individuals find this task cognitively challenging, even when they are highly motivated and attentive". For reference, Pre-Task 1 was a Simple Attention Span Test (SAST). Likewise, the description of Pre-Task 2

(objectively harder option) was this: “Previous research has consistently classified this version of the cognitive task as relatively straightforward and well within the capabilities of most participants. Approximately 99% of individuals complete the task with performance that falls within the expected range, as indicated by a green final reaction-time outcome. Consequently, participants generally perform successfully on this task with minimal difficulty”. For reference, Pre-Task 2 was a Sustained Attention to Response Task (SART).

With these descriptions, the intent was to frame participants’ minds into believing that they were taking part in an easy task (that was actually difficult) or were taking part in a difficult task (that was actually simple). This was to manipulate participants’ mindsets going into the pre-task selection process. To confirm pre-task selection was as stated on the form, screenshots of the completed pre-task were collected from each participant and stored in a secure file. After the pre-task, participants were to take the real task, which was an online-accessible and simple-to-use replication of the Gonzaga PVT (Psychomotor Vigilance Test).

After completing the task, participants were asked to rate statements meant to accurately deduce their respective levels of self-efficacy and self-confidence as a result of the pre-task tests. The 10 questions on this post-task survey were based on existing self-efficacy and self-confidence scales (referenced in the “Materials/Measures” section). They were slightly modified to induce a more vivid recall of the experience of completing the task by shortening the length of the overall survey. They were also modified to make it easier and more direct for high-school students to answer.

Data Analysis

Finally, to compile data, independent samples (T-tests) were measured, with the grouping variable being the different pre-task selections (either option 1 or option 2). Additionally, correlations between the different measures were analyzed in two separate correlation matrices (one included task completion time, and the other included task accuracy).

Results

The study involved a total of 104 participants. Out of these 104 participants, 8 were null participants, in the sense that they were ineligible to complete the tasks entirely due to consent and age restrictions. From this, 63 participants chose Pre-Task 1 (the Simple Attention Span Test) and 33 participants chose Pre-Task 2 (the Sustained Attention to Response Task), which was objectively more difficult and cognitively-demanding than Pre-Task 1. One participant who chose the Pre-Task 1 track had results that were deemed as “missing” due to technical difficulties. The average accuracy (mean accuracy) for participants under the Pre-Task 1 track was 97.2 percent, and the average accuracy (mean accuracy) for participants under the Pre-Task 2 track was 90.3 percent. The median score for those under the Pre-Task 1 track was 98, whereas the median score for those under the Pre-Task 2 track was 94. There was greater variability amongst those who took the Pre-Task 2 track, as the standard deviation for those under the Pre-Task 2 track was 8.31. The standard deviation for those under the Pre-Task 1 track was 3.65. The minimum score for those who took the Pre-Task 1 and Pre-Task 2 tracks, respectively, was 84 and 68. The high score for those who took the Pre-Task 1 and Pre-Task 2 tracks, respectively, was 100 and 98.

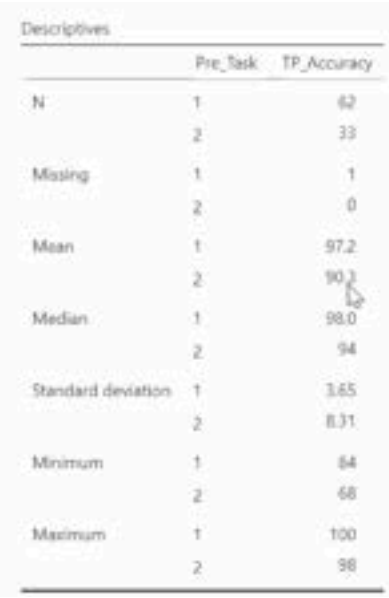
Figures 1 and 2, the correlation matrices between the different Pre-Task groups and the post-task survey results, reveal a lot regarding different learning environments and their impact on students.

Figure 1 finds that there is no statistically significant association between time and any of the post-task survey guidelines. Although there are weak negative correlations between time and difficulty, ability to maintain composure, ability to figure tasks out, and ability to feel capable of doing challenging cognitive tasks, they have no basis due to the lack of statistical significance behind these measures. Additionally, although there are positive correlations between time taken to complete the task and cognitive demand, feelings of frustration, feelings of positivity, the ability to improve in the future, feelings of being stuck, and feelings of negativity, these associations are not statistically significant.

Looking at both matrices, the biggest pattern is that students' feelings about the task were much more closely related to how difficult they thought it was than to how much time they spent on it. Students who rated the task as more difficult were also more likely to report feeling frustrated (r = .831), stuck (r = .806), and that the task was demanding (r = .786). These relationships were some of the strongest in the matrices, showing that difficulty was closely connected to how students felt while working through the task. At the same time, positive experiences tended to go along with feeling like they were making progress. This is seen in a variety of instances, as feeling positive was positively correlated with having the sense of being able to improve (r = .734). Feeling positive was also associated with feeling like you could start figuring things out on your own (r = .687),, while also feeling capable (r = .673). There is also a strong relationship between feeling capable and feeling like you could figure things out (r = .791), and there was a pretty high relationship between feeling capable and not feeling stuck (r = .819). When students felt like they could handle the task, they were also more likely to feel capable of completing the task, and felt more like they could handle the task. Students were also a lot more likely to believe that they could work through problems and make progress, which was critical in helping them complete the task. There was a relationship between accuracy and these factors, but these relationships were not as strong as those between the different feelings and perceptions. Specifically, higher accuracy was associated with lower difficulty (r = -0.423), as well as more frustration (r = -0.398). It was also associated with higher positive feelings (r = 0.323) and feeling capable (r - 0.315). Although these relationships are not as strong, they suggest that students who performed more accurately generally reported somewhat more positive experiences with the task. One of the more interesting results was that time did not really seem to matter.

To sum it up, task accuracy was significantly associated with perceived difficulty ($r = -.423$, $p < .001$), frustration ($r = -.398$, $p < .001$), positive feelings ($r = .323$, $p = .001$), and perceived capability ($r = .315$, $p = .002$). In contrast, task completion time was not significantly associated with any of the post-task survey variables.

Descriptives:



Descriptives

	Pre_Task	TP_Accuracy
N	1	62
	2	33
Missing	1	1
	2	0
Mean	1	97.2
	2	90.1
Median	1	98.0
	2	94
Standard deviation	1	3.65
	2	8.31
Minimum	1	84
	2	68
Maximum	1	100
	2	98

Figures 1 and 2 (Correlation Matrices):
Figure 1:

		TP_ Time	TP_ Difficulty	TP_ Calm	TP_ Demand	TP_ Frustrated	TP_ Positive	TP_Improve	TP_ FigureOut	TP_ Stuck	TP_ Capable	TP_ Negative
TP_ Time	Pearson's r	_										
	df	_										
	p-value	_										
TP_ Difficulty	Pearson's r	-0.188	_									
	df	31	_									
	p-value	0.294	_									

TP_ Calm	Pearson's r	-0.143	0.833	_								
	df	31	94	_								
	p-value	0.426	<0.001	_								
TP_ Demand	Pearson's r	0.271	0.786	0.806	_							
	df	31	94	94	_							
	p-value	0.127	<0.001	<0.001	_							
TP_ Frustrated	Pearson's r	0.079	0.831	0.793	0.773	_						
	df	31	94	94	94	_						
	p-value	0.664	<0.001	<0.001	<0.001	_						
TP_ Positive	Pearson's r	0.023	-0.701	-0.597	-0.699	-0.644	_					
	df	31	94	94	94	94	_					
	p-value	0.898	<0.001	<0.001	<0.001	<0.001	_					

TP_Improve	Pearson's r	0.062	-0.767	-0.767	-0.743	-0.784	0.734	_				
	df	31	94	94	94	94	94	_				
	p-value	0.734	<0.001	<0.001	<0.001	<0.001	<0.001	_				
TP_FigureOut	Pearson's r	-0.102	-0.771	-0.686	-0.757	-0.749	0.687	0.799	_			
	df	31	94	94	94	94	94	94	_			
	p-value	0.573	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_			
TP_Stuck	Pearson's r	0.097	-0.806	-0.804	-0.793	-0.773	0.678	0.769	0.784	_		
	df	31	94	94	94	94	94	94	94	_		
	p-value	0.591	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_		
TP_Capable	Pearson's r	-0.170	-0.746	-0.744	-0.780	-0.751	0.673	0.734	0.791	0.819	_	
	df	31	94	94	94	94	94	94	94	94	_	
	p-value	0.343	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_	

TP_ Negative	Pearson's r	0.022	-0.766	-0.715	-0.703	-0.746	0.684	0.730	0.691	0.782	0.719	_
	df	31	94	94	94	94	94	94	94	94	94	_
	p-value	0.905	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_

Figure 2:

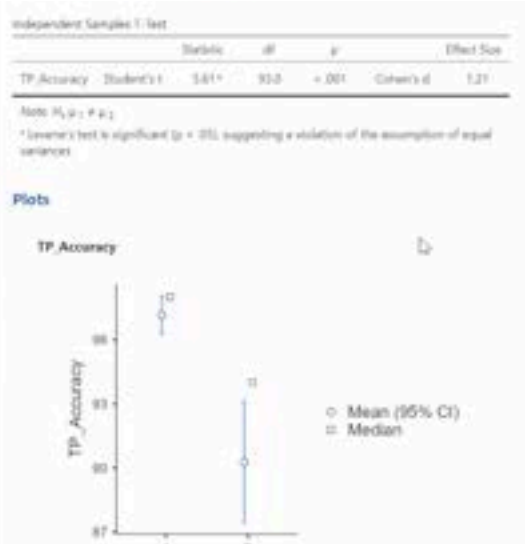
		TP_ Accuracy	TP_ Difficulty	TP_ Calm	TP_ Demand	TP_ Frustrated	TP_ Positive	TP_Improve	TP_ FigureOut	TP_ Stuck	TP_ Capable	TP_ Negative
TP_ Accuracy	Pearson's r	_	-0.423	-0.343	-0.368	-0.398	0.323	0.292	0.260	0.337	0.355	0.321
	df	_	93	93	93	93	93	93	93	93	93	93
	p-value	_	<0.001	<0.001	<0.001	<0.001	0.001	0.004	0.011	0.01	0.01	0.01
TP_ Difficulty	Pearson's r	-0.423	_									
	df	93	_									
	p-value	<0.001	_									
TP_ Calm	Pearson's r	-0.343	0.833	_								

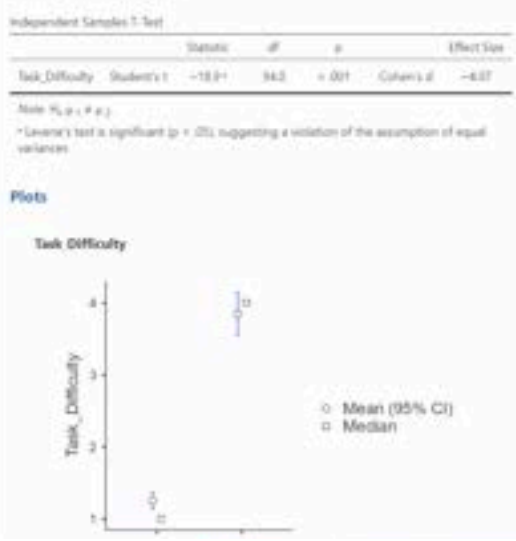
	df	93	94	_								
	p-value	<0.001	<0.001	_								
TP_Demand	Pearson's r	-0.368	0.786	0.806	_							
	df	93	94	94	_							
	p-value	<0.001	<0.001	<0.001	_							
TP_Frustrated	Pearson's r	-0.398	0.831	0.793	0.773	_						
	df	93	94	94	94	_						
	p-value	<0.001	<0.001	<0.001	<0.001	_						
TP_Positive	Pearson's r	0.323	-0.701	-0.597	-0.699	-0.644	_					
	df	93	94	94	94	94	_					
	p-value	0.001	<0.001	<0.001	<0.001	<0.001	_					
TP_Improve	Pearson's r	0.292	-0.767	-0.767	-0.743	-0.784	0.734	_				

	df	93	94	94	94	94	94	_				
	p-value	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	_				
TP_FigureOut	Pearson's r	0.260	-0.771	-0.686	-0.757	-0.749	0.687	0.799	_			
	df	93	94	94	94	94	94	94	_			
	p-value	0.011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_			
TP_Stuck	Pearson's r	0.321	-0.806	-0.804	-0.793	-0.773	0.678	0.769	0.784	_		
	df	93	94	94	94	94	94	94	94	_		
	p-value	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_		
TP_Capable	Pearson's r	0.315	-0.746	-0.744	-0.780	-0.751	0.673	0.734	0.791	0.819	_	
	df	93	94	94	94	94	94	94	94	94	_	
	p-value	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_	
TP_Negative	Pearson's r	0.257	-0.766	-0.715	-0.703	-0.746	0.684	0.730	0.691	0.782	0.719	_

	df	93	94	94	94	94	94	94	94	94	94	_
	p-value	0.012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	_

Figure (Group) 3:





Independent Samples T-Test

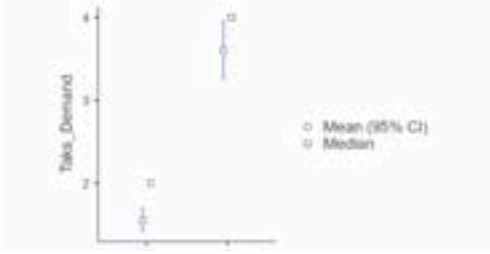
		Statistic	df	p	Effect Size
Taks_Demand	Student's t	-11.2**	88.0	< .001	Cohen's d	-2.83

Note. H_a ($\mu_1 \neq \mu_2$)

* Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Plots

Taks Demand



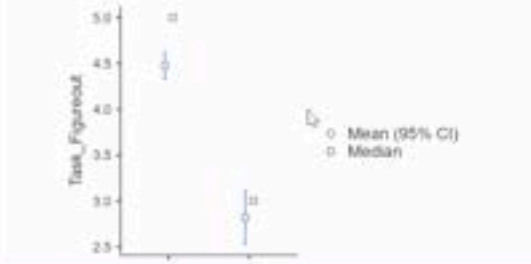
Independent Samples T-Test

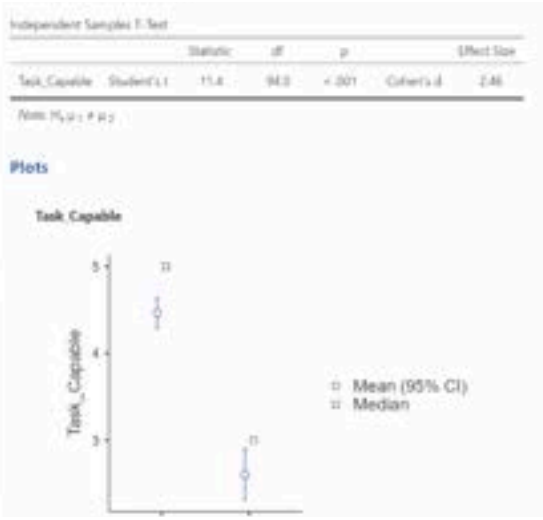
		Statistic	df	p	Effect Size
Task_Figureout	Student's t	11.5	94.0	< .001	Cohen's d	2.46

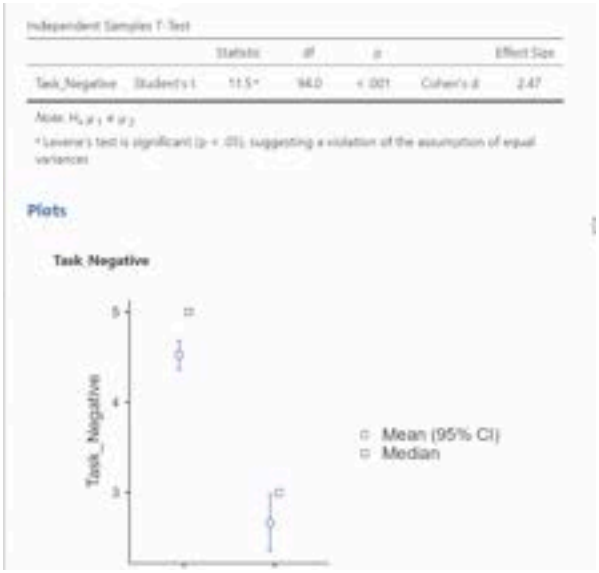
Note. H_a ($\mu_1 \neq \mu_2$)

Plots

Task Figureout







Discussion and Conclusion

To sum it up, the study found that: 1) completion time was not significantly related to the post-task measures, 2) perceived difficulty was strongly related to frustration, feeling stuck, and task demands, 3) self-efficacy/capability was strongly related to positive experiences such as improvement and figuring things out, and 4) accuracy was related to several emotional/cognitive experiences, although these relationships were weaker.

The purpose of this study was to better understand how students' emotional states and mindsets relate to their academic performance and overall experiences while completing cognitive tasks. More specifically, we looked at whether positive cognitive appraisals, lower levels of stress, and stronger feelings of self-efficacy were connected to better performance, including greater accuracy and shorter completion times. The study was also based on stress-management and mindset theories, and centered around academic grit. The purpose and belief of these respective theories is that students may perform best when facing challenges that are difficult but not overwhelming. This theory is partially supported by the findings of this study. While we did not find a statistically significant relationship between students' emotional states and the amount of time they spent completing the task, we did find strong relationships among several perceptions of the task, including difficulty, frustration, capability, improvement, and feeling stuck.

An extremely apparent finding was that there was not a significant association between time and any of the emotional or self-efficacy-based measures that were collected after the task. There were apparent correlations, yet these correlations were unfortunately not found to be statistically significant. This is seen as students who took longer to complete tasks were also seen to report slightly lower levels of perceived difficulty, calmness, the ability to figure things out, and feelings of capability. Longer completion time was also associated with greater demand, higher frustration, higher positive, and higher negativity all at once. These relationships were intriguing, due to how widespread they were, but they were not statistically significant. The original hypothesis, which predicted that students with more positive cognitive appraisals would complete tasks more quickly, was therefore not supported.

At the same time, this null finding is worth paying attention to rather than simply treating it as an unsuccessful result. It suggests that completion time by itself may not be a particularly strong indicator of how a student experiences a cognitive task. For example, one student could spend a relatively long time on a task because they are carefully working through each step while remaining confident and engaged. Another student might finish quickly but feel frustrated, uncertain, or incapable while doing so. In other words, speed does not necessarily tell us what is happening mentally or emotionally during the learning process.

This finding becomes especially interesting when viewed through self-regulated learning theory. Time management and effective learning are two different things. Students may not accomplish more and perform better simply by spending more time reviewing content for tests and exams, and might do better studying only an hour a day. Study methods are not the same as time spent studying, and that's a crucial difference to understand. More specifically, research involving college students has suggested that time management is better understood as part of a larger self-regulated learning process rather than as an independent predictor of achievement. Similarly, research on problem-based learning has found that students with stronger time-planning and self-monitoring skills were better able to use their study time efficiently and performed better on cognitive tests. This suggests that the way students use their time may matter more than the amount of time itself. Therefore, the lack of a significant relationship between time and emotional state in our study does not necessarily contradict learning theory. Instead, it may point toward a more useful question for future research: not simply how long students work, but what they are doing during that time and how effectively they are using it.

The relationships among students' emotional and cognitive perceptions were much stronger than the relationships involving completion time. Perceived difficulty, in particular, was strongly associated with frustration (r = .831), feeling stuck (r = .806), and perceived task demand (r = .786). These relationships suggest that students did not experience difficulty as an isolated part of the task. Instead, seeing a task as difficult tended to come with several other experiences at the same time. Students who perceived the task as more difficult were also more likely to feel frustrated, stuck, or as though the task placed a high level of demand on them. This pattern fits well with the cognitive appraisal perspective that guided the study. The way students interpret a challenge can shape how they respond to it. If a student sees a difficult task as something they can manage, the challenge may encourage them to keep trying. On the other hand, if the same challenge feels impossible or beyond their abilities, it may lead to frustration, feeling stuck, or eventually disengaging from the task.

The relationships on the more positive side of the students' experiences were also particularly strong. Feeling positive was associated with improvement (r = .734), figuring things out (r = .687), and feeling capable (r = .673). Feeling capable was also strongly related to figuring things out (r = .791) and feeling unstuck (r = .819). These findings help illustrate why self-efficacy may be such an important part of the learning process. Self-efficacy did not appear to be simply a measure of whether students felt confident. Instead, feeling capable was connected to several other parts of the experience, including problem-solving, perceived improvement, and the ability to move past moments of being stuck.

This pattern is generally consistent with previous research on academic self-efficacy. A systematic review of the literature has found a moderate positive relationship between self-efficacy and academic performance, while also emphasizing the roles of effort regulation, learning strategies, and goal orientation. Other meta-analytic research suggests that the relationship between self-efficacy and performance may work in both directions. Students' beliefs about what they are capable of doing can influence later performance, but successful performance can also strengthen their beliefs about their abilities. This possibility is especially relevant to our findings. A student who feels capable may be more willing to continue working when a task becomes difficult. Once they successfully work through that difficulty, the experience may then reinforce their belief that they are capable of handling future challenges. In this way, self-efficacy and performance may form a cycle in which each can strengthen the other.

The results for accuracy provide additional support for this interpretation, although the relationships were not as strong as those found among the emotional variables. Accuracy was negatively associated with perceived difficulty (r = −.423) and frustration (r = −.398), while it was positively associated with positive feelings (r = .323), improvement (r = .292), figuring things out (r = .260), and capability (r = .315). These findings suggest that students' actual performance was connected to how they perceived and experienced the task, but the two were not perfectly aligned. This distinction is important because it shows that academic performance cannot be reduced to one emotional or motivational variable. Feeling confident does not automatically lead to high accuracy, just as getting answers correct does not mean that a student necessarily felt confident throughout the entire task. Instead, performance, motivation, emotions, and self-efficacy appear to interact in more complicated ways.

The group comparisons add another important piece to this picture. Students in the Pre-Task 1 group had significantly higher accuracy, while students in the Pre-Task 2 group reported greater difficulty and higher task demands. The Pre-Task 1 group also reported being better able to figure things out, feeling more capable, and experiencing fewer negative feelings about themselves. Taken together, these differences support the broader argument that the environment surrounding a cognitive task may influence how students understand their own abilities and respond when they encounter difficulty.

These findings also connect to growth-mindset and motivation theories. Students may be more likely to persist when they view difficulty as something that can be worked through and improved with effort, rather than as evidence that they simply do not have the ability to succeed. Research on academic underachievement similarly points to lower competence beliefs, lower autonomous motivation, and weaker mastery goals among students who struggle academically. This reinforces the idea that academic outcomes are not determined by ability alone. The beliefs students hold about their own competence and the reasons they have for continuing to work can also shape how they respond to academic challenges.

Taken together, these differences show that students in the two task groups differed in their performance and reported experiences. Because participants selected their task and the tasks differed in objective difficulty, however, these differences cannot be interpreted as evidence that one type of learning environment caused these outcomes.

The sample also consisted of self-selected Bay Area adolescents, which limits how confidently these findings can be applied to students from different geographic, socioeconomic, cultural, or educational backgrounds. The demographic distribution of the sample was also uneven, so the results should not automatically be assumed to represent all racial or ethnic groups equally.

The lack of a significant relationship involving completion time is another important limitation and finding to consider. Because our original hypothesis specifically predicted that more positive cognitive appraisals would be associated with faster task completion, the results did not support this part of the hypothesis. There are several possible explanations. The task may have been too short or too simple for meaningful differences in completion time to appear. It is also possible that completion time is simply not the best measure of academic performance for the emotional and motivational processes we were interested in studying. Future studies could address this by using longer and more academically realistic tasks, collecting multiple measurements of performance, and looking at more than just how quickly students finish. Measures such as efficiency, accuracy, persistence, and strategy use could provide a much clearer picture of how students actually approach challenging work. Longitudinal research would also be useful because it could help determine how self-efficacy and performance influence one another over time, something that cannot be fully established from a single measurement.

Despite these limitations, the study has several important strengths. One of the biggest is that it brings together several theoretical perspectives rather than treating academic performance as nothing more than the number of correct answers a student produces.

Stress-management theory, cognitive appraisal, self-efficacy, growth mindset, grit, and self-regulated learning each offer a different way of understanding why students respond differently to challenging academic situations. The study also included both objective measures, such as accuracy and completion time, and subjective measures of students' experiences. Having both types of measures allowed us to compare what students actually did with how they felt while doing it. The strong relationships among difficulty, frustration, capability, improvement, and feeling stuck further suggest that these experiences are closely connected and deserve more attention in research on learning.

The findings also have practical implications for schools and educators. Rather than assuming that students will perform better simply because they are given more time, educators may benefit more from creating learning environments in which challenges are difficult but still feel manageable. This idea connects with the study's distinction between distress and eustress. A productive level of challenge can encourage effort, problem-solving, and persistence, while too much difficulty may lead to frustration and lower feelings of competence. This does not mean that teachers should make academic work easier or avoid challenging students. Instead, difficulty may be most productive when students have opportunities to improve, learn from mistakes, and recognize that struggling with something does not automatically mean that they cannot succeed.

This is particularly important because students do not always interpret struggle in the same way. One student might see getting an answer wrong as evidence that they need to change their approach, while another might see the same mistake as evidence that they are simply not good at the subject. Creating an environment that emphasizes improvement and strategy may help students interpret challenges in a more productive way. Motivation theory and self-efficacy research both emphasize the importance of students believing that their actions and effort can make a difference. Research on self-regulated learning interventions also suggests that helping students develop stronger learning strategies can improve both academic performance and motivation, including self-efficacy.

Future research should build on these findings by examining whether deliberately changing the way a task is presented or framed can lead to lasting changes in students' motivation, self-efficacy, stress, and academic performance. Using a larger and more diverse sample would make it easier to determine whether these patterns apply across different groups of students. Random assignment could also provide stronger evidence about whether changes in the learning environment actually cause changes in students' experiences. Researchers could further examine whether these effects vary depending on students' previous academic achievement, age, subject area, or initial level of self-efficacy.

Overall, the findings suggest that students' perceptions of difficulty, capability, and emotional experience were closely related during cognitive task performance, while completion time was not significantly related to these experiences. However, because of the fact that there was self-selection into task groups, and differences in objective task difficulty, the findings should be interpreted as evidence of associations rather than causal effects.

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