

COLLEGE STUDENTS' AUTONOMY, SELF-REGULATION, AND ACADEMIC
SELF-EFFICACY DURING COVID-19

By

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Abstract

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The Coronavirus disease 2019 (COVID-19) forced college students to endure challenges that were unusual in the typical university environment. As self-determination theory, self-regulated learning theory, and social cognitive theory would suggest, college students' need for satisfaction of autonomy and the ability to apply self-regulation may have been neglected due to COVID-related stressors (SDT; Ryan & Deci, 2000; SRLT; Zimmerman, 2012; SCT; Bandura, 2005). College students from a university ($N = 94$) participated in an online survey regarding their autonomy, self-regulated learning abilities, academic self-efficacy, and COVID-related stress. Using a moderated mediation model, the current study predicted that self-regulated learning would mediate the relationship between college students' autonomy and academic self-efficacy (H1). For moderation, the relationship between autonomy and academic self-efficacy was expected to depend on the level of students' COVID-related stress (H2). Within the mediation, this study found that autonomy predicted self-regulated learning (H1A), self-regulated learning predicted academic self-efficacy (H1B), and autonomy predicted academic self-efficacy (H1C). For this moderated mediation, the results indicated partial support of the

study's hypotheses: H1 was supported, but not H2. As seen through the findings within this study, as well as supported by previous literature, autonomy support is a vital component of student's academic success. College instructors play a crucial role in providing autonomy and self-regulation support to their students. When students feel autonomous, they can apply the necessary skills of self-regulation to achieve academic self-efficacy.

Keywords: autonomy, self-regulation, COVID-related stress, academic self-efficacy

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Introduction

Ryan and Deci's (2000) theory of self-determination specifies three needs that impact students' academic performance: autonomy, relatedness, and competence.

Because of a need for relatedness (an innate desire to feel supported and connected to others), validation from a student's school, peers, and instructors is linked to a greater likelihood of achieving academic goals (DeRossett et al., 2021). Yet amidst a pandemic, some students struggle to satisfy these three needs, manifesting in difficulties such as maintaining control over their lives and staying motivated to complete academic goals (DeRossett et al., 2021). When the novel coronavirus (COVID-19) swept across the globe at the beginning of 2020, everyone was negatively impacted in one way or another (Chandra, 2020). During the past few years, vaccines were implemented to prevent further spread of COVID-19, and a sense of reassurance has comforted some individuals (Gee et al., 2021). In December of 2020, COVID-19 vaccines were approved by the Emergency Use Authorization (EUA) of the Food and Drug Administration (FDA) and have since been used to provide safety measures for the public (Gee et al., 2021). Nonetheless, students have faced challenges in learning during the COVID-19 pandemic.

Online learning is not a new concept, and for some college students, it provides a flexible option for them to attain their education, yet many students and instructors reported challenges with this modality as they were forced into Emergency Remote Teaching through Online Learning (ERT-OL) during the pandemic (Schwam et al., 2020). For some students, online learning does not offer a useful platform to fully understand and engage with course material (Schwam et al., 2020). Student inequities

became immediately apparent as college students transitioned into online learning in 2020 (Bono et al., 2020; Schwam et al., 2020). Not every student had access to a computer and internet connection, especially those who were low-income or living in rural areas (Ezra et al., 2021). Now, three years after the initial COVID outbreak, most college campuses require faculty members and students to be fully vaccinated to return to in-person learning (Greenhalgh et al., 2021). With this, campuses have also provided available COVID-19 testing, and in the situation where COVID-19 cases do rise again, professors must be able to adapt to a shift back to online learning (Greenhalgh et al., 2021). With many changes being made throughout education systems, college students of all ages have faced unfamiliar circumstances in their learning environments (Ezra et al., 2021). With many students eager to return to in-person learning, COVID-19 has caused limitations not only on physical learning environments but also on one's overall well-being and academic success (Raaper & Brown, 2020). Individuals continue to deal with the aftermath of stressors due to the COVID-19 pandemic.

As Bono et al. (2020) further suggest, students with lower socioeconomic status may have an increase in stress along with a lower sense of well-being during the pandemic. As these challenges impact college students' academic performance, it is important to recognize the differences in accessibility between in-person learning before the pandemic and online learning during the pandemic. Typically, for a college student to thrive in an in-person classroom, they must implement the self-regulatory skills of time management, goal planning, self-monitoring, and evaluation, yet online learning has placed even more pressure on students to apply these skills during a time of increased

stress and uncertainty (Schwam et al., 2020). Although students have mostly returned to in-person learning at this time, online learning continues to be an option for many. As a result, the purpose of this study is to further understand college students' academic motivation and self-regulatory strategies and the relationship between their level of autonomy and COVID-related stress during the ongoing COVID-19 pandemic.

Self-Determination Theory

Broken down into three distinctive needs, self-determination consists of autonomy, relatedness, and competence. Autonomy is the sense of control one has over their life. Competence is one's motivation to accomplish their goals and be successful, and relatedness is the desire for belonging. These basic psychological needs are associated with indicators of well-being such as self-esteem, safety, strength, and growth (Ryan & Deci, 2000). If basic psychological needs are met, an individual will likely have a more positive outlook on life (Stanley et al., 2021). During times when expectations are high, and pressure is heavy, students often face more difficulty in their academic and personal environment when their needs are not met (Chandra et al., 2020).

Gilbert et al. (2021) examined psychological distress in students by employing self-determination theory. Through observations of peer relationships, techniques used by instructors, and overall academic experiences, they found that peer relationships are essential for college students to meet their need for relatedness (Gilbert et al., 2021). One's culture, living environment, parental roles, and outside relationships are important factors that affect students' academic success (Chandra, 2020). Challenges such as job loss, loved ones dying from COVID-19, and lack of community resources will likely

impact the mindset of a college student and their overall performance. Due to the unpredictable nature of COVID-19, each of these factors may contribute to a decrease in the satisfaction of one's basic psychological needs. Students should be supported by their university and have a sense of community (Gilbert et al., 2021). Yet during the height of the COVID-19 pandemic, students' fulfilment of the need for relatedness may have been disrupted. Their need for autonomy could have also been affected as many COVID-19 related difficulties were out of one's control. This may have left students feeling distraught and helpless as they witnessed the detrimental outcomes of COVID-19 affect their loved ones, neighbors, or even themselves. As a result of additional stressors which affect students' basic psychological needs, many students require additional mental health support and other types of support, but may not receive the services they need (Son et al., 2020). Shanahan et al. (2020) found that previous emotional distress is correlated with COVID-related stress, which may further exacerbate one's ability to manage their stress. As students are placed in an online learning environment that may be unfamiliar to them, it is important to recognize how their sense of control, or autonomy will impact their academic success.

Autonomy

As self-determination theory highlights the three basic psychological needs, one need in particular has vital implications for determining academic success in an online course (Lee et al., 2015). Autonomy predicts a student's academic performance through the sense of control they feel they have over their own actions and environment (Rotter, 1954, as cited in Lee et al., 2015). In an online learning environment, a sense of

autonomy and the ability to remain motivated may play a larger role in students' academic performance. Motivation is a main aspect within self-determination theory, especially in regard to the need for autonomy (Ryan & Deci, 2000). Through the satisfaction of basic psychological needs, individuals can feel motivated from within as well as from external stimuli, which in turn can promote a better wellbeing (Ryan & Deci, 2000). For students living with roommates or with children of their own or among students who have limited access to online technology, the ability to control their learning environment is restricted (Ezra et al., 2021). Literature suggests that some students may also have a general lack of awareness of their own autonomy (Henri et al., 2018). Students who have limited self-awareness may show a reduction or no difference in their academic motivation and self-efficacy (Henri et al., 2018).

Although more research is needed to determine how self-awareness impacts college students' autonomy, it is apparent that when students are given the opportunity to control their learning environment through autonomous projects and assignments, there is an increase in their ability to achieve academic self-efficacy (Henri et al., 2018). The forced shift to online learning during the pandemic may have made it more difficult for some students to recognize how to create a structured learning environment or know when they need extra support (Fazey & Fazey 2001; Henri et al., 2018; Macaskill & Denovan 2013). Holzer et al. (2021) observed whether or not college students' basic psychological needs were being met during the COVID-19 pandemic, and it was found that college students' autonomy and self-regulation were positively related to a natural desire to be successful in school (Holzer et al., 2021). The findings within this study

suggest the relevance of motivation to promote fulfilment of basic psychological needs, such as autonomy (Holzer et al., 2021). Further, the findings highlight the importance of providing supportive learning environments to promote autonomy in college students (Holzer et al., 2021).

There are several ways autonomy can be fostered by college instructors, staff, and the institution. When professors show support and encourage their students, students are more likely to apply autonomy to their academics (Lee et al., 2015; Ryan & Deci, 2000). Previous research has suggested that when students are provided resources such as autonomy-based workshops, self-reflection and skill-building exercises, and student-centered learning environments, their confidence and self-evaluation skills improve (Henri et al., 2018; Macaskill & Denovan, 2013). Further, when professors show support and encourage their students, students are more likely to apply autonomy to their academics (Lee et al., 2015; Ryan & Deci, 2000).

Self-Regulated Learning Theory

Autonomy is important for a student to succeed, and it goes hand in hand with their ability to take the initiative to reach their educational goals. Self-regulated learning theory outlines the implementation of metacognition that allows an individual to monitor their personal goals and better understand how to attain them (Zimmerman, 2012). Metacognition is one's ability to recognize the cognitive processing of their own thoughts (Efklides, 2013). There are quite a few self-regulation strategies, and when students apply them to their academics, they are often met with success (Wolters, 2010). Self-regulation can be broken down into three phases: forethought, performance, and self-reflection

(Sasai, 2017). The forethought phase includes the planning and orientation of one's goals. The performance phase consists of identifying one's abilities and overall evaluation of oneself. Last, the self-reflection phase allows an individual to recognize their strengths and weaknesses, and plan the next steps to reach their goal (Efklides, 2013). In the context of education, students must be able to know when and how to apply metacognition to each phase of self-regulation to reach their academic goals (Efklides, 2013). Students also must set realistic goals for themselves by understanding their limitations and skills to ensure the correct steps are taken to succeed (Stone, 2000).

Because students in an online environment have more responsibility over their own learning, procrastination is a potential risk when self-regulated skills are not applied (Pelikan et al., 2021). The process of evaluating one's expectations and performance is known as calibration (Stone, 2000). Some individuals may have high expectations for themselves, yet their subsequent performance reflects low-level results (Stone, 2000). When an individual has poor calibration, it can diminish their ability to employ self-regulation strategies because their expectations and performance reflect two different outcomes (Stone, 2000). Poor calibration may be the result of people overestimating their own capabilities. However, because self-regulation leads to recognizing both one's strengths and weaknesses, individuals high in self-regulation often experience a match between their accomplishments and expectations, resulting in an increase in their ability to set realistic goals for themselves (Stone, 2000). Individual characteristics such as one's confidence, self-concept, level of expertise, goal structure, and processing time, are

important to consider when understanding how to monitor one's self-regulation and calibration (Stone, 2000).

As Hong et al. (2021) noted, students' individual qualities and skills impact their academic outcomes. Hong et al. (2021) also found that students with high levels of self-regulated online learning experienced positive learning outcomes. Students who procrastinated had lower levels of self-regulated online learning (Hong et al., 2021). As this process can be emotional, students with lower self-regulation may be confused as to why they are not succeeding, resulting in more negative attitudes about themselves than their higher-achieving peers. It is important for an individual to know their limitations and also challenge themselves to apply self-regulatory strategies and see positive results (Stone, 2000). Through the application of self-regulation strategies and achieving their goals, students can increase their academic self-efficacy.

Social Cognitive Theory

Social cognitive theory considers the multiple factors that influence learning and goal attainment. It recognizes that learning happens in a social context with complex interactions between a person and their environment. At the core of social-cognitive theory are self-efficacy beliefs, or beliefs surrounding one's confidence and capacity to engage in behaviors that support the achievement of one's goals (Bandura, 2005). In the setting of COVID-19 and online learning, college students' academic self-efficacy influences their educational goal achievement. COVID-19 has significantly impacted college student's self-efficacy and their ability to apply self-regulated learning (Cui, 2021). For students with high self-regulation, academic self-efficacy was achieved

through the implementation of goal orientations and the use of their school's resources (Cui, 2021). Further, in order for students to maximize self-efficacy, Shin and Bolkan (2020) argued that instructors play a role in helping students meet their academic needs and accomplish their academic goals. Instructors who were encouraging and inspiring, aided in their students' academic achievement of self-efficacy (Shin & Bolkan, 2020). Instructors can have a strong influence on their students, especially when they promote positivity and incorporate engaging teaching styles (Shin & Bolkan, 2020). When instructors provide clear expectations, as well as thought-provoking opportunities, students' basic psychological needs are supported (Shin & Bolkan, 2020). This is beneficial to students as it provides them with the ability to apply what they have learned inside and outside a classroom (Shin & Bolkan, 2020).

No one student or individual is the same. Everyone experienced COVID-19 lockdowns differently, yet online platforms introduced during the beginning stages of the pandemic continue to be an option for many. For those learning online or working from home, it is crucial to identify equity factors that have impacted their learning and academic outcomes (Ezra et al., 2021). One's socioeconomic status, and life at home will influence a student's ability to learn online, and as some students have more responsibilities at home than others, it is important to consider how online interactions may be less accessible for some students (Ezra et al., 2021). Online learning outcomes may be restricted for some students as they face technological difficulties, missing crucial opportunities to learn (Ezra et al., 2021). Because of this, students with limited resources will likely not achieve academic self-efficacy compared to their privileged peers (Ezra et

al., 2021). Students who were able to regulate their emotions, particularly negative emotions, were able to apply positive, adaptive coping strategies (Cattelino et al., 2021). Adaption is required to succeed in an online learning environment, and some students face substantial barriers that may result in poor academic achievement (Bono et al., 2020; Schwam et al., 2020). As the pandemic continues, efforts to support and encourage academic-self efficacy for college students is essential.

COVID-Related Stress

COVID-related stress is the level of discomfort, fear, trauma, and intrusive thoughts that occur as a consequence of the COVID-19 pandemic (Taylor et al., 2020). COVID-related stress has been prevalent among college students and has also been tied to how students experience academic belonging and academic self-efficacy (DeRossett et al., 2021). Further, such stressors that are present because of the COVID-19 pandemic will likely affect students' mental health (Son et al., 2020). As a result of COVID-related stress, college students have faced a multitude of challenges, many resulting from the switch to online learning (Son et al., 2020). Some COVID-related stressors that have impacted college students include but are not limited to, disruptions in their typical sleep patterns; high concern for the health of their close friends and family; social isolation; poor academic performance; insufficient eating patterns; heavy class workloads; depressive and suicidal thoughts; lack of coping skills and sense of autonomy; limited support from others; and difficulty seeking professional help (Son et al., 2020).

Many students have experienced high anxiety as a direct outcome of the COVID-19 pandemic, which has negatively impacted their academic self-efficacy (Alemany-

Arrebola et al., 2020). As described by Ryan and Deci (2000), relatedness is a key component for strengthening an individual's confidence to develop a secure sense of self. Because of this, it is important for instructors and universities to ensure their students feel a sense of belonging, along with providing self-regulatory training for students to improve their skills (Dörrenbächer & Perels, 2016). Students with high perceptions of their self-regulated learning abilities are more likely to be conscientious, open, less neurotic, and have lower levels of test anxiety (Dörrenbächer & Perels, 2016). Marler et al. (2020) found that students who felt supported experienced enhanced psychological well-being, which in turn encouraged greater engagement in learning. Unfortunately, not all students have felt supported or have an increased awareness of their self-regulation skills. With this, many students learning during the pandemic have experienced a decrease in well-being due to COVID-related challenges (Marler et al., 2021).

As COVID-related stress persists worldwide, there is no telling how long COVID-19 will remain a pandemic and threat to society (Ye et al., 2020). With this, we can expect to find a surplus of individuals facing difficulties during and after the pandemic. Many students are still experiencing online learning or a mix of online and in-person learning, and some may continue to face difficulties with limited resources at times (Hodges et al., 2020, as cited in Ezra et al., 2021). Because the COVID-19 pandemic will continue to have an impact on today's students, it is important to consider the unique needs of each student during online learning and provide equitable opportunities for all. Precautionary strategies of on-site testing and required vaccines have been implemented on many college campuses (Gee et al., 2021; Greenhalgh et al.,

2021). Yet the return to in-person learning has come with additional challenges for returning or new students. As students adjust to navigating their way back to in-person learning, it is necessary to provide useful resources and support. Considering the many effects of COVID-19, training instructors on how to implement workshops to promote autonomy and self-regulation within their students would be beneficial.

The Current Study

The typical college experience has changed due as a result of the COVID-19 pandemic. Related to academics, the online learning environment has affected college students' academic self-efficacy and academic performance. Examining whether college students' needs for autonomy are being met and if they feel in control of their life will help us further understand the relationship between autonomy and academic self-efficacy. The purpose of this study is to apply the theories of motivation and self-regulated learning to an online learning environment during COVID-19 to assess college students' academic self-efficacy and autonomy. Through the implementation of a survey design, students answered questions about their experience of online learning during the pandemic and their transition back into in-person learning or continued learning in an online or hy-flex environment.

This study primarily focused on the basic psychological need for autonomy as outlined by self-determination theory (Ryan & Deci, 2000) and its relationship to academic self-efficacy, as understood through self-regulated learning. Another important variable in understanding these relationships is COVID-related stress, as this will impact a student's self-control and academic self-efficacy. The current study hypothesized the

relationship between autonomy and academic self-efficacy as a moderated mediation model. This study predicted that college students' self-regulated learning skills would mediate the relationship between autonomy and academic self-efficacy. As this study takes place during the pandemic, college students' COVID-related stress was expected to serve as a moderating variable between this relationship. Individuals around the globe were impacted by COVID-19 and the unpredictable challenges that occurred simultaneously. College students in particular may have faced further difficulties with meeting their need for autonomy as their sense of control was limited given the COVID-19 pandemic. Along with this, because of the strain on students' autonomy due to COVID-related stressors, students would likely feel less motivated to be successful within their academic environment. It was expected that greater autonomy reported by college students would predict greater academic self-efficacy through the use of self-regulated learning skills. However, due to the pandemic and COVID-related stress, students who have limited access to necessary resources to improve their autonomy may not reach the same level of academic self-efficacy or be able to apply self-regulated learning skills as effectively as their peers. As the pandemic continues to affect students' learning abilities, this study aimed to discover what students need to feel autonomous enough to apply self-regulatory strategies and be successful in college.

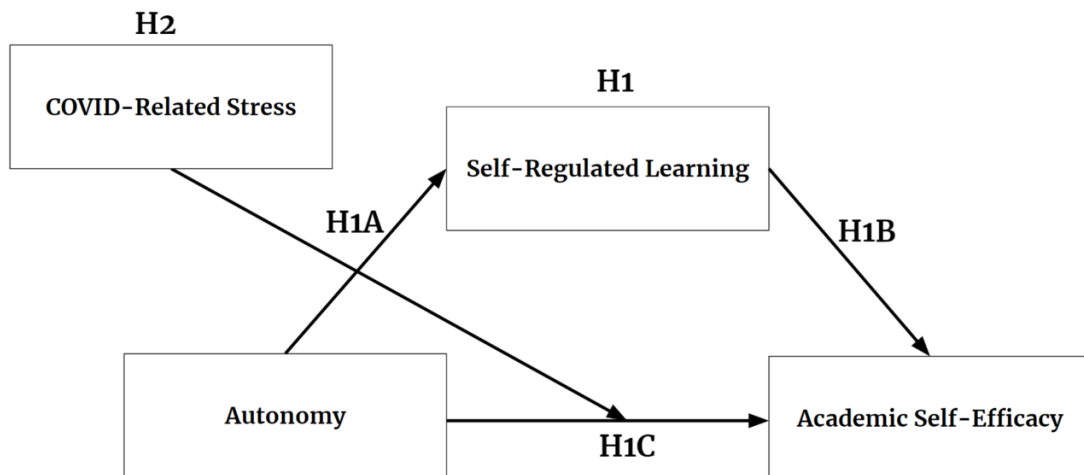
Hypotheses

The proposed study had two hypotheses pertaining to a moderated mediation relationship between the predictor variable, autonomy, and the outcome variable, academic self-efficacy (see Figure 1). First, self-regulated learning was expected to

mediate the relationship between college students' autonomy and academic self-efficacy (H^1). Within this mediation model, autonomy was expected to predict self-regulated learning (H^{1A}), self-regulated learning was expected to predict academic self-efficacy (H^{1B}), and autonomy was expected to predict academic self-efficacy (H^{1C}). For moderation, the relationship between autonomy and academic self-efficacy was expected to depend on the level of students' COVID-related stress (H^2). At high levels of COVID-related stress, college students' levels of autonomy were expected to be less related to academic self-efficacy (H^{2A}). At low levels of COVID-related stress, college students' autonomy was expected to more strongly predict academic self-efficacy (H^{2B}).

Figure 1

Moderated Mediation Model



Method

Participants

To participate in this study, students were required to be at least 18 years of age or older, provide their informed consent, and have experience in at least one online course during the COVID-19 pandemic (Spring 2020-Spring 2023). Participants identified as 49.5% White, 31.6% Latinx, 2.1% Black, 2.1% Asian, 2.1% Native American, and 12.6% two or more ethnicities. The majority of participants (71%) identified as cisgender female/woman, 14% identified as cisgender male/man, 10.8% identified as genderqueer, gender non-binary, or gender fluid, and 4.3% chose more than one of the above gender identities. The average age of participants was 22.6 ($SD = 7.2$) years, with a range from 18 years to 60 years.

Participants who identified as undergraduate, graduate, and post-baccalaureate students enrolled as part-time or full-time at Cal Poly Humboldt were included in this study. According to Cal Poly Humboldt (2021), for both undergraduate and post-baccalaureate students to be considered part-time, they must be taking anywhere between 6-11.99 units. To be deemed full-time, students must be enrolled in 12 or more units (Cal Poly Humboldt, 2021). Graduate students at Cal Poly Humboldt must be registered for 9 or more units to be considered full-time and between 5-8.99 units to be part-time students (Cal Poly Humboldt, 2021). In the current study, 18.1% of participants were freshpersons, 10.6% were sophomores, 41.5% were juniors, 27.7% were seniors, and 2.1% were post-baccalaureate or graduate students.

Design and Procedure

This cross-sectional online study used a self-report survey administered via Qualtrics. The survey was made accessible to students during the Spring 2023 semester, and it took approximately 25 minutes for students to complete it. Participants were recruited from the Cal Poly Humboldt Psychology Department's research participation pool, SONA systems. In addition to being posted on the SONA website, Cal Poly Humboldt instructors across departments were sent emails enclosed with a request to share the study with their students through means of in-person or online announcements. The emails included details about the study along with a brief solicitation for the study (see Appendix H). To further increase the sample size of this study, fliers advertising the study were posted in various locations on campus. Along with this, the Psychology Department's social media account on Instagram used the same flyer to virtually advertise the study.

Interested participants signed up for the study via SONA, where they were given a link to the Qualtrics study. Questions within this survey assessed students' academic self-efficacy, autonomy in their learning environment, application of self-regulatory skills, and COVID-19's impact on their mental health and learning environment. Prior to beginning the survey, participants were required to complete an informed consent form. The consent form included a brief description of the survey and a checkbox to agree to participate and move forward with the survey (see Appendix F). Once the survey was finished, a debriefing form listing psychological services was provided to participants (see Appendix G). Because topics caused potential discomfort, upon completion of the

survey, students were further provided with information on how to access Cal Poly Humboldt's Counseling and Psychological Services (CAPS). Following the end of the survey, some students received extra credit. Only those enrolled in a psychology course or a course from another department that allowed credit to be given through SONA received such compensation. The Cal Poly Humboldt Institutional Review Board approved this study to conduct research using human subjects (IRB#: IRB 22-053).

Measures

Demographics

Demographic questions were included alongside scales measuring key study variables. Demographic information was obtained using fill-in-the-blank and multiple-choice questions in the online survey. Respondents answered questions regarding their age; gender identity; race/ethnicity; sexual orientation; location (county, state); current living situation; household size; relationship status; employment status; financial aid status; parents' highest level of education (as a proxy for socioeconomic status); transfer student status; first-generation student status; class standing; grade point average (GPA); current major at Cal Poly Humboldt; average number of units taken per semester; and status of involvement on campus (i.e., School clubs, sports, research labs) (see Appendix B for the full survey and demographic questions).

COVID-Related Stress

In order to measure COVID-related stress, which is recognized as the level of fear, trauma, and discomfort due to the COVID-19 pandemic (Taylor et al., 2020), questions were implemented through a survey format. Due to the nature of COVID-19,

over the course of the pandemic, there has been a fluctuation of concern levels around the disease. During the time this study was conducted, which was three years after the height of the pandemic, the scales used to measure COVID-related stress in previous studies were considered outdated. Thus, an author-created scale was used as a new measure for this variable (see Appendix B for the full survey and COVID-related questions). Some questions within this scale were inspired by the COVID-Stress Scales, yet none of the COVID-Stress Scales items were used directly (Taylor et al., 2020). The different items within this scale were used to assess how students' learning platforms were affected by COVID-19, as well as to determine whether or not contracting COVID-19 directly influenced the relationship between college student autonomy and academic self-efficacy.

There were a total of 22 items measuring COVID-related stress. Each item was combined to create a composite variable representing COVID-related stress. Seven items were negatively correlated, so these items were reverse-coded. The COVID-related questions pertained to college students': involvement in an online course during the COVID-19 pandemic; typical learning platforms during the first (March 2020-December 2020), second (January 2021-December 2021) third (January 2022-December 2022), and fourth (January 2023-Present) phase of the COVID-19 pandemic; COVID-related worry; duration of COVID-related worry; vaccination status; concern of their own safety, their loved one's safety, and the safety of strangers in regard to COVID-19; social distancing concerns; mask wearing behavior; level of concern when someone coughs or sneezes near them; preference for in-person classes; preference for online courses; opinion on whether COVID-19 disrupted their learning capabilities; contraction of COVID-19

status; year(s) specification for COVID-19 contraction; experience with COVID-19 and Long COVID; short-term and long-term COVID-19 symptomology. In the current study, this measure of COVID-related stress demonstrated sufficient internal consistency, with a Cronbach's alpha of $\alpha = .76$.

Academic Self-Efficacy

To measure the academic self-efficacy of college students, the College Academic Self-Efficacy Scale (CASES), first created by Owen and Froman (1988), was used. CASES has 33 items and uses a 5-point Likert scale ranging from A (*very little*) to E (*quite a lot*) (Owen & Froman, 1988). Students were asked to rate their level of confidence in academic self-efficacy through statements such as, "Asking a professor in class to review a concept you don't understand" (see Appendix C for the complete list of scale items). In the Owen and Froman (1988) study, internal consistency was .90 and .92 over an eight-week period between two groups of psychology students. In recent research where this scale was used in an Indonesian study, the CASES demonstrated a reliable Cronbach's alpha of, $\alpha = .93$ (Ifdil et al., 2019). The reliability of the CASES measurement within the current study showed excellent internal consistency, $\alpha = .93$.

Self-Regulated Learning

To measure self-regulated learning in college students, the Online Self-Regulated Learning Questionnaire (OSLQ) was implemented in the current study (Barnard et al., 2009). The OSLQ is a 24 item scale that determines the level of applied self-regulation by college students who are learning in an online platform. Through the use of a 5-point Likert scale, scores range from 1 (*strongly disagree*) to 5 (*strongly agree*) (Barnard et al.,

2009). A question from this scale is, “I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the semester)” (see Appendix E for the complete list of scale items). Barnard et al. (2009) collected data from two studies that analyzed college students at a large university in the United States: one group of students were enrolled in a fully online learning platform, and the other group was in a hybrid learning structure. The OSLQ demonstrated satisfactory internal consistency and reliability for both studies with values for Cronbach alpha ranging between .43 to .77 in the first study, and .46 to .84 in the second study (Barnard et al., 2009). In the current study, the reliability of the OSLQ measurement showed satisfactory internal consistency through Cronbach’s alpha, $\alpha = .89$.

Autonomy

To measure autonomy, the e-Learning Autonomy Scale (e-LAS) was used (Firat, 2016). The e-LAS is a 10 item scale that measures students’ responsibilities for their online learning experiences (Firat, 2016). Assessed through a 5-point Likert scale, potential responses vary from 1 (*strongly disagree*) to 5 (*strongly agree*). The following question is an example from this scale, “I control my own learning process” (for the full scale, see Appendix D). In previous research, reliability for the e-LAS showed excellent internal consistency using Cronbach’s alpha, $\alpha = .95$ (First, 2016). In the current study, five items were reverse-coded, and a good internal consistency was reported after all items were averaged, $\alpha = .83$.

Results

Power Analysis

A power analysis was run using the 'modmed14' function in the 'pwr2ppl' package in RStudio to determine the sample size for this study (Aberson, 2021). A total of 250 college students enrolled part-time or full-time at Cal Poly Humboldt were needed to meet the expected power level of .8 and a significance level of .05 (Aberson, 2021). The current study had a collected sample of 95 participants, and a sample of this size would only provide a power of .37. This size did not meet either the expected power or significance level. If the sample size were sufficient to represent the population of interest, the findings within this study would have been considered statistically significant. Given that this study has a small sample, the findings are not generalizable and only represent a very particular sample.

Preliminary Analyses

To analyze the data, the programs R Statistical Software and RStudio were used (Posit team, 2023). The data was downloaded from Qualtrics and launched in RStudio. Skewness, outliers, kurtosis, and other potential problems that would impact the statistical analysis were assessed for. Regression assumptions were tested, and missing data were also accounted for (see Main Analysis). The survey contained three attention-check questions that ensured participants read and answered questions adequately. Each construct variable: autonomy, self-regulated learning, self-efficacy, and COVID-related stress were analyzed to calculate the means, standard deviation, and intercorrelations with other variables. Along with this, the CASES, e-LAS, OSLQ, and COVID measurements

had their reliability assessed to check for internal consistency. This was done through calculating the Cronbach alpha statistic for each scale.

Main Analysis

To complete the statistical analysis and data mutation, R Statistical Software and RStudio were used (Posit team, 2023). The hypothesized moderated mediation variables of student academic self-efficacy, autonomy, online self-regulated learning, and COVID-related stress were tested through the regression path analysis, PROCESS, model 8 (Hayes, 2022). Moderated mediation was used to identify how an indirect effect (mediation) is affected by a moderating variable (Preacher et al., 2007; Regorz, 2020). Model 8 was used to run the analysis as it was the closest model to align with the expected relationships within this study. This model in particular also observes whether the relationship between the predictor and mediator is moderated. There is a limitation with the use of model 8 because the hypotheses in this study did not test this moderated relationship directly. Although an interesting moderation to test for, the model 8 approach may not have been the best model to use within this study. This is because it included an assessment of additional relationships that were not accounted for within either of the hypotheses. Future research should not select a model that observes outside relationships, and rather should find a model that best represents only the hypotheses.

Missing Data

For the purpose of addressing missing data, multiple imputations occurred through the use of the package, Mice. One participant failed to complete the survey, so they were removed from the data. Upon excluding this person, the sample included 94

participants. There were 72 participants who had completed cases, which meant that there were 22 cases that were incomplete. Because of these missing cases, multiple imputation was used. Multiple imputations generated multiple datasets by using different regression weights, or estimates, to create replacement values best fit to represent the data (Aberson, 2022; Regorz, 2022b). Multiple imputations occurred because the sample size of this study was already very small, and eliminating the incomplete cases through means of listwise deletion would have reduced the impact of the already underpowered study.

The multiple imputations method is broken down into three phases: imputation of the data, regression analysis with the imputed dataset, and pooling of the data (Aberson, 2022; Regorz, 2022b). During the imputation period, 30 imputed datasets were created (the standard is 20), and 10 iterations (the standard is 10) were run (Aberson, 2022; Regorz, 2022b). Upon the completion of multiple imputations, five random data sets were selected to review whether assumptions of regression were met. After visually assessing the datasets through the use of plots (e.g., residuals-versus-fitted, normal Q-Q, scale-location, etc.), each set appeared to meet the assumptions, which meant it was appropriate to use for further analyses.

Regression Assumptions

The model 8 analysis for moderated mediation includes a function to bootstrap the data, but it does not address regression assumptions or issues such as outliers or missing observations (Regorz, 2020). With this in mind, the data prior to the moderated mediation analysis was important to review. To address these assumptions in greater detail, one of

the multiple imputed datasets was selected to run different tests to further check the regression assumptions.

A multiple regression was run using the outcome variable, academic self-efficacy, predicted by the predictor variable, autonomy; mediating variable, online self-regulated learning; and moderating variable, COVID-related stress. The normality of residuals was assessed visually through a normal Q-Q plot, as well as through the evaluation of the variables' skew and kurtosis levels. The skewness of academic self-efficacy had an almost perfect symmetry (0.02), with kurtosis (-0.03) indicating a normal distribution. The student autonomy kurtosis (0.95) and skewness were also nearly symmetrical, but there was a slight negative skew (-0.18). Online self-regulated learning showed mostly symmetrical distribution with kurtosis (0.35), but there were some outliers causing a slight positive skew (0.45). The COVID variable showed a nearly symmetrical distribution with a slight positive skew (0.40) and kurtosis (-0.18). Despite each variable's confidence intervals falling in the range of normal distribution, issues remained with outliers, so to address this issue, transformations on the variables were run. Yet after running square root, log, and inverse transformations, the multivariate outliers remained an issue, and after rechecking the assumptions for these variables, they were not significantly improved. As a result, the *untransformed* variables were used in this analysis.

The data was additionally observed using a residuals-versus-fitted plot, and this met the assumption of linearity. To address the assumption of homoscedasticity, a visual inspection of the scale-location plot showed that the data were homoscedastic. To ensure

this assumption was met, a Breusch-Pagan test was conducted. The Breusch-Pagan results showed that there was not enough evidence to detect heteroscedasticity within the data, therefore rejecting the null hypothesis of heteroscedastic data, as the data was homoscedastic ($BP = 1.4, p = .24$). The assumption of absence of multicollinearity within the data was addressed through the use of variance inflation factor (VIF) and tolerance. As suggested by literature in regard to regression, VIF values greater than five and tolerance values less than .20 have possible implications of multicollinearity (Marcoulides & Raykov, 2019). In the current study, both the VIF and tolerance values did not indicate signs of multicollinearity; therefore the assumption of the absence of multicollinearity was met. As mentioned earlier, multivariate outliers were an issue before and after transformations. These outliers were visible through the residuals-versus-leverage plot to view Cook's distance. Because of this, Mahalanobis distance was calculated, and it was determined that the multivariate outliers did not pose a threat to the data ($p = .001$).

Hypothesis Testing

The PROCESS moderated mediation analysis-based regression model was used to test the study hypotheses (Hayes, 2022). This test was the most appropriate for this study and helped determine the relationship between each variable within the moderated mediation design. Due to the small sample size, the current study did not include control variables. The moderated mediation analysis, model 8, is structured to identify how the direct effect (c' path) and the indirect path (ab path), as well as the relationship between the predictor and mediator (a path), are moderated (Regorz, 2021). The index of

moderated mediation within this analysis was used to identify whether or not the moderating variable had an impact on both the indirect and direct effects. If there is a significant index, then that means there is a moderated mediation (Regorz, 2021). See Table 1 below for the full results of the mediation analysis, see Table 2 for the full results of the moderated mediation analysis, and see Appendix A for the results of the moderated mediation (Regorz, 2022a) .

Hypothesis 1

In this study, it was hypothesized that self-regulated learning would mediate the relationship between college students' autonomy and their academic self-efficacy (*ab* path). The moderated mediated analysis primarily provides information on how the moderator impacts the *a*, *b*, *c*, *c'*, and *ab* paths, but this analysis does not provide information on whether the mediation (*ab* path) is significant without a moderator. Given this limitation, a mediation analysis via lavaan was conducted to determine the individual significance of the *ab* path (H1). The analysis determined that the hypothesized relationship between students' autonomy and academic self-efficacy was significantly explained by self-regulated learning with 95% CIs [.02, .31].

Hypothesis 1a

Within the mediation design, the study hypothesized that autonomy would predict self-regulated learning (*a* path). This relationship was determined to be statistically significant in both the mediation ($b = 0.13, p = .001$) and moderated mediation ($b = 0.09, p < .001$) analysis, supporting the hypothesis.

Hypothesis 1b

It was hypothesized that self-regulated learning would predict academic self-efficacy (*b* path). Both the mediation ($b = 0.13, p = .02$) and the moderated mediation ($b = 0.12, p = .005$) analysis determined there was a significant relationship between these two variables, which supported the hypothesis.

Hypothesis 1c

This study hypothesized that autonomy would predict academic self-efficacy. There was a significant total effect (*c* path) from autonomy to academic self-efficacy in both the mediation ($b = 0.15, p = .001$) and the moderated mediation ($b = 0.12, p = .001$) analysis, supporting the hypothesis.

Table 1

Mediation Results, Path Estimates, and Standard Errors

Variable	<i>a</i>	<i>s_a</i>	<i>b</i>	<i>s_b</i>	<i>c</i>	<i>s_c</i>	<i>c'</i>	<i>s_{c'}</i>	<i>ab</i>	<i>s_{ab}</i>	95% CI
Effect of: Predicting M from the IV <i>OSLQ & eLAS (a)</i>	.44**	.13									[.20, .71]
Effect of: Predicting DV from the M <i>CASES & OSLQ (b)</i>			.30*	.13							[.07, .57]
Total effect: Predicting DV from the IV <i>CASES & eLAS (c)</i>					.52**	.15					[.24, .83]
Direct effect: Predicting DV from IV via M <i>CASES & eLAS, OSLQ (c')</i>							.39*	.17			[.08, .72]
Indirect effect: <i>c-c' (ab)</i>									.13	.08	[.02, .31]

Note. *N* = 94. DV & CASES = Academic Self-Efficacy; IV & eLAS = Autonomy; M & OSLQ = Self-Regulated Learning. COVID-Related Stress is not included in this mediation table.

* indicates *p* < .05. ** indicates *p* < .01.

Hypothesis 2

In the moderated mediation, it was predicted that high levels of COVID-related stress would predict student's autonomy to be less related to their academic self-efficacy (H^{2A}), and low levels of COVID-related stress would cause students' autonomy to be more strongly predictive of their academic self-efficacy (H^{2B}). It was determined that there was not a significant effect from the moderator, COVID-related stress ($b = -0.02$), 95% BootCIs [-0.27, 0.31] on the direct and indirect effect of autonomy predicting academic self-efficacy through self-regulated learning. As a result, there was not a moderated mediation with these variables.

Table 2

Regression results for the a-path from eLAS to OSLQ and for the b/c'-path from OSLQ to CASES (b) and eLAS to CASES (c')

Variable	Model a-path			Model b/c' path		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
eLAS	0.43	0.10	< .001**	0.39	0.11	.001**
COVID	-0.30	0.1	.07	0.10	0.17	.54
eLAS x COVID	-0.07	0.30	.82	0.13	0.30	.67
OSLQ				0.31	0.11	.001**

Note. $N = 94$. CASES= Academic Self-Efficacy; eLAS = Autonomy; OSLQ = Self-Regulated Learning; COVID = COVID-Related Stress.

The model for the a-path $R^2 = .2119$, $F(3,90) = 8.0641$, $p < .001$. The model for b-path and c'-path $R^2 = .2871$, $F(4, 89) = 8.9618$, $p < .001$.

* indicates $p < .05$. ** indicates $p < .01$

Discussion

This study investigated the relationship between the need for autonomy and academic self-efficacy, as understood through self-regulated learning, while also considering the role of COVID-related stress. The moderated mediation hypotheses within this study were partially supported. The results supported each branch within the first hypothesis (H1, H^{1A}, H^{1B}, and H^{1C}). College students' autonomy in an online environment predicted students' online self-regulation (*a* path). Online self-regulation predicted academic self-efficacy (*b* path), and students' level of autonomy in an online learning environment predicted students' academic self-efficacy (*c* path). The relationship between these students' online autonomy and academic self-efficacy was mediated by students' online self-regulated learning abilities (*ab* path).

The current study also hypothesized that COVID-related stress would moderate the relationship between students' autonomy in an online environment and academic self-efficacy. This hypothesis was not supported as the data analysis determined a moderated mediation did not occur (H2, H^{2A}, H^{2B}). The relationship between students' autonomy in an online learning environment and academic self-efficacy did not depend on COVID-related stress.

Literature Application to Study Results

As seen within the current study, self-regulation and academic self-efficacy were significantly related. These two variables have been found to have a similar relationship in the literature (Duchatelet & Donche, 2018; van Dinther et al., 2011). Earlier literature suggests that this relationship may be a result of students' abilities to apply self-

regulatory strategies to create, maintain, and achieve their academic goals (Cui, 2021). Through the application of self-regulation, students have learned how to enhance their academic self-efficacy to succeed in school (Cui, 2021). Similar research findings suggest that students who apply self-regulation and self-efficacy strategies experience greater improvements in their academic environments (Tynjälä, 2008).

The hypothesized relationship that autonomy would predict self-regulated learning was supported in the current study. As noted in the literature, autonomy is a critical part of one's identity, and it is also an important predecessor to self-regulation (Valenzuela et al., 2020). Autonomy is a stepping stone for self-regulatory strategies such as time management, goal planning, and setting realistic expectations for oneself (Valenzuela et al., 2020).

Importantly, one must be aware of their autonomy in order to see positive effects on self-regulation and self-efficacy. Because autonomy deals with an individual's core identity along with a sense of control in their life, teachers are in an ideal position to support and bring attention to students' autonomy. The literature supports the importance of teachers promoting autonomous-based learning and self-regulatory skill-building for students in both online and in-person classrooms. In fact, autonomy support has been suggested to be most useful for students when it comes directly from a teacher (Oriol-Granado, 2017). Autonomy support from a teacher is linked to increased academic engagement, which leads to a number of positive academic outcomes for students (Oriol-Granado, 2017).

Given that the current study found COVID-related stress to be a nonsignificant moderator, it is possible that students may not have felt threatened by the pandemic at the time the survey was completed, which was three years into the COVID-19 pandemic. Alternatively, the relationship between autonomy support and self-efficacy could have been so strong that COVID-related stress did not have an impact on this relationship. It is possible that instructors at this university were skilled at encouraging autonomy, as well as teaching self-regulation skills within their classroom(s). Future research is needed to test these ideas.

Limitations

It is important to consider the many limitations of this study. One of the largest limitations was the size of the sample ($N = 94$), which led to statistical analyses being underpowered. If this study had a sufficient sample size, several covariates would have been measured including students' format of learning, total number of enrolled units, age, SES, race/ethnicity, gender, and student class status.

Even though no covariates were included in the moderated mediation analysis, the researcher did notice characteristics of the participants which may indicate this is a select sample of students. For example, on average, participants in the study took a high number (15) of units each semester. This is considered full-time for undergraduate, graduate, and post-baccalaureate students (Cal Poly Humboldt, 2021). The participants in this study had a GPA range between 1.8 to 4.0, with the average being 3.27 ($SD = .56$). Considering the above-average number of units and GPA, this sample may have consisted of a high proportion of motivated students who were more dedicated to their

studies than the typical college student. We must consider that the findings reflect a select sample and may not generalize to the broader population of students at the university or all college students.

In terms of methodology, the design of this survey was cross-sectional, which makes it difficult to be certain about the directionality of relationships. Ideally, students would be followed throughout their college careers and assessed at least yearly to test how variables influence one another over time. Further, the survey was provided through an online platform and used a self-report format which may have introduced bias or other validity issues. Last, because most research on COVID-related stress within the academic environment related to the detrimental effects students faced during the height of the pandemic, an appropriate scale was a challenge to find within the literature. Since COVID is no longer as great of a concern as it was even a year ago, a 22 item COVID-related stress scale was created by the author for this study. The scale had Cronbach's alpha of .76 which showed adequate internal consistency, although exploratory or confirmatory factor analyses were not conducted. Given the timeline of this study, further analyses were not performed, causing another limitation.

Future Directions

Future research should collect longitudinal and qualitative data because both methods have the power to capture unique information that cannot be captured in a survey format or a cross-sectional design. Incorporating different moderating variables, as well as covariates such as demographic variables, would allow for a deeper analysis to occur. Possible moderators for future work may include the variable student class status,

as students face different challenges depending on how long they have been at their university. Particularly, future research should investigate differences between students beginning their academic careers (freshpersons and sophomores) and more advanced students (juniors and seniors), as well as transfer students who are new to the university. Considering how freshpersons and sophomores spent the last few years taking high school courses in an isolated format during the height of the pandemic, they may be facing challenges that are completely different than students who started college prior to the pandemic. On the other hand, some juniors and seniors may have taken a few years off from college during the height of the pandemic for possible reasons such as lack of resources or difficulty concentrating in an online format. Either way, this variable could shine light on the kinds of resources students may need to get back on track to meet their academic goals.

Moreover, addressing moderating variables such as student class status can help identify which students need extra support from their professors, peers, or the university as a whole. At colleges nationwide, including Cal Poly Humboldt, homelessness and housing insecurity are major issues for continuing and incoming students. These concerns have been heightened during Cal Poly Humboldt's recent transition to a polytechnic university (Linton & Delany, 2023). Creating a moderating variable exploring the impact of basic needs like homelessness or housing insecurity on students' autonomy, self-regulation, and academic self-efficacy is an important next step. Numerous students faced challenges with limited resources during the height of the pandemic, which negatively affected their academic self-efficacy compared to peers who had their basic needs met

(Ezra et al., 2021). More research is needed as a greater proportion of students experience extenuating challenges to persisting and thriving in higher education.

Implications

The current study adds to the literature on college students' autonomy, self-regulated learning strategies, academic self-efficacy, and COVID-related stress in a changing world. Although much research has been collected pertaining to academic self-efficacy, autonomy, and self-regulation individually, studies observing the relationship between these three variables, especially with mediation, have been limited. The literature that does exist is consistent with the findings in the current study. With autonomy acting as the key to self-determination, this can be thought of as the first step to applying self-regulation, with academic self-efficacy as the final step where students develop the confidence and skills to achieve their educational goals. This pathway has important implications in higher education and also points to the importance of college instructors providing autonomous and self-regulatory strategies to students.

Conclusion

This study applied theories of motivation and self-regulated learning to an online learning environment during COVID-19 to assess college students' academic self-efficacy and autonomy. There was support for a full mediation in which autonomy predicted academic self-efficacy through self-regulation. A moderated mediation analysis was used to identify how the moderator, COVID-related stress, impacted the indirect and direct effects within the mediation analysis. However, there was no evidence to support this hypothesis. Overall, the findings provide pertinent information for the literature

addressing self-determination, self-regulation, and social-cognitive theory, as well as students' capabilities to pursue their college degrees post a global pandemic.

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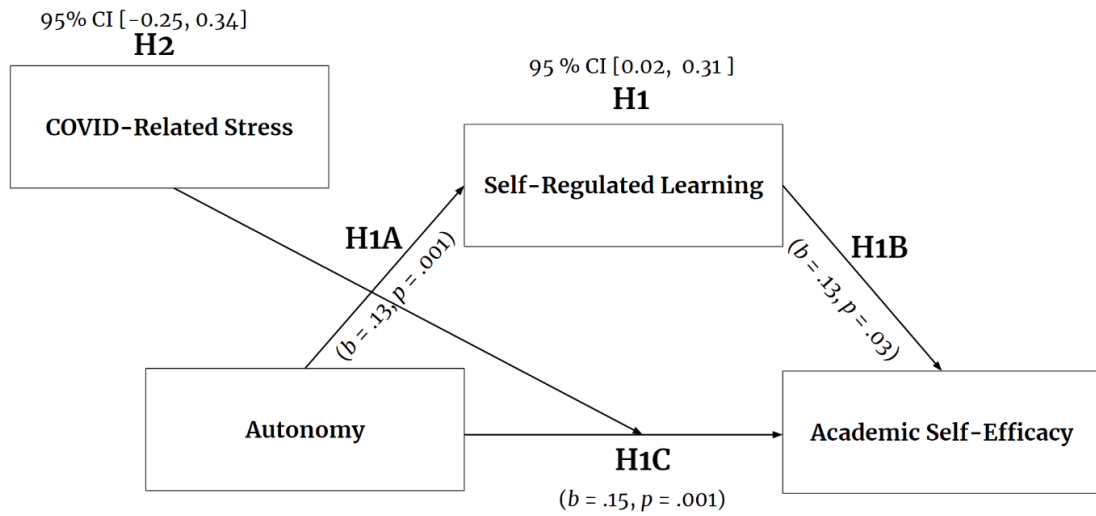
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Appendices

Appendix A: Hypotheses Model and Pathway Significance



Appendix B: Qualtrics Survey

1. How old are you?

2. What is your gender? Please select all that apply.

- Cisgender male/man
 - Cisgender female/woman
 - Genderqueer, gender non-binary, gender-fluid
 - Transgender female/woman
 - Transgender male/man
 - Prefer to self-describe
-

3. What racial/ethnic group do you identify as? Please select all that apply.

- Native American
 - Black/African American
 - White (Not Hispanic)
 - Pacific Islander
 - Asian
 - Hispanic
 - Prefer to self-describe
-

4. What is your sexual orientation?

- Asexual
 - Bisexual
 - Gay
 - Lesbian
 - Heterosexual
 - Pansexual
 - Queer
 - Prefer to self-describe
-

5. Where do you currently live? (County, and State)

6. What is your living situation?

- I live alone
- I live with a roommate
- I live with multiple roommates (Non-family members)
- I live with my parent/parents

- I live with my sibling/siblings
 - I live with my significant other/partner
 - Other _____
-

7. How many total number of people live in your household?

8. What is your relationship status?

- Single
- In a relationship, but not married
- Married

9. Are you currently employed? Please select all that apply.

- Yes, I work through Cal Poly Humboldt on campus
- Yes, I am self-employed
- Yes, I work as an essential worker (e.g., Nurse, teacher, grocery clerk)
- Yes, I work more than one job
- Yes, I am employed, and am a full-time student
- Yes, I am employed, and am a part-time student
- No, I am not employed, I am a full-time student
- No, I am not employed, I am a part-time student

10. Do you receive financial aid?

- Yes
- No

11. What is the highest level of education your mother or parental guardian has received?

- Less than a High School Diploma
 - High School Diploma
 - Some College but no Degree
 - Associate's Degree
 - Bachelor's Degree
 - Master's Degree
 - Advanced Degree (PhD or MD)
 - Unsure
 - Other _____
-

12. What is the highest level of education your father or parental guardian has received?

- Less than a High School Diploma
- High School Diploma
- Some College but no Degree

- Associate's Degree
 - Bachelor's Degree
 - Master's Degree
 - Advanced Degree (PhD or MD)
 - Unsure
 - Other _____
-

13. Are you a transfer student?

- Yes
- No

14. Do you typically ride your bicycle upside down?

- Yes
- No

15. Are you a first-generation college student? (i.e., You are the first one in your immediate family to go to college).

- Yes
- No
- Unsure

16. What is your class standing?

- Freshperson
- Sophomore
- Junior
- Senior
- Graduate Student
- Post-baccalaureate Student

17. What is your current GPA?

18. What is your current major at Cal Poly Humboldt?

19. What is the number of units you are taking this semester?

20. Are you involved on campus? (e.g., School clubs, sports, research lab).

- Yes, I am
- I am not involved on campus, but I would like to be
- I was involved on campus, but not at the moment
- I have never been involved on campus

- I have no interest in getting involved on campus
21. Have you taken at least one online course during the COVID-19 pandemic (Spring 2020-Spring 2023)?
- Yes
 - No
22. During the first phases of the COVID-19 pandemic (March 2020-December 2020), what was your typical learning environment? Please select all that apply.
- Online (Asynchronous)
 - Online (Synchronous)
 - Hy-flex (Both in-person and online classroom)
 - In-person
23. During the middle phases of the COVID-19 pandemic (January 2021-December 2021), what was your typical learning environment? Please select all that apply.
- Online (Asynchronous)
 - Online (Synchronous)
 - Hy-flex (Both in-person and online classroom)
 - In-person
24. During the last phases of the COVID-19 pandemic (January 2022-December 2022), what was your typical learning environment? Please select all that apply.
- Online (Asynchronous)
 - Online (Synchronous)
 - Hy-flex (Both in-person and online classroom)
 - In-person
25. What is your current learning environment? Please select all that apply.
- Online (Asynchronous)
 - Online (Synchronous)
 - Hy-flex (Both in-person and online classroom)
 - In-person
26. Do you find yourself worried about the COVID-19 virus?
- Yes
 - No
27. If you answered yes to the previous question, how often do you worry about the COVID-19 virus?
- I worry about the virus on a daily basis.
 - I worry about the virus on a weekly basis.
 - I worry about the virus on a monthly basis.

- N/A
28. Are you vaccinated?
- Yes
 - No
29. If you answered yes to the previous question, how many vaccines did you receive?
- 1 vaccine
 - 2 vaccines
 - 3 vaccines
 - 4 or more vaccines
 - N/A
30. Have you gone into outer space recently?
- Yes
 - No
31. Are you concerned for your safety in regard to COVID-19?
- Yes
 - Sometimes
 - Neutral
 - Rarely
 - No
32. Are you concerned for the safety of your loved ones in regard to COVID-19?
- Yes
 - Sometimes
 - Neutral
 - Rarely
 - No
33. Are you concerned for the safety of strangers in regard to COVID-19?
- Yes
 - Sometimes
 - Neutral
 - Rarely
 - No
34. Do you worry about social distancing protocols?
- Yes
 - Sometimes
 - Neutral

- Rarely
 - No
35. Do you wear a mask in-public?
- Yes, always
 - Sometimes
 - Not all the time
 - Rarely
 - No, never
36. Are you concerned for your safety when someone coughs or sneezes near you?
- Yes, always
 - Sometimes
 - Not all the time
 - Rarely
 - No, never
37. Given the current state of the COVID-pandemic, do you prefer taking classes in-person?
- Yes
 - Sometimes
 - Unsure
 - Rarely
 - No
38. Given the current state of the COVID-pandemic, do you prefer taking courses online?
- Yes
 - Sometimes
 - Unsure
 - Rarely
 - No
39. Do you find that the COVID-19 pandemic has disrupted your current learning capabilities?
- Yes
 - No
 - Unsure
40. Have you ever contracted COVID-19?
- Yes
 - No
 - N/A, I have never been tested for COVID-19

41. If yes, what year did you contract COVID-19? Please select all that apply.
- 2020
 - 2021
 - 2022
 - 2023
 - N/A, I have never contracted COVID-19
 - N/A, I have never been tested for COVID-19
42. COVID-19 and "Long COVID" can cause detrimental health effects that persist for extended periods of time (e.g., several weeks or months). Have you experienced any long-term symptoms from COVID-19?
- Yes, I have contracted COVID-19, but I no longer feel any symptoms
 - Yes, I currently have symptoms of Long COVID
 - No, I have never contracted COVID-19
 - No, I have never been tested for COVID-19
43. Have you experienced short-term or long-term COVID-19 symptomatology that has affected your memory capabilities, caused fatigue, brain fog, or difficulties concentrating? Please select all that apply.
- Yes, I have contracted COVID-19, and experienced short-term effects
 - Yes, I have contracted COVID-19, and experienced long-term effects
 - Yes, poor memory capabilities
 - Yes, fatigue that disrupts my daily life
 - Yes, difficulties concentrating (i.e., Brain fog)
 - Yes, joint or muscle pain
 - Yes, sleep problems
 - No, I have never contracted COVID-19
 - No, I have never been tested for COVID-19
44. Do you prefer wearing your shoes backwards?
- Yes
 - No

Appendix C: College Academic Self-Efficacy Scale

(1) A = Very little	(2) B =	(3) C =	(4) D =	(5) E = Quite a lot
	Confidence			

(CASES; Ifdil et al., 2019; Owens et al., 1988)

The statements below ask about your academic experiences in college courses, along with your efforts outside of the classroom to maintain on track for attaining academic success. Please rate each question according to the scale above.

1. Taking well-organized notes during a lecture.
2. Participating in a class discussion,
3. Answering a question in a large class.
4. Answering a question in a small class.
5. Taking “objective” tests (multiple-choice, T-F, matching).
6. Taking essay tests.
7. Writing a high-quality term paper.
8. Listening carefully during a lecture on a difficult topic.
9. Tutoring another student.
10. Explaining a concept to another student.
11. Asking a professor in class to review a concept you don’t understand.
12. Earning good marks in most courses.
13. Studying enough to understand the content thoroughly.
14. Running for student government office.
15. Participating in extracurricular events (sports, clubs).
16. Making professors respect you.
17. Attending class regularly.
18. Attending class consistently in a dull course.
19. Making a professor think you’re paying attention in class.
20. Understanding most ideas you read in your texts.
21. Understanding most ideas presented in class.
22. Performing simple math computations.
23. Using a computer.
24. Mastering most content in a math course.
25. Talking to a professor privately to get to know him or her.
26. Relating course content to material in other courses.
27. Challenging a professor’s opinion in class.
28. Applying lecture content to a laboratory session.
29. Making good use of the library.

30. Getting good grades.
31. Spreading out studying instead of cramming.
32. Understanding difficult passages in textbooks.
33. Mastering content in a course you're not interested in.

Appendix D: e-Learning Autonomy Scale

1 = Strongly disagree	2 = Disagree	3 = Neutral	4 = Agree	5 = Strongly agree
--------------------------	-----------------	----------------	--------------	-----------------------

(e-LAS; Firat, 2016)

The listed statements are used to understand your level of autonomy (control over oneself) in an online learning environment. Please answer the questions by using the corresponding scale shown above.

1. I plan my own learning experiences.
2. I don't evaluate my own studies.
3. I don't arrange environment for myself.
4. I track my learning performance.
5. I don't take responsibility for my decision.
6. I control my own learning process.
7. I set my own learning strategy.
8. I don't determine my own learning needs.
9. Decisions do not belong to me.
10. I determine my own learning goals.

Appendix E: Online Self-Regulated Learning Questionnaire

1 = Strongly disagree	2 = Disagree	3 = Neutral	4 = Agree	5 = Strongly agree
--------------------------	-----------------	----------------	--------------	-----------------------

(OSLQ; Barnard et al., 2009)

Through the different stages of self-regulated learning, the following statements ask you about your experiences in both online and/or hybrid learning formats. Please answer these questions by using the scale above.

Goal Setting

1. I set standards for my assignments in online courses.
2. I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the semester).
3. I keep a high standard for my learning in my online courses.
4. I set goals to help me manage studying time for my online courses.
5. I don't compromise the quality of my work because it is online.

Environmental Structuring

6. I choose the location where I study to avoid too much distraction.
7. I find a comfortable place to study.
8. I know where I can study most efficiently for online courses.
9. I choose a time with few distractions for studying for my online courses.

Task Strategies

10. I try to take more thorough notes for my online courses because notes are even more important for learning online than in a regular classroom.
11. I read aloud instructional materials posted online to fight against distractions.
12. I prepare my questions before joining in the chat room and discussion.

13. I work extra problems in my online courses in addition to the assigned ones to master the course content.

Time Management

14. I allocate extra studying time for my online courses because I know it is time-demanding.

15. I try to schedule the same time everyday or every week to study for my online courses, and I observe the schedule.

16. Although we don't have to attend daily classes, I still try to distribute my studying time evenly across days.

Help-Seeking

17. I find someone who is knowledgeable in course content so that I can consult with him or her when I need help.

18. I share my problems with my classmates online so we know what we are struggling with and how to solve our problems.

19. If needed, I try to meet my classmates face-to-face.

20. I am persistent in getting help from the instructor through e-mail.

Self-Evaluation

21. I summarize my learning in online courses to examine my understanding of what I have learned.

22. I ask myself a lot of questions about the course material when studying for an online course.

23. I communicate with my classmates to find out how I am doing in my online classes.

24. I communicate with my classmates to find out what I am learning that is different from what they are learning.

Appendix F: Consent Form**CONSENT AS RESEARCH PARTICIPANT**

College Students' Academic Experiences During COVID-19
Department of Psychology, Cal Poly Humboldt

Contact: Maddy Jo Avila (MaddyJo.Avila@humboldt.edu)

My name is Maddy Jo Avila, and I am a graduate student researcher at Cal Poly Humboldt in the Department of Psychology. I am conducting research to examine the connection between autonomy, self-regulation, COVID-19 related stressors, and academic self-efficacy in college students at Cal Poly Humboldt. To qualify as a participant, you must be at least age 18 or older and currently be enrolled as either a part-time or full-time student at Cal Poly Humboldt. You will be asked to complete a one-time 25-minute survey that will be facilitated through the online survey platform, Qualtrics.

Your participation is completely voluntary. At any point you can refuse or withdraw your participation in this study. If you decide to participate, or not participate in this study, your association with Cal Poly Humboldt will not be jeopardized. Some questions in this survey may cause discomfort in relation to COVID-19, autonomy, self-regulation, and academic self-efficacy. You can choose to not answer a question if discomfort arises. As a Cal Poly Humboldt student your email address will be used to access the survey in SONA, but your responses will remain confidential. It is anticipated that the study results will be shared with the public through presentations and/or publications. Information collected for this study is to remain completely anonymous and cannot be linked back to you. Survey data will be stored in the online survey platform Qualtrics (see more information at qualtrics.com). Although Qualtrics does not record emails, they do keep track of IP addresses. Regardless, IP address information will not be linked to your individual responses. Additionally, all data files used for data analyses will exclude IP addresses to further protect your anonymity. The anonymous data obtained will be maintained on a Google shared drive and may be used for future research studies or distributed to another investigator for future research studies without additional informed consent from you. Five years after this study is completed, the data and this consent form will be destroyed. In regard to compensation, participation in this study may provide you with an extra-credit opportunity in an eligible psychology course. Your responses will benefit this research as we aim to understand more about what college students need to feel successful in college. If applicable, extra-credit through a participating course in SONA will be your compensation once you have completed the survey. In order to receive any compensation the survey must be completed. If your instructor does not offer extra-credit through SONA, you will not be compensated.

Additionally, if you know any Cal Poly Humboldt students who may be interested in participating in this study through SONA please share <https://hsupool.sona->

systems.com/default.aspx?p_return_experiment_id=258. Please do not share your personal responses to the survey with anyone until they have completed the

survey themselves. We ask this because previous knowledge of the survey questions may discredit the results.

If you have questions about this research at any point in time, please email me at (MaddyJo.Avila@humboldt.edu) or contact the faculty advisor, Dr. Brandilynn Villarreal (Brandilynn.Villarreal@humboldt.edu). If you have any concerns or questions about your right as a human subject and participant in this study, please email the Institutional Review Board for the Protection of Human Subjects at irb@humboldt.edu or call (707) 826-5165. They will be able to answer your questions.

Your participation in this study indicates that you are at least 18 years old, have read and understood the information provided above, that you willingly agree to participate, and that you may withdraw your consent at any time and discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

For future reference, please print out this informed consent form. If you agree to participate in this online survey, please check the box below to begin. Thank you for your contribution to research.

- I have read and understood the consent information and agree to participate in this study.

- I do not consent to participate in this study.

Appendix G: Debriefing Document**Debriefing Document**

College Students' Academic Experiences During COVID-19

Contact: Maddy Jo Avila (MaddyJo.Avila@humboldt.edu)

Department of Psychology, Cal Poly Humboldt

Thank you for your participation in this study on college student autonomy and self-regulation during the COVID-19 pandemic. This survey identified how autonomy, COVID-related stress, and self-regulatory strategies are related to college students' academic self-efficacy. Your participation in this study has granted us further understanding of what students need to achieve their academic goals to be successful in college.

Considering the possible stressors within this study, we understand that you may request to speak with someone. Therefore we are providing you with the contact information for Cal Poly Humboldt's Counseling and Psychological Services (CAPS). In case of emergency, please call Humboldt County Mental Health at (707) 445-7715, or dial 911. If there is an immediate safety risk, you should always call 911 as the police can offer the fastest and best assistance.

CAPS receptionists are available Monday through Friday during the academic year¹. MWF hours are 8:45am-12:00pm and 1:00pm-4:15pm. TTh hours are 9:45am-12:00pm and 1:00pm-4:15pm. CAPS is available by phone at (707) 826-3236 and via email (hsucaps@humboldt.edu). CAPS is available for services (individual therapy, consultations, crisis services, and groups) MWF 8:45am-5:00pm, and TTh from 9:45am-5:00pm. If urgent care is required, a 24/7 CAPS therapist is available through the main phone line, as mentioned above. Additional information is available at (<https://counseling.humboldt.edu/>)

If you have any questions please contact the researcher, Maddy Jo Avila (MaddyJo.Avila@humboldt.edu) or the faculty advisor Dr. Brandilynn Villarreal (Brandilynn.Villarreal@humboldt.edu).

Thank you for your participation in this study, your contribution to research is valued.

Kindly,

Maddy Jo Avila

Academic Research Graduate Student

Department of Psychology

Cal Poly Humboldt

¹CAPS office is closed during academic holidays and breaks. Urgent help is still available through the main phone line. In case of emergency, please call Humboldt County Mental Health at (707) 445-7715, or dial 911.

Appendix H: Advertisement Script

Email and Classroom Study Announcement Script

College Students' Academic Experiences During COVID-19

Contact: Maddy Jo Avila (MaddyJo.Avila@humboldt.edu)

Department of Psychology, Cal Poly Humboldt

Maddy Jo Avila, a graduate student in the Department of Psychology at Cal Poly Humboldt is currently recruiting participants for her study on College Students' Academic Experiences During COVID-19. This study examines how college students' autonomy, self-regulated learning, and COVID-related stress relate to their academic self-efficacy while learning in an online environment during the COVID-19 pandemic.

To be eligible to participate in this study, you must be age of 18 or older, have taken at least one online course during the COVID-19 pandemic, and currently be enrolled as either a part-time or full-time student at Cal Poly Humboldt. Participating in this voluntary research consists of completing a one-time online survey that is estimated to take 25 minutes to complete. If you are interested in participating, please log into SONA using your Humboldt email and complete the survey **College Students' Academic Experiences During COVID-19**.

Extra credit compensation may be given upon the completion of this survey, but only if your instructor allows research participation through SONA as an extra credit opportunity. Otherwise, you will not receive any compensation upon the completion of this survey.

Please contact the principal investigator Maddy Jo Avila (MaddyJo.Avila@humboldt.edu) if you have any questions. Thank you for your time!

SONA Link: https://hsupool.sona-systems.com/default.aspx?p_return_experiment_id=258