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# Disposition to critical thinking, anxiety due to COVID-19 and academic self-efficacy in university students

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**Introduction:** The present study aims to determine whether anxiety due to COVID-19 (AC) and disposition to critical thinking (DCT) predict academic self-efficacy (AS).

**Method:** The study is non-experimental, predictive, and cross-sectional. The sample was made up of 218 university students from northern Peru. The instruments used were the CAS, CTDS, and the EAPESA.

**Results:** The results showed that the AS was negatively and positively related to AC and DCT, respectively. AS in university students was significantly predicted by DCT ( $p < 0.01$ ), while AC was not a significant predictor ( $p > 0.05$ ).

**Conclusion:** DCT is a significant predictor of AS, while AC is not. Strategies must be sought to improve and support this important aspect in each student to improve their disposition to critical thinking and academic self-efficacy. It is recommended for future studies to continue investigating variables associated with academic factors, such as those in this study, that lead to taking action for the effective development of university students.

## KEYWORDS

anxiety, COVID-19, disposition to critical thinking, academic self-efficacy, university students

## Introduction

Academic self-efficacy is a construct that has been taken with greater interest in recent descriptive and correlational studies (Grijalva-Quiñonez et al., 2020; Gun et al., 2020; Rosales-Ronquillo and Hernández-Jáquez, 2020; Valle et al., 2020; Zysberg and Schwabsky, 2021; Jamshaid et al., 2023; Khan, 2023). It refers to the belief that a student can successfully achieve academic goals (Bandura, 1993; Elias and MacDonald, 2007). This self-efficacy increases the student's self-regulation strategies of the actions necessary to achieve this goal and, likewise, the sense of responsibility and importance in the face of academic tasks (Lee et al., 2020), which leads the student to make an effort to fulfill their duties (Arcoverde et al., 2022).

Following the emergence of a health emergency in the city of Wuhan (China) on December 31, 2019 (Organización Mundial de la Salud [OMS], 2020), the COVID-19 anxiety variable was coined, defined as the set of cognitive, psychological, emotional, and behavioral manifestations of anxiety produced by the information and social context experienced by Sars-cov2 (Lee, 2020). This anxiety was negatively related to coping with COVID-19 and general health (Yildirim et al., 2021), depression, and panic buying (Shabahang et al., 2021), eating disorders (Scharmer et al., 2020) and psychological distress (Albery et al., 2021).

The university population presented anxiety figures during the pandemic: China (Chi et al., 2021), Colombia (Suarez et al., 2021), and Peru (Sanz et al., 2020), influencing various areas of their academic training (Mok, 2022). This worrying situation regarding the mental health of university students has repercussions even in post-pandemic times (Heumann et al., 2023; Jamshaid et al., 2023). The presence of negative emotions due to the influence of COVID-19, including anxiety, decreases levels of academic self-efficacy (Alemany-Arrebola et al., 2020).

On the other hand, critical thinking is one of the elements that make up the highest level of thinking (Zohar, 2006) and promotes students' academic performance (Ren et al., 2020). Its teaching is a priority in contemporary educational systems (Aderoncle-Acosta et al., 2020) and is within the expected profile of a university student (Cangalaya Sevillano, 2020; Schendel et al., 2023). However, when discussing critical thinking, it must be mentioned that it has two dimensions: ability and disposition. The first involves a mental process of analysis, interpretation, and evaluation, which includes reasoning, skills, and emotions to solve problems and make decisions (Ennis, 1985; Guerci de Siufi, 2008; Richards et al., 2020). The second dimension can be understood as the attitude (motivation) to think critically about a given context (Halpern, 1998; Hernández et al., 2015).

Concerning the first dimension, it has been found that it is a determining factor for aspects related to academic training and professional quality. It promotes academic performance (Nasution et al., 2023) and investigative competence (Chen et al., 2020) and is related to the improvement of academic writing (Teng and Yue, 2023). According to studies, some didactic strategies favor the development of critical thinking: the discussion of case reflection based on the Graham Gibbs cycle (Ardian et al., 2019), display of arguments (Ngajie et al., 2020), team-based learning (Silberman et al., 2020) and reflection in teaching (Xie et al., 2020; Fandiño Parra et al., 2021). It has been shown, speaking of its second dimension, that it is a factor that is directly and positively related to the participation and commitment of university students in academic activities (Álvarez-Huerta et al., 2023) and with learning styles (Behzadi and Momennasab, 2023). In addition, parenting style is related (Huang et al., 2015; Wang et al., 2020) and learning motivation (Oh et al., 2021). Disposition to critical thinking predicts decision-making ability in primary school students (Karahana et al., 2023) as well as their academic performance (Liu et al., 2023). The disposition to critical thinking had a positive effect on creative self-efficacy in high school students (Qiang et al., 2020), self-efficacy in research in university students (Odaci and Erzen, 2021), and the self-efficacy of teachers (Arce-Saavedra and Blumen, 2022).

Mood has been shown to influence critical thinking skills (Lun et al., 2023). However, according to the literature review, there is a scarcity of studies that evaluate the variables related to the dimension of disposition to critical thinking in university students, and none that relate this variable with academic self-efficacy and anxiety due to COVID-19. Given this, Fandiño Parra et al. (2021) point out that there is a research gap about this specific dimension of critical thinking.

Therefore, this article aims to determine if the disposition to critical thinking and anxiety about COVID-19 predict the academic self-efficacy of university students in northern Peru. In this way, the importance of the study lies in the fact that it aims to fill the gap in knowledge regarding the study of the disposition to critical thinking in university teaching by associating it with variables currently in

force. This work will contribute to the field of education by demonstrating that two emotional variables (anxiety about COVID-19 and disposition to critical thinking) influence academic self-efficacy.

## Method

The study design is quantitative, non-experimental, predictive, and cross-sectional (Ato et al., 2013).

The data were collected from three universities in northern Peru. Non-probabilistic convenience sampling was followed at the researcher's intention, making a total of 218 university students from different majors who met the criterion of being over 18 years of age. The majority of the participants were women (59.2%), between 18 and 24 years of age (81.2%), and in the fifth year of their respective careers (36.7%), see Table 1. The survey was created using Google Forms software and shared via email and WhatsApp.

It was approved by the Ethics Committee of the Universidad Peruana Unión, Peru (Approval certificate number 2021-CE-EPG-000061), following the guidelines of the 1964 Helsinki Declaration. Respondents were informed about the study's objective, voluntary participation, benefits, risks, confidentiality, and data privacy.

The following instruments were used:

*Critical Thinking Disposition Scale (CTDS)*: This scale was developed by Sosu (2013) and validated in Spain by Bravo et al. (2020). It consists of 11 directly quantifiable items on a Likert scale with 5 response options (1 = strongly disagree and 5 = strongly agree). It has been used in studies related to higher education (Escolà-Gascón et al., 2021; Álvarez-Huerta et al., 2023). It has good reliability ( $\alpha = 0.840$ ), according to (Hair et al., 2014), and adequate psychometric properties

TABLE 1 Sociodemographic information.

(n = 218)		Frequency	%
Sex	Female	129	59.2%
	Male	89	40.8%
Age	From 18 to 24 years	177	81.2%
	From 25 to 34 years	33	15.1%
	From 35 to 44 years	8	3.7%
	Administration and accounting	78	35.8%
	Health Sciences	44	20.2%
	Law and Political Sciences	12	5.5%
	Education and Communication Sciences	18	8.3%
	Faculty of Business	1	0.5%
	Faculty of Physical Sciences and Mathematics	1	0.5%
	Faculty of Social Sciences	4	1.8%
	Engineering and Architecture	60	27.5%
Year of study currently completed	First year	22	10.1%
	Second year	47	21.6%
	Third year	37	17.0%
	Fourth year	32	14.7%
	Fifth year	80	36.7%

(CFI=0.976), considered an acceptable fit index for the model (Bentler and Bonett, 1980).

**COVID-19 anxiety scale:** The version validated in Peru of the COVID-19 anxiety scale was used (Caycho-Rodríguez et al., 2020), prepared by Lee (2020) to measure the frequency of physiological symptoms (cognition, emotions, and attitudes) of anxiety generated by thoughts and information related to COVID-19 perceived during the last two weeks. It consists of 5 items on a Likert scale (0 = not at all and 5 = almost every day during the last two weeks). The scale has a very high reliability ( $\alpha = 0.89$ ) and presented factor loadings greater than 0.68 and an acceptable fit index that supports the unifactorial structure of the scale (CFI=0.99).

**Perceived self-efficacy scale specific to academic situations (EAPESA):** The Perceived Self-Efficacy Scale Specific to Academic Situations (EAPESA) prepared by Palenzuela (1983) and validated by Dominguez Lara (2018) was used. It is a unidimensional instrument with 9 items and a scale with four response options. It has been used in various studies in the area of education (Dominguez-Lara and Fernández-Arata, 2019; Arias-Chávez et al., 2020; Burgos-Torre and Salas-Blas, 2020; Tumino et al., 2020). The scale has high reliability ( $\alpha = 0.89$ ). The instrument's items have acceptable factor loadings greater than 0.58.

Once the instruments were applied, the data were entered into the Statistical Package for the Social Sciences (SPSS, version 27.0). Descriptive statistics were extracted (frequency, M=Mean, SD=Standard Deviation, A=Asymmetry Coefficient, K=Kurtosis Coefficient), see Table 2. After this, a preliminary correlation analysis was carried out between the 3 variables using the Pearson correlation coefficient, as is typical before performing a regression analysis (Cohen, 1968); see Table 3. Then, the multiple correlation coefficients were analyzed, see Table 4. Finally, multiple linear regression analysis was used to verify the predictive capacity of the disposition to critical thinking and anxiety due to COVID-19 on academic self-efficacy (Baeza-Serrato and Vázquez-López, 2014), see Table 5.

## Results

Table 1 presents the sociodemographic information of the 218 university students. The 59.2% are women, and 40.8% are men. Regarding their age, 81.2% are between 18 and 24, the majority. Their study areas include engineering, education, business, health, law, and political science. Regarding their year, only 10.1% are in the first year, 21.6% in the second year, 17% in the third year, 14.7% in the fourth year, and 36.7% in the fifth, which are the majority of the participants.

TABLE 2 Descriptive analysis of the variables disposition to critical thinking, anxiety due to the coronavirus and self-efficacy for academic situations.

Variables	Mean	DE	Asymmetry	Kurtosis
Disposition to critical thinking	45.00	5.265	-1.401	1.460
Anxiety due to COVID 19	8.67	3.885	1.126	0.622
Academic self-efficacy	26.91	5.632	-0.093	-0.550

Table 2 shows the descriptive statistics, including the mean, standard deviation (SD), skewness, and kurtosis. The highest average is in the variable Disposition to critical thinking, and the lowest average is in the variable Anxiety due to COVID-19. The greatest dispersion is also found in Self-efficacy for academic situations. Moreover, the skewness and kurtosis coefficient do not exceed the range of being more significant than 1.5 or less than -1.5, so it is considered symmetrical, so the data is estimated to be close to the average.

## Correlation analysis

In Table 3, the relationship between the variables Disposition to critical thinking and Anxiety due to COVID-19 is observed with a result of -0.200 ( $p < 0.01$ ), which is a negative, inverse, and highly significant relationship, while the relationship between Disposition to critical thinking and Self-efficacy for academic situations is 0.492 ( $p < 0.01$ ) which is a positive, direct, and highly significant relationship. Additionally, the relationship between Anxiety due to COVID-19 and Self-efficacy in academic situations, the result is -0.157 ( $p < 0.05$ ), indicating a negative, inverse, and significant relationship.

Table 4 shows the model summary, where the corrected coefficient of determination (corrected R<sup>2</sup>) is 0.246, which indicates that the variables' Disposition explains 24.6% of the variability of Self-efficacy for academic situations to Critical thinking and Anxiety due to COVID-19. At the same time, the F value of the ANOVA ( $F = 35.08$ ,  $p = 0.000$ ) indicates a significant linear relationship between Self-efficacy for academic situations as a criterion variable and Disposition to critical thinking and Anxiety due to COVID-19 as predictor variables. Also, Figure 1 shows the correlations between variables.

Table 5 shows the unstandardized regression coefficients (B) and standardized regression coefficients ( $\beta$ ). In these results, the  $\beta$  coefficients (0.480 and -0.062) indicate that the Disposition to critical thinking and Anxiety due to COVID-19 has a positive effect on the first and a negative impact on the second for Self-efficacy for academic situations in university students. The result of the t-test shows that the variable Disposition to critical thinking is significant ( $p < 0.05$ ), while Anxiety due to COVID-19 is not significant ( $p > 0.05$ ), so Disposition to critical thinking is an essential factor for predicting Self-efficacy in academic situations.

## Discussion and conclusions

The literature mentions that students who perceive themselves as highly capable are more likely to be successful in the learning context (Zimmerman et al., 1992). This is why students with higher levels of self-efficacy commonly have higher academic achievements (Su et al., 2018). In this sense, this research aimed to determine if anxiety about COVID-19 and the disposition to critical thinking predicts academic self-efficacy in Peruvian university students.

Likewise, in this study, descriptive analyzes were used to analyze the levels of Disposition to critical thinking and Anxiety due to COVID-19 and Academic self-efficacy reported in the sample of participants, segregating based on different sociodemographic variables to allow the comparison of these phenomena similar to the one presented in Prieto Molinari et al. (2020).

TABLE 3 Correlation analysis between disposition to critical thinking, anxiety due to COVID 19 and academic-self-efficacy.

Variables	Disposition to critical thinking	Anxiety due to COVID 19	Academic self-efficacy
Disposition to critical thinking	1		
Anxiety due to COVID 19	-0.200**	1	
Academic self-efficacy	0.492**	-0.157*	1

\*\*The correlation is significant at the 0.01 level (bilateral).  
\*The correlation is significant at the 0.05 level (bilateral).

TABLE 4 Multiple correlation coefficients R, R2, corrected R2, EE and F.

Model	R	R2	R2 adjusted	EE	F	p-value
1	0.496	0.246	0.239	4.913	35.08	0.000

Predictors: (Constant), Anxiety due to COVID 19, Disposition to critical thinking.

TABLE 5 Multiple regression coefficients B (unstandardized), β (standardized), and t-test.

	B	EE	β	Student t	p-value
(Constant)	4.575	3.168		1.444	0.150
Disposition to critical thinking	0.514	0.065	0.480	7.944	0.000
Anxiety due to COVID 19	-0.089	0.088	-0.062	-1.020	0.309

Dependent variable: academic self-efficacy.

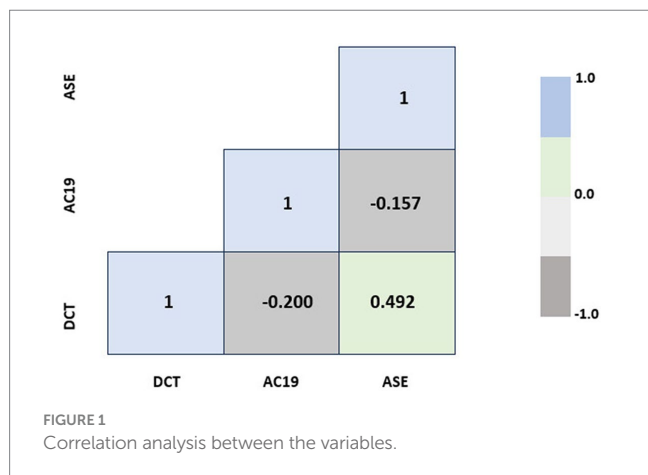


FIGURE 1 Correlation analysis between the variables.

Although the results present a low coefficient of determination, they align with the theory and contribute to predicting academic self-efficacy based on the Disposition to Critical Thinking and Anxiety due to COVID-19 used by university-level students.

The results show that the disposition to critical thinking and anxiety about COVID-19 predict academic self-efficacy in university students. This means that students with higher levels of critical thinking disposition and low levels of COVID-19 anxiety tend to

improve academic self-efficacy. This result follows what was reported by Fu et al. (2023), in which students' critical thinking is related to student self-efficacy and anxiety. On the other hand, studies confirmed a positive association between students' academic self-efficacy and its effect on critical thinking (Fahim and Nasrollahi-Mouziraji, 2013). Likewise, recent studies confirm that academic self-efficacy correlates with critical thinking and generalized anxiety (Huamán-Tapia et al., 2023). Reports confirm that anxiety has negative effects on academic performance and satisfaction with studies because it affects behaviors, short-term memory, and decision-making (Robinson et al., 2013). Coupled with this context and the pandemic, researchers believe that the pandemic period produced a significant increase in anxiety-related symptoms in university students (Rizun and Strzelecki, 2020).

The proposed model's multiple correlation coefficient (R) is moderate (0.496); however, its sample significance level is high ( $p=0.000$ ). On the other hand, the R-value<sup>2</sup> corrected or adjusted was low (0.246), which indicates that 24.6% of the variability of Self-efficacy for academic situations is explained by the variables Disposition to critical thinking and Anxiety due to COVID-19. However, the correlation is significant ( $p=0.000$ ), according to (Arias and Molina, 2017). Furthermore, the F value of the ANOVA is 35.08; this means that there is a high rate of variance between the means, which indicates that there is a linear explanatory relationship between the Disposition to Critical Thinking and Anxiety due to COVID-19, with academic self-efficacy as a criterion variable (Baños et al., 2019). This predictive power is confirmed by the multiple regression analysis, with the impact generated by the disposition to critical thinking being greater ( $t=7.944$ ). It is the first study to measure the predictive effect of the disposition to critical thinking and anxiety due to COVID-19 on academic self-efficacy.

The greater the disposition to critical thinking, the greater academic self-efficacy ( $r=0.492$ ), and with greater anxiety due to COVID-19, the disposition to critical thinking decreases ( $r=-0.200$ ). This corroborates what was found by Kim and Byun (2019); likewise, with non-specific self-efficacy in academic situations (Kim and Kim, 2007; Kim, 2016). It was found that anxiety due to COVID-19 has a low negative relationship ( $-0.2$ ) with the disposition to critical thinking. This finding confirms, although not directly with anxiety due to COVID-19, what was found by Kwon, 2008; Kwon et al. (2007). This same behavior occurs with mathematics anxiety (Güner and Gökçe, 2021) and state anxiety (Suliman and Halabi, 2007). It is the first study to evaluate the relationship between the disposition to critical thinking and anxiety due to COVID-19.

The findings confirmed what was established by the Yerkes-Dobson Law in 1908, which says that a person's external stimulation can favor their performance and motivation in a given task when they are at an optimal level. This performance decreases as that optimal level is exceeded, thus forming an inverted U-shaped curve that graphs the abovementioned phenomenon (Yerkes and Dodson, 1908). The results obtained prove that anxiety about COVID-19, as a negative external stimulus, has an impact on the motivation for academic achievement (academic self-efficacy) and, consequently, also on their performance, despite not being part of the objective of this study, but it was demonstrated by previous studies.

On the other hand, motivation or willingness to think critically was negatively associated with anxiety about COVID-19. This finding corroborates what Palmero et al. (2002) said in their book Psychology of Motivation and Emotion. In it, he states that the motivational

processes that an individual has to carry out a task or activity can be explained and, in turn, act as an explanatory factor for the emotions that they experience. Furthermore, it empirically demonstrates the claim that emotion is a hypothetical factor that drives (motivating action) and channels (regulatory action) behavior (Consuegra Anaya, 2010). A specific individual's attitude in certain situations will depend on motivation. However, according to theory and what was demonstrated by this study, emotions could also play a determining role.

Among the practical implications of these findings, although COVID-19 infections in the world have decreased, particularly in Peru (University of Oxford, 2022). However, the mental health problems associated with it, such as anxiety, continue to affect the optimal performance of university students in the development of their academic tasks. This is an issue that must be taken into consideration as a point of reflection so that all those who are related to the educational area regarding the state of motivation that their students have to think critically, as well as the confidence in their abilities to successfully achieve their academic tasks, which will significantly improve their academic performance and self-regulation of their learning. In this way, seek and implement didactic and/or other strategies to improve and support the learning process experienced inside and outside the classroom by students.

Among the most important limitations is the sample size of this study since there were only 218 university students. Therefore, it is recommended that similar studies with larger samples be carried out. Likewise, data collection was carried out using the virtual medium, a process through which some of the students to whom the survey was sent agreed to answer it; however, as it is a self-report, certain biases are likely in the study. Finally, this study is transectional, so it is impossible to make causal inferences.

It is recommended to validate the CTS in the Peruvian context to continue investigating how to promote critical thinking in university students based on their emotional aspect (disposition). Furthermore, it is suggested that future studies continue investigating variables associated with academic factors, as well as experimental studies regarding how to improve the negative impact that COVID-19 has on the mental health of university students, leading to action for the favorable development of their professional training.

Despite these limitations, we consider this research to contribute to the literature on self-efficacy for academic situations since the predictive factors are observed. We conclude that the Disposition to critical thinking and Anxiety due to COVID-19 has a positive effect on the first and a negative impact on the second for Academic

Self-efficacy in university students. This means that intervention programs must be established for students to improve their disposition to critical thinking and regulate anxiety due to COVID-19.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

The studies involving humans were approved by Comité de Ética de la Escuela de Posgrado de la Universidad Peruana Unión. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

JT-C, CA-R, and AA conceived and designed the experiments, performed the experiments, analyzed and interpreted the data, and wrote the manuscript. JL-G performed statistical analyses during peer review. CA-R and AA contributed reagents, materials, and analysis tools or data, and wrote the manuscript. All authors contributed to the article and approved the submitted version.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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