Influencing factors in creativity in learning, mediated by self-confidence in university students in the post-pandemic

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Abstract

The research aimed to establish the relationship between factors such as self-esteem, emotional states, and computer anxiety mediated by self-confidence in creativity in learning in post-pandemic university students. The methodology used for the study was non-experimental research; a questionnaire was applied to a convenience sample of 271 students (n=21; α=0.906 ω=0.917), validity and reliability tests were carried out, and using the Partial Least Squares Structural Equations Modeling (PLS-SEM), the analysis of the proposed model was carried out. The results showed that computer anxiety is accentuated when there is a demand for the use of ICT and a lack of computer resources; it influences self-confidence and creativity in learning and emotional states. In the same way, self-esteem influences self-confidence, creativity in learning, and emotional states. The research provides critical foundations to improve the conditions for developing creative skills in learning.

Keywords

Creativity in learning, Self-confidence, Computer anxiety, Self-esteem, Emotional states

1. Introduction

The educational conditions in which university activities were developed during the pandemic have been characterized by the use of information and communication technologies (ICT), so the educational models designed for attendance had to be redesigned. Changing the dynamics

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and established routines had an essential impact on their health and psychological well-being [1]. In such a way that, as health conditions have been overcome, these educational models have been modified from e-learning teaching and learning situations to b-learning (blended learning) or hybrid models, which integrate face-to-face with virtuality, testing the various psychological resources, both behavioral and affective, cognitive, and motivational [2]. Likewise, these experiences in teaching and especially in learning have resulted in positive and negative effects for teachers and students, so it is necessary to pay attention to the undesirable repercussions derived from their daily use [3].

The first studies related to this educational problem maintain that students' most frequent emotional responses have been fear, uncertainty, distorted perceptions of risk, and anxiety [4]. Depression, anxiety, and stress are multifactorial affective disorders that can manifest as a series of physical and psychological symptoms that reduce the quality of life and hinder the normal performance of people [5] so that with confinement comes Due to the pandemic, people have experienced fear and uncertainty in addition to unexpected and worrying destabilizations in the development of daily life from the family, community, economic-labor spheres, personal projects, and the meaning of life and well-being [6], causing a multifaceted crisis in the global context that encompasses areas of health, economy, and education [6]. In the case of education, computer anxiety is manifested and accentuated when there is a requirement to use ICT, and there is a lack of computer resources; on the contrary, the greater the use of computer resources, the more information anxiety is reduced [7]. The technology acceptance model (TAM) has demonstrated its efficiency in explaining the intention to use e-learning among university students with anxiety in such a way that all the effects associated with perceived usefulness (PU) are reinforced while those associated with perceived ease of use (PEOU) attenuate anxiety[8].

On the other hand, self-confidence manifests from a relationship between perfectionism and difficulties in decision-making, especially in university students, due to a lack of understanding and proper orientation [9]. Likewise, the development of creative skills in learning begins by reflecting on different strategies to teach and others to learn using framing to foster creativity in learning [10], also in the use of tools based on the interests of students, such as mobile technologies [11], and also the use of storybird to promote the writing of visual poems from the interpretation of images [12]. Similarly, developing an attitude towards technology will also allow students to better design the quality of their lexicon [13]. The state of anxiety in students is strongly associated with emotional states. For example, in the case of music, part of a recognition of musical emotions as a manifestation of the development of social cognition, which is also the premise of musical appreciation [14], the emotional state of students is very changeable, so the internalization of ICT influences emotional states in university students [15].

- H1 Computer anxiety has a positive effect on self-confidence.
- H2 Computer anxiety has a positive effect on creativity in learning.
- H3 Computer anxiety has a significant effect on emotional states.

Positive self-esteem, or subjective feelings about oneself, is integrally related to self-concept [16]. Self-esteem should be affected by positive or negative information that is frequently presented in the form of social feedback [17]. There is a link through the support of classmates with prosocial behavior in which the role of self-esteem plays a significant moderating role [18]. For this reason, it is necessary to implement collaborative strategies for learning in which

relationships and support from classmates play a fundamental role [19] in such a way that constructivist virtual environments have served as great affective support for students, especially in times of pandemic [20]. Thus, there are critical factors for the success of e-learning, such as overcoming computer anxiety, the quality of collaboration between teachers and students, the quality of information, the quality of service, the quality of the computer system or learning management system (LMS), and the use of computer devices [21], the university student will improve his self-esteem, have greater self-confidence, and will strengthen their creative skills in learning and have better emotional control.

- H4 Self-esteem has a significant effect on self-confidence.
- H5 Self-esteem has a positive effect on creativity in learning.
- H6 Self-esteem has a positive effect on emotional states.

Diversity, participation, and creativity in learning require the same attributes in organizational and systemic leadership [22]. Fostering collaborative and playful environments for learning emphasizes creativity in learning and human flourishing in education [23]. Developing creative abilities today is one of the cornerstones of students' abilities to achieve learning significance, especially in science, technology, engineering, arts, and mathematics (STEAM) education [24]. Therefore, creativity is becoming an emerging area of research in education [25]. The freedom that enables creative action also allows self-confidence in the person.

- H7 Self-confidence positively influences creativity in learning.

Social learning is closely related to the emotional dimension of the person, so today we can talk about social and emotional learning (SEL)[26], as proposed by Jones, who states that the social, emotional, and cognitive domains are interconnected in the learning process [27]. Managing educational resources well means adding design elements that make lessons more engaging. This is because students' grades measure how they think and feel. In the same way, the cognitive processes are turned on, which leads to learning results like retention and transfer [28]. Also, it's vital to set up learning sequences for students so that you can figure out their patterns of behavior [29]. On the other hand, a pedagogical approach to creativity [30] says that creativity in learning is linked to students' creative self-efficacy, which relates to self-confidence and emotional balance.

- H8 Emotional states have a positive effect on self-confidence.
- H9 Emotional states positively influence creativity in learning.

2. Methodology

This study was carried out with a sample of 271 university students from the professional art career; 90 men represent 33.2%, and 181 women represent 66.8%. The ages are between 18 and 30, with a mean of 22.9 and an SD= 3.58. The instrument was applied in April and May of the year 2022. The methodology applied for the study is a non-experimental investigation, and the sample extraction was for convenience. The instrument has been adapted and approved for the study, as

the creativity in the learning variable precedes the research: Switching to online learning during COVID-19: Theorizing the role of IT mindfulness and techno-eustress in facilitating productivity and creativity in student learning [31] and the impact of technostress on end user satisfaction and performance [32]. For the self-esteem variable, the Rosemberg self-esteem scale [33] was used; the emotional states variable has been taken from the research: digital competence of non-university education students: predictive variables [34]. Additionally, statistical tests were carried out, such as exploratory and confirmatory factor analysis, respectively, to guarantee the robustness of the instrument.

3. Results

Reliability tests were performed using Alpha Cronbach's (α=0.906) and McDonald's Coefficient (ω=0.917), with satisfactory results. Likewise, the analysis of communalities was carried out, obtaining results ranging from 0.536 to 0.904, which implies that the items would explain the model in the worst case by 53.6% and the best case by 90.4%. To analyze the adequacy of the items with their factor, the Kaiser-Meyer-Olkin test (KMO= 0.834) was performed, which indicates a reasonable adjustment of the analyzed items with their elements. Bartlett's Sphericity Test had the following results: X^2= 4233.895; df= 210, and p=<0.000, whose assessment is reasonably significant. The total variance is explained by 74.177% for the five factors of the model. Table 1 presents the rotated component matrix using the principal components analysis extraction method, with the varimax rotation method with Kaiser normalization.

Table 1
Rotated Component Array

Item/Component	1	2	3	4	5
LCA1				0.885	
LCA2				0.897	
LCA3				0.916	
EE4			0.662		
EE5			0.771		
EE6			0.710		
EE7			0.806		
EE8			0.630		
CA1		0.766			
CA2		0.616			
CA3		0.841			
CA4		0.750			
CA5		0.741			
CO1					0.763
CO2					0.850
CO3					0.870
AUT1	0.809				
AUT2	0.835				
AUT3	0.809				
AUT4	0.850				
AUT5	0.555				

In Figure 1, the measurement model results are observed using the calculation with the PLS algorithm in SmartPLS. In addition, the trajectory coefficients were obtained using 300 iterations in the exploratory analysis, with a stopping criterion of 10-7. The results of the hypothesis tests indicated that: computer anxiety (LCA) has a positive effect on self-confidence (CO) (β LCA→CO = 0.131, t = 2.417, p < 0.008), which supports H1; computer anxiety (LCA) has a positive effect on creativity in learning (CA) (β LCA→CA = -0.156, t = 2.85, p < 0.002), a result that supports H2; Computer anxiety (LCA) has a significant effect on emotional states (EE) (β LCA→EE = -0.228, t = 4.101, p < 0.000), which supports H3; Self-esteem (AUT) has a significant effect on Self-confidence (CO) (β AUT→CO = -0.479, t = 8.644, p < 0.000), results that support H4; Self-esteem (AUT) has a positive effect on Creativity in learning (CA) (β AUT→CA = -0.378, t = 5.854, p < 0.000), results that support H5; Self-esteem (AUT) has a positive effect on emotional states (EE (β AUT→EE = -0.535, t = 10.926, p < 0.000), results that support H6; Self-confidence (CO) positively influences creativity in learning (CA) (β CO→CA = 0.099, t = 1.816, p < 0.035), which supports H7 and emotional states (EE) positively influences creativity in learning (CA) (β EE→CA = 0.383, t = 5.691, p < 0.000), which supports H9. Contrarily, emotional states (EE) have a positive effect on self-confidence (CO) (β EE→CO = 0.021, t = 0.303, p < 0.381), results that do not support H8.

Figure 1 also explains the coefficient of determination R^2 considering Creativity in learning as an endogenous variable, an R^2 of 0.479 is obtained, that is to say, that the variance is explained

by the model in 47.9%, being the exogenous variables, Self-esteem, the emotional states computer anxiety and acting as a mediation variable self-confidence; On the other hand, according to the structural model, considering the emotional states variable as an endogenous variable, the R^2 is 0.376, that is, 37.6% of the variance is explained by the model, with the exogenous variables being Self-esteem and Computer anxiety.

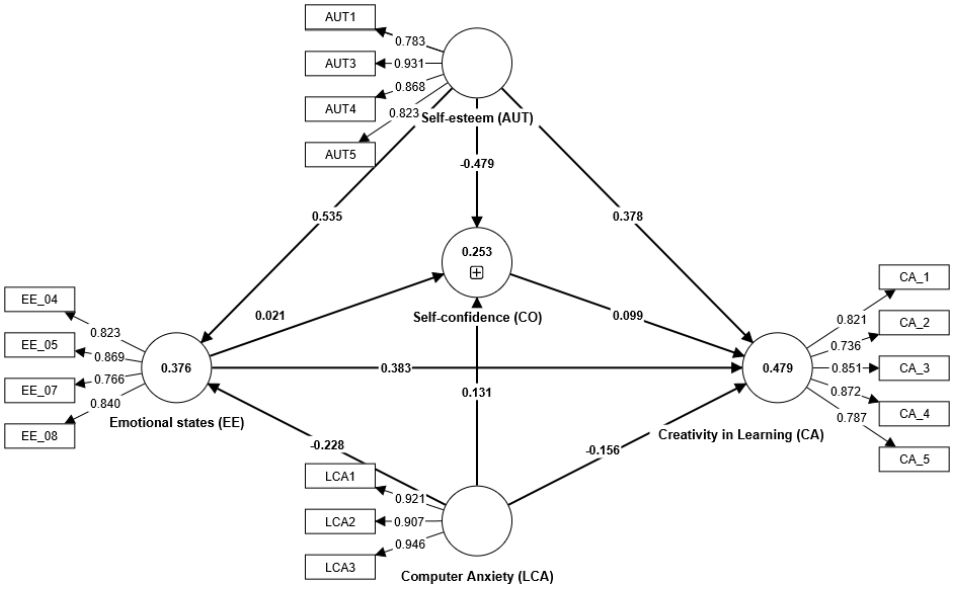

Figure 1: R2 of the SmartPLS mode

Table 2 shows the results of the reliability and construct validity tests. It shows that, when we consider the correlation coefficients, the reliability and construct validity expressed in Cronbach's alpha, the values obtained vary between 0.836 and 0.916, being very acceptable. The values of the average variance extracted, Average Variance Extracted (AVE), are between 0.664 and 0.856, which is above the 0.500 recommended by several authors, in such a way that it can be affirmed that the convergent validity is acceptable. For the analysis of the composite reliability, it is recommended as an acceptance criterion that the values obtained exceed 0.6, so that reasonable levels of internal consistency reliability would be demonstrated for each of the variables, with the result being valued between 0.895 and 0.947. The coefficient (rho_A) is used to verify the reliability of the values obtained in the construction and design of the model; it is recommended as an acceptance criterion that its values exceed 0.7, and the results vary between 0.841 and 0.932; consequently, the values of obtained evidence of very acceptable levels of reliability and validity, that is, of internal consistency of the model.

Table 3 presents the significant indirect effects obtained through the bootstrapping resampling test; according to the proposed model, self-confidence (CO) operates as a mediating variable between emotional states (EE) and creativity in learning (CA). According to the results, we can say that the total indirect effect of the relationship is (0.002), so it is not significant (t=0.255, p<0.399). Therefore, we can affirm that there is no complementary mediation.

Table 4 shows the discriminant validity test; for this purpose, the Fornell and Larcker crite-

Table 2
Reliability and construct validity

Item/Component	Cronbach's Alpha	rho_A	Composite reliability	(AVE)
Computer Anxiety (LCA)	0.916	0.927	0.947	0.856
Self-esteem (AUT)	0.915	0.932	0.936	0.747
Self-confidence (CO)	0.836	0.841	0.901	0.753
Creativity in Learning (CA)	0.873	0.882	0.908	0.664
Emotional states (EE)	0.845	0.863	0.895	0.681

Table 3
Significant indirect effects matrix (p<0.05)

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Self-esteem (AUT) -> Emotional States (EE) -> Creativity in Learning (CA)	0.205	0.205	0.042	4.937	0.000
Computer Anxiety (LCA) -> Emotional States (EE) -> Creativity in Learning (CA)	-0.087	-0.087	0.022	3.928	0.000
Self-esteem (AUT) -> Self-confidence (CO) -> Creativity in Learning (CA)	-0.048	-0.048	0.026	1.798	0.036

rion [35] was used; they propose that when two or more latent variables share the variance between pairs of constructs, it is less than the variance extracted by each individual construct. Discriminant validity exists [36], and validity tests are carried out to determine to what extent a specific construct is different from other constructs [37], essentially independent variables. Taking these criteria into account, there is discriminant validity.

Table 4
Fornell-Larcker criterion

	LCA	AUT	CO	CA	EE
Computer Anxiety (LCA)	0.925				
Self-esteem (AUT)	-0.154	0.865			
Self-confidence (CO)	0.198	-0.487	0.868		
Creativity in Learning (CA)	-0.313	0.572	-0.228	0.815	
Emotional states (EE)	-0.310	0.57	-0.292	0.618	0.825

Another criterion to establish the discriminant validity is the Heterotrait Criterion - Monotrait -HTMT; it is used to evaluate the discriminant validity through the criterion of values of less than 0.9 of the constructs. Therefore, Table 5 does not present values that exceed the suggested value of 0.9, which is equivalent to saying that there is discriminant validity.

Table 5
Heterotrait Criterion - Monotrait –HTMT

	LCA	AUT	CO	CA	EE
Computer Anxiety (LCA)					
Self-esteem (AUT)	0.168				
Self-confidence (CO)	0.216	0.543			
Creativity in Learning (CA)	0.346	0.622	0.254		
Emotional states (EE)	0.340	0.612	0.326	0.702	

Regarding the evaluation of the global or estimated model, the adjustment index, Standardized Root Mean Square Residual (SRMR), which defines the difference between the observed correlation and the predicted correlation, according to Hu and Bentler [38], the lower values of a < 0.08 is considered a good fit; therefore, the results for the estimated model the SRMR is 0.079, and for the saturated model it is 0.079, which is equivalent to saying that the measurement model is well evaluated and that the model estimated does not provide more data than the model transmits. Therefore, the model cannot be rejected, so it is deduced that the model is valid.

Table 6 shows the results of the bootstrapping test through a run of 10,000 resamples with the substitution of the original sample [39]. Considering the significance level for the P-Value ($p < 0.05$), the hypotheses are admitted: H1; H2; H3; H4; H5; H6; H47 and H9. The following hypotheses are rejected: H8.

Table 6
Hypothesis test - bootstrapping

Hypothesis	β	Sample mean (M)	Standard deviation (STDEV)	t-Statistics (|O/STDEV|)	P Value
H1 Computer anxiety (LCA) -> Self-confidence (CO)	0.131	0.133	0.054	2.417	0.008
H2 Computer Anxiety (LCA) -> Creativity in Learning (CA)	-0.156	-0.157	0.055	2.85	0.002
H3 Computer Anxiety (LCA) -> Emotional States (EE)	-0.228	-0.23	0.056	4.101	0.000
H4 Self-esteem (AUT) -> Self-confidence (CO)	-0.479	-0.481	0.055	8.644	0.000
H5 Self-esteem (AUT)-> Creativity in Learning (CA)	0.378	0.379	0.065	5.854	0.000
H6 Self-esteem (AUT)-> Emotional states (EE)	0.535	0.537	0.049	10.926	0.000
H7 Self-confidence (CO) -> Creativity in Learning (CA)	0.099	0.1	0.055	1.816	0.035
H8 Emotional states (EE) -> Self-confidence (CO)	0.021	0.022	0.07	0.303	0.381

4. Conclusions

The findings of this research confirm that computer anxiety as a manifestation in university students is accentuated when there is a demand for the use of ICT and a lack of computer resources in such a way that it influences self-confidence and creativity in the learning and emotional states of university students. Similarly, self-esteem, integrally related to self-concept, is a predictor variable and would influence self-confidence, creativity in learning, and emotional states. The self-confidence associated with the student's emotional balance would positively influence creativity in learning; Regarding emotional states, there would be a positive effect on creativity in learning, especially when we promote collaborative and playful environments. However, emotional states would not influence the student's self-confidence because emotional states are interconnected in the learning process with social and cognitive domains. Regarding self-confidence, which operates as a mediating variable between emotional states and creativity in learning, it has not been possible to demonstrate that this mediation effect exists[40].

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