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The relationship between perceived learning, academic performance and academic engagement in virtual education for university students

Ricardo Navarro[1] ✉
Vanessa Vega[2]
Hugo Bayona[3]
Victor Bernal[4]
Arlis Garcia[5]


(✉ Corresponding Author)

[1,2,3,5]*Pontifical Catholic University of Peru, Peru.*
[1]*Email: ricardo.navarro@pucp.pe*
[2]*Email: vanessa.vega@pucp.pe*
[3]*Email: hugo.bayona@pucp.edu.pe*
[4]*Email: victor.bernal@pucp.edu.pe*
[5]*Email: arlis.garciad@pucp.edu.pe*

Abstract

This study aimed to determine whether the three dimensions of academic engagement (cognitive, emotional and behavioral) were positively associated with perceived learning and academic performance. The participants were 301 university students from Lima. Structural equation models were used to test the proposed theoretical relationship between the variables. The results indicated that the model showed satisfactory fit indices (CFI = 0.956, TLI = 0.949, RMSEA = 0.043, SRMR = 0.062). Perceived learning was found to be predicted by cognitive engagement ($\beta = 0.447$, $p < 0.01$) and emotional engagement ($\beta = 0.230$, $p < 0.05$). However, there was no statistically significant relationship between behavioral engagement and perceived learning ($\beta = 0.035$, $p = 0.840$). On the other hand, academic performance was predicted by behavioral engagement ($\beta = 0.393$, $p < 0.05$) but not by cognitive ($\beta = -0.164$, $p = 0.301$) or emotional ($\beta = 0.001$, $p = 0.991$) engagement. The study highlights the importance of fostering academic engagement in university students to enhance both their academic performance and perceived learning.

Keywords: Academic performance, Academic self-efficacy, Perceived learning, Virtual education, Higher education, Structural equation modeling.

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Contents

Contribution of this paper to the literature
This study addresses the relationships between personal and contextual variables and their effect on learning during the period of virtuality due to the COVID-19 pandemic. The results obtained provide recommendations that can be applied to virtual education.

1. Introduction

More than a billion children were impacted by pandemic-related school closures globally (Chiu, 2022) which led to a rapid shift to emergency online learning without any planning or guidelines (Abou-Khalil et al., 2021). This transition posed challenges for students and teachers (Chiu, 2022; Lucas & Vicente, 2023). Developing countries faced even greater difficulties due to limited internet access, technology availability and resource scarcity (Abou-Khalil et al., 2021; Bonilla-Guachamín, 2020; Lucas & Vicente, 2023).

The learning environments in traditional and online virtual education are very different. Online learning systems provide the benefit of asynchronous learning which is accessible anytime from anywhere while traditional classrooms limit activities to a physical setting (Habib, Haider, Suleman, Akmal, & Khan, 2022). This shift became particularly relevant during the last two years when higher education institutions widely adopted virtual courses to meet the needs of students during the pandemic (Amaechi, Amaechi, Oyetunji, & Kgosiemang, 2022). Given the circumstances, emergency e-learning focused on delivering rapid and reliable instruction rather than attempting to replicate a complete educational ecosystem adapting to the challenges and constraints imposed by the situation (Hodges, Moore, Lockee, Trust, & Bond, 2020).

Thus, virtual education has been the predominant modality in Peruvian universities. Although the Peruvian government has approved the gradual return to face-to-face classes in universities, some higher education experts argue that the virtual or blended modality may continue to be offered at universities in the coming years (Navarro, López, & Caycho, 2021). However, the necessary learning outcomes cannot be ensured by online learning alone (Lu, Yang, Wu, & Yang, 2023; Riner, Hur, & Kohlmeier, 2022). The adaptability of online learning has been a challenge for universities due to the low levels of digital skills of teachers and students (Bonilla-Guachamín, 2020). This had an impact on academic performance and raised questions regarding the qualifications of college students who have been studying online for the past two years as many courses were not created with online learning in mind and teachers lacked the skills to effectively create and implement virtual teaching methods (Navarro et al., 2021).

Similarly, several college students faced challenges adjusting to the new educational landscape resulting in difficulties in maintaining a positive academic performance (Benites, 2021; Rojas, 2021). Some students find it difficult to stay motivated in these unusual environments and not every student is able to succeed in them (Chiu, 2022). Consequently, it is widely recognized that students' academic engagement plays a crucial role in achieving the desired academic achievement and other outcomes (Qiao, Zhu, Guo, Sun, & Qin, 2021; Udin, Maufur, & Riyanto, 2022). Academic engagement refers to the level of effort students invest to excel and achieve desired academic outcomes (Wang, Dai, & Mathis, 2022). The effectiveness of educational experiences depends largely on the active participation of students which also depends on the degree of autonomy that is fostered in the student during the learning process (Mohamed Mohamed Bayoumy & Alsayed, 2021). In the context of online learning, it has been found that user activity and high levels of interaction (forums, videoconferences and virtual courses) can predict students' grades (Wijaya & Weinhandl, 2022).

However, it is still unknown which engagement strategies are perceived as the most effective during emergency e-learning (Abou-Khalil et al., 2021). Therefore, recent studies showed a general decline in student engagement during online classes and their academic performance (Abou-Khalil et al., 2021; Chen, Kaczmarek, & Ohyama, 2021). Consequently, the adaptation of relevant motivational theories to design effective and sustainable pedagogy is still relatively under-researched (Chiu, 2022). This study aims to explore the relationship between academic engagement, perceived learning and academic engagement among Peruvian university students in an emergency online learning environment.

Schaufeli, Martinez, Pinto, Salanova, and Bakker (2002) define academic engagement as a persistent and positive motivational state that students experience during their academic activity characterized by three dimensions: (a) vigor which includes high levels of energy and mental endurance to the academic task along with a strong desire to strive and persevere in the face of adversity dedication and absorption. (b) Dedication which alludes to high academic involvement which goes hand in hand with the feeling of enthusiasm, inspiration, pride and challenge in a task and c) absorption which implies high levels of concentration on the task to be performed such as the perception that time "flies by" when performing the task and difficulties to disconnect from the task due to the concentration itself and the enjoyment of performing it (Schaufeli & Salanova, 2007).

Academic engagement is critical given its positive relationship with academic achievement in every educational context (Bond, 2020; Gao et al., 2021; González & Blackford, 2022). The evidence indicates that engagement depends on the resources available to the students and the difficulty of an academic task (Gutiérrez, Tomás, Barrica, & Romero, 2017; Martínez, Youssef-Morgan, Chambel, & Marques-Pinto, 2019). Thus, appropriate resources to respond to particular needs can promote engagement. On the other hand, excessive demands and limited resources lead to burnout (Li, Leung, & Li, 2021).

According to Fredricks, Blumenfeld, and Paris (2004), academic engagement is a multidimensional construct composed of three interrelated factors such as a) the behavioral factor which refers to the involvement in learning, academic tasks and educational activities through various behaviors such as concentration, attention, following educational rules, effort, persistence, etc. b) the emotional factor which refers to the presence of higher levels of interest, enthusiasm, joy, identification, sense of belonging, etc. and lower levels of boredom, dislike, anxiety, sadness, etc. and c) the cognitive factor which integrates psychological investment, self-regulation and the use of strategies that are relatively elaborated to achieve the desired results. It is a pending task to develop an instrument to measure academic engagement from the activities and tasks addressed in the classroom that reflects the three dimensions present in Fredricks et al.'s (2004) model: behavioral, cognitive and emotional considering that researchers should be clear about how they define engagement (Bedenlier, Bond, Buntins, Zawacki-Richter, &

Kerres, 2020; Yévenes-Márquez, Badilla-Quintana, & Sandoval-Henrıquez, 2022). Emamjomeh, Toghyani, & Bahrami, 2021; Kowitlawakul et al., (2022) have shown evidence of the predictive power of engagement on performance as well as the direct relationships between engagement and academic achievement and perceived learning effectiveness (Abukhalil, Halawani, & Daher, 2021; Chauhan, Gupta, Palvia, & Jaiswal, 2021; Kala & Chaubey, 2023). Thus, school performance is more effective when students have positive and active attitudes with affection (dedication) and energy (vigor) when performing their academic tasks (Carmona-Halty, Salanova, Llorens, & Schaufeli, 2021). Evidence has also been found of the functionality of engagement as a mediator between other variables and academic performance (Prabowo, Yuniarty, & Ikhsan, 2022) such as between the adoption of virtual education and the latter (Bryson & Andres, 2020) which indicates that online learning environment would provide learning support that allows students to participate more and perform better in their academic courses (Kim, Hong, & Song, 2019) provided that it is well applied. There is also evidence of engagement and academic performance as mediators between obstacles and psychosocial facilitating factors (Martínez et al., 2019) and between positive emotions and academic performance (GPA) (Carmona-Halty et al., 2021).

Academic performance is the level of learning obtained by a student in a teaching-learning process which is influenced by the interaction of variables associated with the student and his educational context and expressed in a quantitative grade through an evaluation (Fong-Silva, Fong-Amarís, & Pérez-Mendoza, 2022; Limniou, Varga-Atkins, Hands, & Elshamaa, 2021; Putwain, Wood, & Pekrun, 2022). This varies according to organic and environmental conditions in addition to individual factors such as intellectual level, personality, motivation, abilities, interests, study habits, self-esteem or the teacher-student relationship (Magulod Jr, 2019). The majority of studies refer to grades as a representation of performance despite the claims and objections surrounding them. Grades are also taken into account when determining eligibility for scholarships, advancement to a higher education level and employment opportunities. This type of conceptualization of academic performance is made due to the need to identify students' progress in a simple way and also reflect their learning (Navarro, 2015, 2018). Therefore, some studies use school grades as academic performance criteria to calculate reliability and validity indexes (Lamas, 2015).

In the case of the present study, the academic performance of college students can be predicted by circumstances such as their virtual education experiences (Aggarwal, Jain, & Jain, 2023; Joia & Lorenzo, 2021; Kusmaryono, Jupriyanto, & Kusumaningsih, 2021). Thus, several studies use grades as a manifestation of academic performance as a dependent variable on the effect of other variables related to virtual education such as motivation towards e-learning (Torun, 2020), satisfaction with e-learning (Younas, Noor, Zhou, Menhas, & Qingyu, 2022), e-learning readiness (Yavuzalp & Bahcivan, 2021) or e-learning strategy (Jawad & Shalash, 2020).

According to Lamas (2015), defining the educational goals we should strive for, analyzing the situations and challenges we face and developing ideas and plans of action that will help us get closer to those goals are all crucial and beneficial. Therefore, it was deemed convenient to include a measure of perceived learning for the present study which is defined as a student's judgment of the knowledge and comprehension of a subject (Alqurashi, 2019). Thus, students are asked to reflect on the benefits of the course, their activities and assignments and the level of learning they achieved during the semester (Martin & Bolliger, 2022). In the international context, a review of several studies by Yunusa and Umar (2021) has found that perceived learning in virtual higher education is predicted by several variables that can be grouped into factors of communication dynamics: the e-learning environment, the organization, the situation and the individual characteristics of the student. Predictor variables include self-efficacy and academic engagement.

Engagement in learning associated with academic performance is one of the current emerging fields of research seeking to improve the quality and significance of student learning. It is assumed that enhanced engagement can provide solid knowledge and a stronger understanding of the subjects studied by Mohamed Mohamed Bayoumy and Alsayed (2021). Therefore, a theoretical model is proposed in which academic engagement manifested in its cognitive, behavioral, and emotional dimensions has a direct impact on both perceived learning and student academic performance for the present study (see Figure 1).

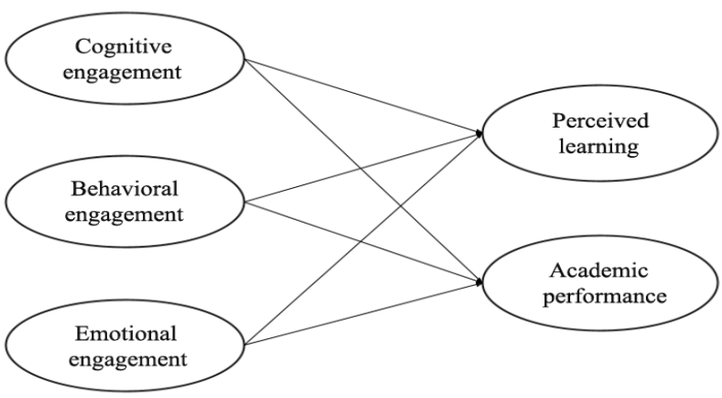

Figure 1. Hypothetical model.

2. Method

2.1. Participants

Participants were 301 university students aged 18 to 32 years ($M = 20.86$, $SD = 2.28$). In terms of gender, 124 people identified as male (41.2%), 4 as non-binary (1.3%), and 173 as female (57.5%). The majority of students belonged to the faculties of law (19.3%), psychology (19%), science and engineering (17.3%), communication (17.2%), arts (7.6%), social sciences (6.3%) and business (6%) while 7.3% belonged to other faculties. Additionally, in terms of academic performance, the average grades of the participants were between 10 and 18 ($M = 15.36$, $SD = 1.58$).

2.2. Instruments

Data sheet. A data sheet was used to gather the sociodemographic characteristics of the participants. We inquired about their age, gender, faculty and grade point average (GPA) in the most recent semester.

Academic engagement. The engagement to academic tasks questionnaire (Comp-TA; Yévenes-Márquez et al. (2022)) was used to assess academic engagement. This questionnaire comprises 15 items organized into three dimensions: cognitive, emotional and behavioral. The behavioral dimension refers to participation in learning activities. The emotional dimension refers to the presence of higher levels of sense of belonging and lower levels of anxiety. Finally, the cognitive factor integrates psychological investment, self-regulation and the use of strategies to achieve desired outcomes (Bedenlier et al., 2020; Yévenes-Márquez et al., 2022). Furthermore, the questionnaire shows adequate psychometric properties in a sample of Peruvian university students ($\chi 2$(df) = 202.435(87), p < 0.001; S-B$\chi 2$ = 1.383, CFI = 0.924, TLI = 0.908, RMSEA = 0.067 and confidence interval = 0.057-0.077, SRMR = 0.056).

Perceived learning. The cognitively perceived learning in a virtual questionnaire (ACP-V) was developed for the study using the research of Rovai, Wighting, Baker, and Grooms (2009) and Sher (2009). It is unidimensional and consists of six items. Perceived learning refers to students' subjective assessment of their knowledge and understanding of a specific topic. It is related to the student's perception of their mastery of a particular area of knowledge. Ledesma, Molina, and Valero (2002) state that the test's psychometric qualities are adequate with a Cronbach's alpha of.91 and a Kaiser-Meyer-Olkin test of .91. Similarly, this scale presents a model with good fit indices: $\chi 2$(df) =16.338(9), $p < 0.001$; *S-B*$\chi 2$ = 1.265; CFI = .990; TLI = .984; RMSEA = .052 (confidence level = .009 - .088); SRMR = .022.

2.3. Procedure

The surveys were administered online to students at a private university. Each participant received an informed consent document detailing the objectives of the study and participation requirements. Subsequently, they were provided with the sociodemographic information sheet and questionnaires.

2.4. Data Analysis

Data coding and analysis were performed in RStudio software (Posit Team, 2022). First, missing cases and extreme values were reviewed. Subsequently, descriptive statistics were calculated and multivariate normality was assessed with the Mardia (1970) test.

Then, the structural equation model (SEM) was carried out using the maximum likelihood estimator with the correction of Satorra and Bentler (2001) to correct for the possible lack of multivariate normality. The Bentler-Bonett comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA) and the standardized residual mean square root (SRMR) were considered to evaluate the model fit. The following criteria were indicative of good model fit: CFI and TLI > .90; RMSEA < .06; and SRMR < .08 (Brown, 2015; Mueller & Hancock, 2018; Schreiber, Nora, Stage, Barlow, & King, 2006; West, Taylor, & Wu, 2012).

3. Result

The multivariate normality assumption was evaluated before the SEM analysis. The results of Mardia's test suggest that the data set does not comply with this assumption since it presents multivariate skewness (ˆγ1, p = 3976.559, $p < .001$) and kurtosis (ˆγ2, p = 28.669, $p < .001$). Consequently, the maximum likelihood estimation approach with the correction of Satorra and Bentler (2001) was used during the SEM analysis.

Thus, the findings suggest that the hypothesized model has a good fit: ($\chi 2$(df) = 315.065(201), p = < 0.001; S-B$\chi 2$ = 1.252, CFI = 0.956, TLI = 0.949, RMSEA = 0.043 (confidence interval = 0.035 - 0.051), SRMR = 0.062. In addition, Figure 2 shows the statistically significant regressions.

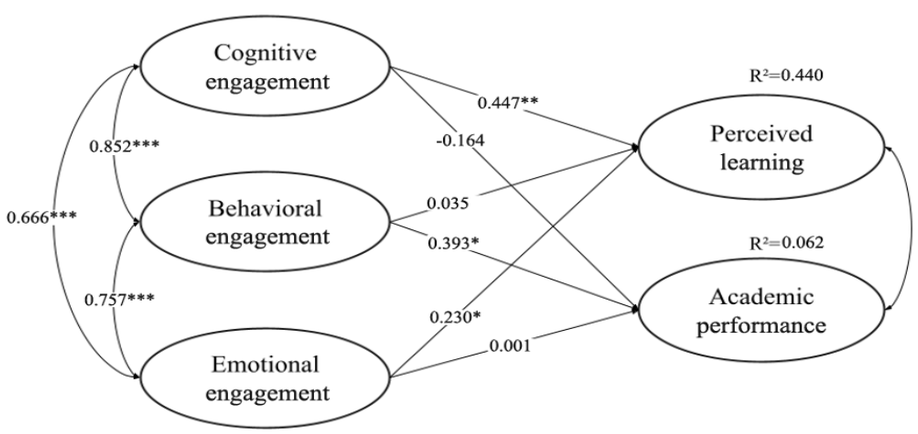

Figure 2. Structural equation model.

Note: *p<0.05; **p<0.01; ***p<0.001.

Regression analysis revealed that emotional engagement (β =.230, p <.05) and cognitive engagement (β =.447, p <.01) were the factors that predicted perceived learning. On the other hand, behavioral engagement shows no statistically significant relationship with perceived learning (β =.035, p =.840). Academic performance was predicted by behavioral engagement (β = .393, $p < .05$) but not by cognitive engagement (β = -.164, p = .301) or emotional engagement (β = .001, p = 991).

4. Discussion

The purpose of the present study was to test a theoretical model in which academic engagement as manifested in its cognitive, behavioral and emotional dimensions has a direct influence on students' perceived learning and academic performance. A discussion of the results is presented below. First, the emotional and cognitive dimensions of engagement have direct effects on perceived learning. The emotional dimension refers to students' emotions towards their classroom tasks (Subramainan & Mahmoud, 2020), the cognitive dimension is conceived as the investments that students make in their learning (Fredricks et al., 2004). Therefore, students who demonstrated a strong interest in the subject matter and a commitment to understanding the material believed that they had gained a greater understanding than their peers. The above discussion implies that higher cognitive and emotional engagement leads to a greater perception that learning was obtained from the courses taken virtually which does not necessarily imply a higher grade in those courses. These results are consistent with previous research indicating that students who lack emotional engagement in their academic activities are more likely to experience adverse academic outcomes. In contrast, engaged students who exceed minimum course requirements, set learning goals and actively seek challenges to improve their skills demonstrate competencies essential for effective learning (Panigrahi, Srivastava, & Panigrahi, 2021). The lack of a relationship between the behavioral dimension of engagement and perceived learning is of concern. In addition, a relatively minor part of the variability in this variable is explained by the strong effect of behavioral engagement on academic success. In previous research, findings suggest that behavioral norms in this dimension such as active attendance or homework completion are critical for positive academic outcomes (Kuh, 2008). Thus, the results may be explained by the differences between virtual and face-to-face education. In face-to-face education, the learner must follow classroom behavioral norms and interact largely with the teacher, virtual education is conducted autonomously and asynchronously with a more active and participatory role for the learner compared to traditional education (Fernández-Otoya, Raposo-Rivas, & Halabi-Echeverry, 2022; Navarro et al., 2021). The study conducted by Abou-Khalil et al. (2021) found that students perceived content-to-student engagement strategies to be significantly more effective than either student-to-student or teacher-to-student strategies. This difference is attributed to the nature of emergent online learning in a resource-constrained context where slow internet connections and a lack of necessary technologies make it difficult to fully access course content. Consequently, this dimension would assess behaviors that are not performed or are unnecessary in this new educational modality. In addition, the lack of necessary teaching and institutional support makes it difficult for students to reach an acceptable level of engagement with teachers and peers (Abou-Khalil et al., 2021).

5. Conclusion

The cognitive, behavioral and emotional aspects of academic engagement show how it directly affects students' perceptions of their learning and academic achievement. The results indicate that both the cognitive and emotional dimensions directly influence perceived learning while the behavioral dimension does not show a significant relationship with perceived learning and has only a small effect on academic performance. These findings suggest that student participation in the classroom should be fostered through interventions. These interventions can add value beyond innate cognitive abilities, personality traits or standardized test scores in predicting academic performance (Martínez et al., 2019). Educational institutions should also be willing to monitor attendance, review student assignments and ensure compliance with classroom rules in the LMS. Strategies such as student participation, debates, voting and quizzes about a subject can also be adopted when necessary (Teng & Wang, 2021). Teachers can assign relevant readings and exercises and ask students to turn them in before class, provide supplemental online materials and use formative assessments to increase students' cognitive engagement (Walker & Koralesky, 2021). Among the limitations of the study is that it was conducted as a cross-sectional survey. Future research could complement these results with longitudinal studies to assess learning effectiveness and determine the magnitude and causal direction of the relationship between engagement and learning outcomes over time. In addition, it is crucial to identify and control for other extraneous variables that may influence the investigated relationship to ensure the generalizability of empirical results (James, Zhang, Li, Ziegelmayer, & Villacis-Calderon, 2022). Including traditional predictors of academic performance such as high school transcripts, entrance exams and extracurricular activities as control variables can help determine the relative contribution of engagement (Martínez et al., 2019). Furthermore, future research should consider controlling for personality traits, intelligence and self-efficacy which are significant predictors of academic performance in previous studies (Mishra, 2020). It is also recommended to incorporate demographic variables such as gender and age which play a significant role in the effectiveness of online learning (Akhter et al., 2022). In terms of online learning, one must take into account the support of peers and teachers which is essential for motivating children by giving them freedom, structure and involvement (Chiu, 2022). A successful teaching strategy during the pandemic may involve giving students' psychological needs a high priority across various dimensions with a focus on encouraging positive learning (Zhao, Cao, Li, & Li, 2022). It is also important to ensure favorable conditions for successful virtual education such as creating an accessible virtual environment, embracing virtual learning, implementing government policies, using cloud platforms, mobile learning, virtual environments (simulation, games, etc.) and leveraging social networks (Alturki & Aldraiweesh, 2022). In addition, students' socioeconomic status influences their access to information and communication technology tools and favorable learning environments. Extensive research is needed to understand how limited resources affect students' participation and capabilities in emergency online learning (Ferri, Grifoni, & Guzzo, 2020).

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