

Academic satisfaction and key competencies in managing personal learning environments (PLE) at university

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Abstract– *The purpose of this study is to analyze the influence of key competencies in the management of Personal Learning Environments (PLEs) on the academic satisfaction of university students. The research was conducted using a quantitative approach, with a non-experimental, cross-sectional design and an explanatory scope. The sample consisted of university students from a private institution in Peru. The methodology employed an exploratory factor analysis, which was validated through measurement model analysis. Data processing and analysis were performed using PLS-SEM, a structural equation modeling approach that enabled comparisons of direct effects among the model's variables. The results show that information organization, creative collaboration, and participation in communities and discussion groups have direct, positive, and statistically significant effects on academic satisfaction. In contrast, online information searching did not show a significant direct effect on this variable. Furthermore, the structural model presented a moderate level of explanation for academic satisfaction, confirming the multifactorial nature of this construct in university contexts mediated by digital technologies. The main conclusion is that academic satisfaction does not depend solely on access to digital information but is shaped by cognitive and social skills associated with the effective management of PLEs, especially those linked to the organization of information and collaborative interaction.*

Keywords— *Online information search, Information organisation, Creative collaboration, Participation in communities and discussion groups, Academic satisfaction.*

I. INTRODUCTION

The rapid digitalization of higher education has profoundly reshaped how students engage with learning, positioning Personal Learning Environments (PLE) as a central framework for understanding contemporary academic practices. PLE emphasizes learner autonomy, personalization, and self-regulation, allowing students to actively configure and manage digital tools, information resources, and social interactions in accordance with their academic needs and goals. Rather than relying solely on institutionally prescribed platforms, students increasingly construct individualized learning ecosystems that integrate searching, organizing, sharing, and co-creating knowledge [1, 2]. In this context, effective PLE management has become a key competence in university education.

Within PLE-oriented learning models, academic satisfaction emerges as a critical outcome that reflects students' perceptions of their learning experiences. Academic satisfaction has been conceptualized as a multidimensional

construct associated with motivation, engagement, persistence, and academic performance [3, 4]. Empirical studies consistently indicate that students who perceive their learning environments as supportive, interactive, and well-structured tend to report higher satisfaction, which in turn contributes to improved academic outcomes and psychological well-being [5, 6]. Consequently, academic satisfaction is widely regarded as an indicator of educational quality and effectiveness in higher education, particularly in digital and blended learning contexts [7].

Recent literature highlights that academic satisfaction is not determined solely by institutional characteristics or instructional design, but also by students' competencies in managing their PLE. Core competencies such as online information search, information organization, creative collaboration, and participation in learning communities have been identified as essential for navigating complex digital learning environments [1, 8]. Research conducted during and after the COVID-19 pandemic demonstrates that students who actively organize digital resources and engage in collaborative and community-based learning within their PLE report higher satisfaction levels than those who adopt more passive learning strategies [9, 10].

In particular, online information search constitutes a foundational element of PLE, enabling students to access diverse academic resources and personalize their learning pathways. However, empirical evidence suggests that access to information alone is insufficient to generate positive learning experiences unless it is accompanied by higher-order processes such as organization, reflection, and social interaction [3]. Information organization plays a crucial role in this regard, as it helps reduce cognitive overload, enhances students' sense of control, and supports more efficient learning processes, all of which are associated with higher academic satisfaction [2, 11].

Beyond individual cognitive strategies, the social dimension of PLE has gained increasing attention. Studies on collaborative and community-based learning environments show that creative collaboration and participation in discussion groups foster engagement, peer support, and a sense of belonging, which are strongly linked to academic satisfaction [12, 13]. Moreover, empirical evidence from higher education contexts indicates that interactive digital environments contribute to academic thriving and well-being, particularly

when students actively participate in learning communities [5, 14].

Despite the growing body of research on PLE and academic satisfaction, there remains a need for integrated explanatory models that examine how key competencies in managing PLE jointly influence academic satisfaction at the university level. Addressing this gap is particularly relevant in the post-pandemic context, where students are expected to navigate increasingly complex digital learning ecosystems and assume greater responsibility for their learning processes. Accordingly, this study aims to analyze the influence of key competencies in managing Personal Learning Environments (PLE) on academic satisfaction among university students, contributing empirical evidence to advance research and practice in higher education.

A. Online information searching and academic satisfaction

Online information retrieval is a central component of Personal Learning Environments, enabling students to independently access digital resources, academic content, and diverse sources of knowledge. The literature agrees that the ability to locate relevant and reliable information strengthens perceptions of control over the learning process, thereby positively impacting academic satisfaction [1, 3]. In digital education contexts, this practice is also associated with higher levels of motivation and critical thinking, fostering a more positive evaluation of the educational experience [15].

Studies conducted in technology-mediated university settings show that access to digital resources and the ease of interacting with them influence perceptions of the learning environment, although their impact depends on the pedagogical use students make of the information they provide [16]. Furthermore, recent research shows that perceived efficacy during information searches reinforces technological self-efficacy and the willingness to continue learning in virtual environments, resulting in higher levels of academic satisfaction [4, 8]. From this perspective, online information searches emerge as a relevant factor within Personal Learning Environments (PLEs) for explaining university student satisfaction. Based on the theoretical foundations developed, the following hypothesis is formulated:

H1. Online information searches have a positive and significant influence on the academic satisfaction of university students.

B. The organisation of information as the basis for academic well-being

Information organization refers to a student's ability to classify, structure, and reuse content obtained from various digital sources. In today's learning environments, characterized by information overload, this skill is key to reducing cognitive overload and optimizing the learning process [1, 11]. Proper information structuring allows students to better understand the content and manage their academic tasks more efficiently.

Empirical evidence shows that students who effectively organize information perceive greater control over their learning, which is associated with higher levels of academic

satisfaction and educational engagement [3, 17]. Studies conducted during remote learning have identified that the structured management of digital content and resources contributes to a more positive learning experience, especially when supported by well-designed virtual platforms [2, 18]. Furthermore, information organization has been identified as a relevant predictor of academic well-being and student flourishing in higher education [5, 7]. Based on the theoretical foundations developed, the following hypothesis is formulated:

H2. Information organization has a positive and significant influence on the academic satisfaction of university students.

C. Creative collaboration and its impact on academic satisfaction

Creative collaboration involves co-construction of knowledge, joint generation of ideas, and collaborative problem-solving in digital environments. In Personal Learning Environments, this dimension transcends simple functional interaction and promotes socially meaningful learning experiences [10, 12]. Previous research has shown that collaborative work mediated by digital technologies increases academic engagement and strengthens positive perceptions of learning [19].

During the pandemic, several studies demonstrated that creative collaboration facilitated by digital platforms helped maintain learning continuity and improve perceptions of academic performance and student satisfaction [9]. Furthermore, recent literature indicates that environments that foster collective creativity generate higher levels of satisfaction by promoting a sense of shared achievement, belonging, and socio-emotional support [5, 14]. In this sense, creative collaboration is consolidated as a key factor in explaining academic satisfaction in student-centered learning models. Based on the theoretical foundations presented, the following hypothesis is formulated:

H3. Creative collaboration has a positive and significant influence on the academic satisfaction of university students.

D. Participation in communities and discussion groups as a social dimension of learning

Participation in communities and discussion groups represents an essential social dimension of Personal Learning Environments, facilitating knowledge exchange, peer feedback, and the building of academic support networks. The literature agrees that meaningful social interaction increases academic satisfaction by strengthening students' emotional engagement and sense of belonging [12, 13]. In virtual environments, these spaces compensate for the lack of face-to-face interaction and foster more satisfying learning experiences.

Several empirical studies show that active participation in learning communities is associated with higher levels of motivation, persistence, and academic well-being, reducing the risk of dropping out and strengthening positive perceptions of the educational environment [5, 6]. Furthermore, research in higher education shows that social support and continuous

interaction directly influence student satisfaction and academic performance [7, 14]. Consequently, participation in communities and discussion groups emerges as a relevant predictor of academic satisfaction within PLEs (Personal Learning Environments). Based on the theory presented, the following hypothesis is formulated:

H4. Participation in communities and discussion groups positively and significantly influences university students' academic satisfaction.

II. METHODOLOGY

A. Research design and approach

This study adopted a quantitative research approach with a non-experimental, cross-sectional design, aimed at examining the direct relationships between online information search (OIS), information organisation (IO), creative collaboration (CC), and participation in communities and discussion groups (PCDG) on academic satisfaction (SAT) within the framework of Personal Learning Environments (PLE). The research adopted an explanatory design, testing theoretically grounded hypotheses through multivariate statistical modeling using partial least squares structural equation modeling (PLS-SEM). This approach is appropriate for analyzing complex relationships between latent constructs in educational and technology-mediated learning contexts.

B. Participants and sampling

The target population consisted of undergraduate university students enrolled at a private university in Peru. Data were collected using a non-probabilistic convenience sampling strategy, which is suitable for explanatory studies focused on theory testing in higher education research. The final sample comprised 293 students, with no missing data reported. Participants' ages ranged from 17 to 25 years ($M = 19.1$, $SD = 2.04$), with a median age of 18 years, reflecting a typical undergraduate demographic profile. The age distribution showed a higher concentration of students aged 17-20, accounting for more than half of the sample. Regarding gender composition, 53.6% of participants were female ($n = 157$) and 46.4% were male ($n = 136$), indicating a relatively balanced distribution. Data collection was conducted between August and September 2025, ensuring temporal consistency with the academic period during which students actively engaged in digital learning environments.

C. Instrument and measures

Data were collected using a structured, self-administered questionnaire specifically designed for this research, ensuring alignment with the theoretical foundations of PLE and the study's objectives. The instrument consisted of multiple items measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) and operationalized five latent constructs: online information search (OIS), information organisation (IO), creative collaboration (CC), participation in communities and discussion groups (PCDG), and academic satisfaction (SAT). Prior to hypothesis testing, the instrument was refined through an exploratory factor analysis, resulting in the removal of items

that did not meet established psychometric criteria. Subsequently, the adequacy of the measurement model was assessed through reliability and validity analyses, ensuring robust internal consistency and convergent and discriminant validity.

D. Data analysis procedure

Statistical analyses were conducted using SmartPLS software (version 4.1.1.7). The analysis followed a sequential procedure. First, descriptive statistics were computed to characterize the participants' demographic profile. Second, the measurement model was evaluated by assessing internal reliability (Cronbach's alpha, rho_A, and composite reliability), convergent validity (average variance extracted), and discriminant validity (HTMT and Fornell-Larcker criteria). Third, the structural model was examined using PLS-SEM to estimate the direct effects of the predictor variables on academic satisfaction, and to assess the model's explanatory power via the coefficient of determination (R^2). Model adequacy was assessed using established goodness-of-fit indicators consistent with current methodological recommendations for PLS-SEM in educational research. Statistical significance was evaluated at a 95% confidence level.

III. RESULTS

The model fitting results indicate a good overall fit, consistent with the methodological standards required for high-impact research. In the exact fit test, the χ^2 statistic = 465 with 265 degrees of freedom is significant ($p < .001$), a common finding in models with moderate or large sample sizes, given the chi-square test's sensitivity to sample size. Therefore, its interpretation should be complemented by alternative fit indices, which are more robust in this type of context.

Regarding the incremental and absolute fit measures, the results are consistent with a well-specified model. The CFI = 0.946 and the TLI = 0.939 exceed the recommended threshold of 0.90 and approach the stricter criterion of 0.95, demonstrating a substantial improvement over the null model. The SRMR = 0.0467, lower than the reference value of 0.08, indicates a low discrepancy between the observed and estimated matrices. Likewise, the RMSEA = 0.0507, along with its 90% confidence interval (0.0430 – 0.0583), falls within the range of good fit (≤ 0.06), confirming the model's parsimony. Taken together, these indicators provide strong evidence that the model adequately represents the proposed theoretical structure, thereby supporting the validity of the inferences drawn from the estimated relationships among the analyzed constructs.

The results in Table I show that the measurement model exhibits adequate levels of internal reliability and convergent validity for all the analyzed constructs, after the refinement performed following the exploratory factor analysis. First, the standardized factor loadings (λ) of the retained items are mostly above the recommended threshold of 0.70, indicating a

substantial and consistent relationship between the indicators and their respective latent factors. In this process, items OIS4, OIS5, and CC5 were removed from the model because they did not meet the established quality criteria. This strengthened the instrument's internal consistency and parsimony without compromising the conceptual coverage of the constructs related to Personal Learning Environments.

In terms of reliability, the Cronbach's alpha (α), rho_A, and composite reliability (rho_c) values significantly exceed the minimum threshold of 0.70 for all factors, confirming adequate internal consistency. The values observed for academic satisfaction are particularly noteworthy, indicating high reliability consistent with the theoretical stability of this construct in educational research. Furthermore, the mean variance extracted (AVE) values are greater than 0.50 in all cases, confirming the model's convergent validity and demonstrating that each construct explains more than 50% of the variance in its indicators. Taken together, these results support the psychometric robustness of the measurement model and provide a solid empirical basis for further analysis of the structural model and the relationships between PLE dimensions and academic satisfaction.

TABLE I
RESULTS OF THE MEASUREMENT MODEL AFTER EXPLORATORY FACTOR ANALYSIS: INTERNAL RELIABILITY AND CONVERGENT VALIDITY OF THE CONSTRUCTS

Factor	Indicator	λ	α	rho a	rho c	AVE
Creative collaboration	CC1	0.841	0.837	0.848	0.890	0.670
	CC2	0.850				
	CC3	0.751				
	CC4	0.830				
Information organisation	IO1	0.748	0.817	0.819	0.872	0.576
	IO2	0.736				
	IO3	0.774				
	IO4	0.748				
	IO5	0.788				
Online information search	OIS1	0.796	0.734	0.785	0.844	0.645
	OIS2	0.872				
	OIS3	0.734				
Participation in communities and discussion groups	PCDG1	0.821	0.853	0.856	0.895	0.631
	PCDG2	0.791				
	PCDG3	0.808				
	PCDG4	0.803				
	PCDG5	0.745				
Academic satisfaction	SAT1	0.869	0.927	0.928	0.945	0.776
	SAT2	0.889				
	SAT3	0.861				
	SAT4	0.915				
	SAT5	0.868				

The results in Table II confirm that the model adequately meets the discriminant validity criteria, indicating that the analyzed constructs represent conceptually distinct dimensions within the framework of Personal Learning Environments and academic satisfaction. First, the Heterotrait-Monotrait (HTMT) criterion analysis shows that all coefficients fall below the conservative threshold of 0.85, and even below the stricter criterion of 0.90, demonstrating adequate empirical separation between the constructs. The observed relationships between creative collaboration, information organization, online

information search, participation in communities, and academic satisfaction show moderate values, which is theoretically consistent, given that these dimensions are part of the same digital learning ecosystem but do not conceptually overlap.

Additionally, the Fornell-Larcker criterion reinforces these findings, as in all cases the square root of the extracted mean variance (AVE) for each construct is greater than its correlations with the other factors in the model. This pattern confirms that each latent variable explains the variance of its own indicators better than the variance shared with other constructs.

TABLE II
DISCRIMINANT VALIDITY

Heterotrait-monotrait criterion (HTMT)					
	CC	IO	OIS	PCDG	SAT
CC					
IO	0.597				
OIS	0.581	0.728			
PCDG	0.623	0.494	0.523		
SAT	0.594	0.581	0.453	0.543	
Fornell-Lacker criterion					
	CC	IO	OIS	PCDG	SAT
CC	0.819				
IO	0.497	0.759			
OIS	0.463	0.571	0.803		
PCDG	0.528	0.414	0.410	0.794	
SAT	0.530	0.510	0.398	0.485	0.881

The results in Table III demonstrate an adequate overall fit of the structural model, empirically supporting the relationship between the dimensions of Personal Learning Environments, specifically online information search, information organization, creative collaboration, and participation in communities and discussion groups, and academic satisfaction. The SRMR value of 0.058, in both the saturated and estimated models, is below the recommended threshold of 0.08, indicating a low discrepancy between the observed and model-estimated correlations. Additionally, the d_ULS (0.859) and d_G (0.319) indices show consistent values, confirming the stability and coherence of the proposed model for explaining learning processes in self-regulated digital environments.

Regarding the chi-square statistic ($\chi^2 = 540.033$), its interpretation should be approached with caution due to its sensitivity to sample size. Therefore, it is methodologically pertinent to prioritize alternative fit indicators in the PLS-SEM approach. The NFI = 0.848, although slightly lower than the reference value of 0.90, can be considered acceptable for explanatory models in the educational field, especially when analyzing complex constructs related to Personal Learning Environments. Overall, these results confirm the model's structural validity and provide a solid basis for interpreting the effects of information management and online social interaction strategies on students' academic satisfaction.

TABLE III
MODEL FIT

	Saturated model	Estimated model
SRMR	0.058	0.058
d ULS	0.859	0.859
d G	0.319	0.319
Chi-square	540.033	540.033
NFI	0.848	0.848

The results in Figure 1 show that the structural model achieves a moderate level of explanation for the dependent variable, as the coefficient of determination ($R^2 = 0.397$) indicates that the predictor variables online information search (OIS), information organization (IO), creative collaboration (CC), and participation in communities and discussion groups (PCDG) together explain 39.7% of the variance in academic satisfaction (SAT). This value is consistent with explanatory studies in the field of Personal Learning Environments (PLEs), where SAT is conceived as a multidimensional construct influenced by cognitive and social practices mediated by digital technologies.

The analysis of bivariate relationships, based on standardized regression coefficients (β), reveals differentiated contributions from each predictor. Information organization (IO) shows a positive and statistically significant effect on SAT ($\beta = 0.270$; $p < 0.001$), suggesting that students' ability to structure and manage digital information is directly associated with higher levels of academic satisfaction. Similarly, creative collaboration (CC) ($\beta = 0.266$; $p < 0.001$) and participation in communities and discussion groups (PCDG) ($\beta = 0.221$; $p = 0.001$) show positive and significant relationships, demonstrating that collaborative interaction and active participation in learning communities strengthen the academic experience. In contrast, online information search (OIS) does not show a significant relationship with SAT ($\beta = 0.030$; $p = 0.558$), indicating that online information search, considered in isolation, is not enough to increase academic satisfaction if it is not integrated with the organizational, collaborative, and social participation processes characteristic of PLEs (Personal Learning Environments).

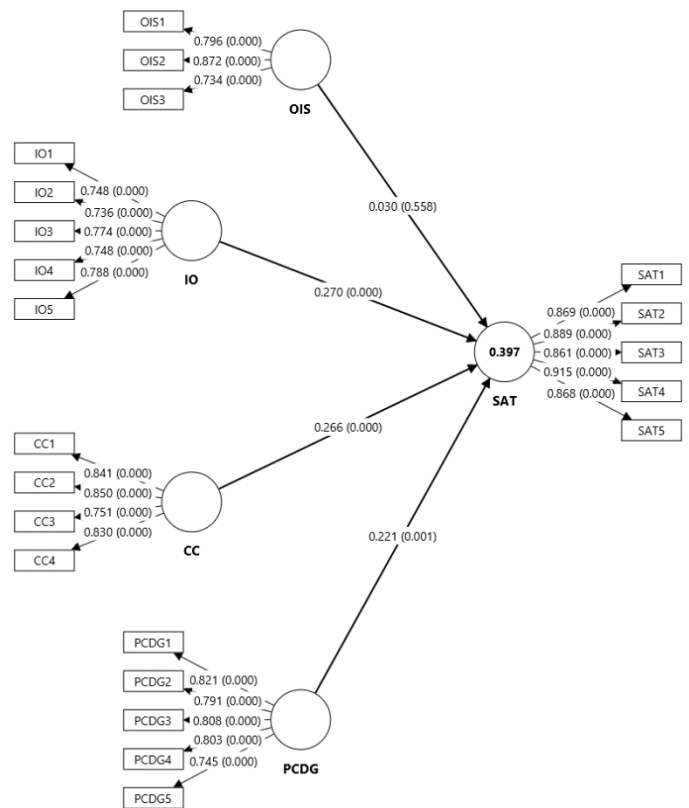


Figure 1 Results of the explanatory model – PLS-SEM.

The results in Table IV partially confirm the hypothesized model and allow us to understand, from the perspective of Personal Learning Environments (PLEs), which digital practices significantly influence academic satisfaction (SAT). First, hypothesis H1, which posits a direct relationship between creative collaboration (CC) and SAT, is confirmed ($\beta = 0.266$; $t = 3.803$; $p < 0.001$). This result indicates that co-creation dynamics, the exchange of ideas, and collaborative work in digital environments are key factors in improving students' academic experience, reinforcing the social and constructivist nature of PLEs.

Consistently, hypothesis H2, which evaluates the effect of information organization (IO) on SAT, is also empirically supported ($\beta = 0.270$; $t = 4.147$; $p < 0.001$). This finding demonstrates that a student's ability to efficiently structure, classify, and manage digital information is positively associated with higher levels of academic satisfaction. In the context of Personal Learning Environments (PLEs), this result underscores the importance of cognitive self-regulation and information management skills as central elements for meaningful and satisfying learning.

Conversely, hypothesis H3, which proposes a direct relationship between online information search (OIS) and SAT scores, is not supported ($\beta = 0.030$; $t = 0.586$; $p = 0.558$). This result suggests that, considered in isolation, simply searching for information online does not have a significant impact on academic satisfaction. From a theoretical perspective, this

finding reinforces the idea that access to digital information is a necessary but not sufficient condition, and that its educational value depends on how that information is organized, interpreted, and shared within the student's PLE.

Finally, hypothesis H4, which examines the effect of participation in communities and discussion groups (PCDG) on SAT, is confirmed ($\beta = 0.221$; $t = 3.469$; $p = 0.001$). This result demonstrates that active participation in learning communities and discussion groups fosters meaning-making, peer support, and academic engagement, which translates into higher levels of satisfaction. Overall, the results in Table IV show that academic satisfaction in PLEs is primarily determined by information organization processes, creative collaboration, and social participation, rather than simply searching for information online. This has significant implications for pedagogical design and the promotion of self-regulated learning in higher education.

TABLE IV
HYPOTHESIS TESTING

Hypothesis	β	M	STDEV	t	p	Result
H1: CC -> SAT	0.266	0.262	0.070	3.803	0.000	Supported
H2: IO -> SAT	0.270	0.272	0.065	4.147	0.000	Supported
H3: OIS -> SAT	0.030	0.034	0.051	0.586	0.558	Not Supported
H4: PCDG -> SAT	0.221	0.222	0.064	3.469	0.001	Supported

IV. DISCUSSION AND CONCLUSIONS

The aim of this research was to analyze the influence of a set of key competencies in the management of Personal Learning Environments (PLEs) on academic satisfaction among university students. The results of the structural model show that information organization, creative collaboration, and participation in communities and discussion groups have positive, statistically significant effects on academic satisfaction, whereas online information searching does not have a significant direct effect. These findings provide a deeper understanding of the role that cognitive and social competencies play in PLEs within the student's academic experience.

First, the positive influence of information organization on academic satisfaction confirms that the ability to effectively structure, classify, and manage digital resources is a central element of self-regulated learning. This result is consistent with previous studies indicating that proper organization of information reduces cognitive overload, increases the perception of control, and fosters more satisfying learning experiences (Jiménez-Bucarey et al., 2021; Dinh et al., 2022; Semerikov et al., 2025). In the context of Personal Learning Environments (PLEs), this finding reinforces the idea that access to multiple digital resources is not enough; students must also possess the skills to integrate them effectively into their learning process.

Furthermore, the results show that creative collaboration has a significant effect on academic satisfaction, highlighting the importance of co-constructing knowledge and creative exchange in digital environments. This finding aligns with research that emphasizes that collaborative interaction

promotes engagement, a sense of shared achievement, and academic belonging—factors closely linked to student satisfaction (Sabah, 2022; Tan et al., 2021; Kassab et al., 2024). In PLEs (Personal Learning Environments), creative collaboration transcends individual learning and strengthens the social dimension of learning, contributing to more meaningful academic experiences.

Complementarily, participation in communities and discussion groups also has a positive and significant effect on academic satisfaction. This result confirms that social interaction, peer support, and active participation in discussion spaces promote academic well-being and a positive perception of the educational environment. Previous studies have indicated that participation in learning communities increases motivation, persistence, and academic integration, especially in virtual and blended learning environments (Sharif Nia et al., 2023; Wong & Chapman, 2022; Jumaa et al., 2025). In this sense, the results reinforce the idea that effective PLEs incorporate not only individual tools but also social dynamics that strengthen the learning experience.

Conversely, online information searching does not show a significant direct effect on academic satisfaction. This finding suggests that information seeking, while a basic competency within PLEs, is not sufficient on its own to generate academic satisfaction. This result is consistent with studies indicating that the impact of information seeking depends on its integration with processes of knowledge organization, reflection, and socialization (Dinh et al., 2022; Martin & Bolliger, 2022). Consequently, information seeking should be understood as a necessary, but not determining, condition within PLEs.

Overall, the model explains a moderate percentage of the variance in academic satisfaction, which is consistent with the multifactorial nature of this construct. The results confirm that academic satisfaction in university contexts is strongly linked to how students manage their PLEs, especially in terms of cognitive organization and social participation, rather than simply access to digital information.

The results of this research indicate that the academic satisfaction of university students is significantly influenced by key competencies in managing Personal Learning Environments (PLEs). In particular, information organization, creative collaboration, and participation in communities and discussion groups are configured as relevant predictors of a positive academic experience.

In contrast, online information retrieval, while a fundamental component of PLEs, does not have a significant direct effect on academic satisfaction, demonstrating that access to digital information does not, in itself, guarantee satisfactory learning experiences. This finding underscores the need to promote more complex cognitive and social skills that enable the transformation of information into meaningful knowledge.

From a theoretical perspective, the study provides empirical evidence that reinforces the PLE approach as a comprehensive explanatory framework for university learning

in digital contexts. The results highlight that the most effective PLEs integrate information management strategies and collaborative dynamics, thereby consolidating both the individual and social dimensions of learning.

In practical terms, the findings suggest that higher education institutions should design pedagogical strategies to strengthen information-organization skills, foster creative collaboration, and promote active participation in learning communities. These actions can significantly improve academic satisfaction and, consequently, the well-being and retention of students in university programs.

As limitations of the study and directions for future research, it should be noted that the cross-sectional design restricts the possibility of establishing causal inferences between competencies in managing personal learning environments and academic satisfaction, since the relationships were examined at a single point in time. Likewise, the findings should be interpreted with caution because the model was tested in a specific university context, which may limit its generalisability to other institutional settings. Future studies should validate the model in different universities, academic programmes, and educational contexts, as well as employ longitudinal designs to examine how students' personal learning environments evolve and influence academic satisfaction over time. In addition, future research could incorporate mediating variables, such as self-regulated learning, digital engagement, or perceived usefulness of digital resources, and moderating variables, such as academic year, field of study, digital competence, or institutional support. From a practical perspective, universities should strengthen students' competencies in searching, organising, sharing, and collaboratively producing information through workshops, digital literacy programmes, mentoring strategies, and course-based activities that integrate personal learning environment management into academic tasks.

REFERENCES

- [1] F. Martin and D. U. Bolliger, "Developing an online learner satisfaction framework in higher education through a systematic review of research," *International Journal of Educational Technology in Higher Education*, vol. 19, no. 1, 2022, doi: 10.1186/s41239-022-00355-5.
- [2] S. O. Semerikov, P. P. Nechypurenko, T. A. Vakaliuk, I. S. Mintii, and L. O. Fadieieva, "Differential effects of Moodle course design on student subpopulations: advancing personalized learning in higher education," *Smart Learning Environments*, vol. 12, no. 1, 2025, doi: 10.1186/s40561-025-00400-6.
- [3] T. C. Dinh, P. B. N. Nguyen, T. T. T. Nguyen, X. M. T. Ngo, and A. T. L. Nguyen, "The Predictors of Students' Satisfaction and Academic Achievements in Online Learning Environment in Higher Education," *Vietnam Journal of Education*, vol. 6, no. 1, pp. 80–92, 2022, doi: 10.52296/vje.2022.132.
- [4] Y. Xiang, M. R. B. Ismail, and B. C. Y. Fah, "Exploring the Relationship between Learning Environment and Academic Performance in Chinese Vocational Schools: The Mediating Role of Student Satisfaction," *Sumerianz Journal of Education, Linguistics and Literature*, vol. 7, no. 3, pp. 37–44, 2024, doi: 10.47752/sjell.73.37.44.
- [5] S. E. Kassab, R. Rathan, D. C. M. Taylor, and H. Hamdy, "The impact of the educational environment on student engagement and academic performance in health professions education," *BMC Med Educ*, vol. 24, no. 1, p. 1278, Nov 7 2024, doi: 10.1186/s12909-024-06270-9.
- [6] H. Sharif Nia *et al.*, "Student satisfaction and academic efficacy during online learning with the mediating effect of student engagement: A multi-country study," *PLoS One*, vol. 18, no. 10, p. e0285315, 2023, doi: 10.1371/journal.pone.0285315.
- [7] P. Yidana, "Predictors of the Higher Education Psychosocial Learning Environment: Students' Perspectives," *International Journal of Social Science and Human Research*, vol. 08, no. 01, 2025, doi: 10.47191/ijsshr/v8-i1-86.
- [8] C. I. Maican *et al.*, "The role of contextual and individual factors in successful e-learning experiences during and after the pandemic – a two-year study," *Journal of Computers in Education*, vol. 12, no. 2, pp. 589–624, 2024, doi: 10.1007/s40692-024-00323-0.
- [9] O. G. Aguilar, F. T. Apaza, and S. C. Huanca, "Influencing factors in perceived learning mediated by satisfaction in university students in times of Covid-19," in *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology*, 2022, vol. 2022-July, doi: 10.18687/LACCEI2022.1.1.586.
- [10] K. H. Tan, P. P. Chan, and N.-E. Mohd Said, "Higher Education Students' Online Instruction Perceptions: A Quality Virtual Learning Environment," *Sustainability*, vol. 13, no. 19, 2021, doi: 10.3390/su131910840.
- [11] C. Jiménez-Bucarey, Á. Acevedo-Duque, S. Müller-Pérez, L. Aguilar-Gallardo, M. Mora-Moscoto, and E. C. Vargas, "Student's Satisfaction of the Quality of Online Learning in Higher Education: An Empirical Study," *Sustainability*, vol. 13, no. 21, 2021, doi: 10.3390/su132111960.
- [12] N. M. Sabah, "The Impact of Social Media-Based Collaborative Learning Environments on Students' Use Outcomes in Higher Education," *International Journal of Human-Computer Interaction*, vol. 39, no. 3, pp. 667–689, 2022, doi: 10.1080/10447318.2022.2046921.
- [13] W. H. Wong and E. Chapman, "Student satisfaction and interaction in higher education," *High Educ (Dordr)*, vol. 85, no. 5, pp. 957–978, 2023, doi: 10.1007/s10734-022-00874-0.
- [14] Z. Y. Jumaa *et al.*, "The impact of educational environment on academic thriving among medical students: insights from a multinational cross-sectional survey," *BMC Med Educ*, vol. 25, no. 1, p. 1449, Oct 21 2025, doi: 10.1186/s12909-025-08053-2.
- [15] A. G. Carter, D. K. Creedy, and M. Sidebotham, "Evaluation of tools used to measure critical thinking development in nursing and midwifery undergraduate students: a systematic review," *Nurse Educ Today*, vol. 35, no. 7, pp. 864–74, Jul 2015, doi: 10.1016/j.nedt.2015.02.023.
- [16] O. Gutierrez-Aguilar, F. Ticona-Apaza, G. Callinaupa-Quispe, A. Duche-Perez, L. Salas-Valdivia, and S. Chicana-Huanca, "Ease of use and perceived usefulness and its influence on motivation, collaboration and behavioral intention in university students in times of Covid-19," in *2022 17th Latin American Conference on Learning Technologies, LACLO 2022*, 2022, doi: 10.1109/LACLO56648.2022.10013372.
- [17] A. Kobicheva, E. Tokareva, and T. Baranova, "Students' Affective Learning Outcomes and Academic Performance in the Blended Environment at University: Comparative Study," *Sustainability*, vol. 14, no. 18, 2022, doi: 10.3390/su141811341.
- [18] O. G. Aguilar, A. B. Duche Perez, and A. G. Aguilar, "Teacher performance evaluation model in Covid-19 times," in *Proceedings of the 15th Latin American Conference on Learning Technologies, LACLO 2020*, 2020, doi: 10.1109/LACLO50806.2020.9381159.
- [19] O. Gutiérrez-Aguilar and L. Salas-Valdivia, "Collaborative learning: The educational perspective of facebook," in *Proceedings - 14th Latin American Conference on Learning Technologies, LACLO 2019*, 2019, pp. 348–352, doi: 10.1109/LACLO49268.2019.00065.