Critical factors in hybrid learning environments[1]

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Abstract

This research examined the perceptions of students and graduates of hybrid doctoral courses regarding course design, teaching and learning activities, virtual educational platforms, interaction, evaluation techniques and overall perception. The researchers used quantitative methodology with a cross-sectional survey design and a self-administered questionnaire with 33 participants. The results revealed high satisfaction with the course design and teaching activities. The participants appreciated the flexibility and accessibility of the virtual educational platform, although they reported occasional technical issues. They highlighted interaction as a crucial factor for the success of the course. The findings suggest that hybrid courses effectively meet the needs of adult learners.

Keywords: hybrid learning, adult learning, interactive communication.

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Factores críticos en ambientes de aprendizaje híbrido

Resumen
Esta investigación indaga sobre las percepciones de estudiantes y egresados de cursos doctorales híbridos en términos de diseño del curso, actividades de enseñanza y aprendizaje, plataformas educativas virtuales, interacción, técnicas de evaluación y percepción general. Se empleó una metodología cuantitativa con un diseño de encuesta transversal y un cuestionario autoadministrado a 33 participantes. Los resultados revelaron una alta satisfacción con el diseño del curso y las actividades de enseñanza. La flexibilidad y accesibilidad de la plataforma educativa virtual fueron bien valoradas, aunque se reportaron problemas técnicos ocasionales. La interacción se destacó como un factor crucial para el éxito del curso. Los hallazgos sugieren que los cursos híbridos se ajustan eficazmente a las necesidades de los estudiantes adultos.

Palabras clave: aprendizaje híbrido, aprendizaje en adultos, comunicación interactiva.

Fatores críticos em ambientes de aprendizagem híbrida

Resumo
Esta pesquisa investigou as percepções de estudantes e graduados de cursos doutorais híbridos em relação ao design do curso, às atividades de ensino e aprendizagem, às plataformas educacionais virtuais, à interação, às técnicas de avaliação e à percepção geral. Para isso, empregou-se uma abordagem quantitativa, com um delineamento transversal e a aplicação de um questionário autoadministrado a 33 participantes. Os resultados indicaram um alto nível de satisfação com o design do curso e as atividades de ensino. A flexibilidade e a acessibilidade da plataforma educacional virtual foram bem avaliadas, embora tenham sido relatados problemas técnicos ocasionais. A interação foi destacada como um fator crucial para o sucesso do curso. Os achados sugerem que os cursos híbridos atendem de forma eficaz às necessidades dos estudantes adultos.

Palavras-chave: aprendizagem híbrida, aprendizagem de adultos, comunicação interativa.

1. Introduction

In a world where technology constantly redefines the boundaries of education, hybrid learning emerges as a transformative educational model that integrates digital culture and 21st-century skills. The acquisition of essential competencies - including critical thinking, digital literacy, collaborative problem-solving and adaptability - plays a crucial role in equipping students to navigate and

succeed in the rapidly evolving digital landscape. The synergistic combination of in-person and digital instruction not only extends the reach of knowledge but also personalizes and enriches learning in ways unimaginable just a decade ago (Picciano, 2018). Hybrid learning fosters digital fluency, enabling students to navigate, analyze, and synthesize information across various digital platforms, preparing them for increasingly technology-driven professional environments.

The combination modality has received a variety of names: b-learning, blended learning, mixed learning, and hybrid learning environments or hybrid learning (Cabero-Almenara, 2024). This teaching modality is not a passing trend: it is an inevitable evolution driven by the need for accessibility, flexibility, and pedagogical effectiveness in a globalized educational environment (Graham, 2013). The incorporation of digital tools in hybrid education enhances interactive learning experiences, promotes self-directed learning, and fosters engagement through diverse multimedia resources and adaptive learning platforms.

The University of Puerto Rico, Río Piedras Campus (UPRRP), has not only adopted hybrid learning but has made it a key strategy for expanding academic offerings and meeting the demands of a diverse and ever-changing student population. Since they were approved by the Puerto Rico Higher Education Council (CES), hybrid courses have increased, transforming the way students interact with knowledge and with their educators (Lugo et al., 2016). However, despite this growth, student perceptions of this modality remain under-explored, especially in local contexts such as Puerto Rico (Vale & Calderón, 2010).

The importance of researching student perceptions lies in the fact that they are the main beneficiaries and critics of the educational system. Understanding their experiences and opinions can provide valuable information for the continuous improvement of hybrid programs, ensuring that these are not only innovative but also effective and aligned with students' needs and expectations (Vásquez, 2016). In particular, doctoral students in the education program with a sub-specialization in learning technology offer a unique and profound perspective on the challenges and benefits of hybrid learning due to their advanced training and focus on educational technology.

This study investigates students' perceptions regarding course design, instructional activities, digital learning platforms, social interaction and assessment techniques. More importantly, it situates these perceptions within the broader discourse on digital literacy, technological fluency, and the methodological rigor required to enhance hybrid learning environments

(Bates, 2020). By doing so, this research contributes to the continuous improvement of hybrid programs and provides a replicable methodological approach applicable across different educational contexts.

2. Theoretical Framework

2.1. Hybrid Learning Environments

Hybrid learning, also known as blended learning (Chaeruman & Maudiarti, 2018), has emerged as an innovative educational strategy that combines elements of traditional face-to-face learning with digital technologies in online environments (Semanate-Quiñonez et al., 2021; Mejía Gallegos et al., 2017). The key considerations include the misconception that hybrid education merely consists of alternating in-person and online sessions; the need to be creative and imaginative in blending spaces for educational transformation, and the use of information and communication technologies (ICT) and active methodologies in the teaching process, ensuring that faculty are adequately trained to develop their professional activity with a hybrid teaching model (Cabero-Almenara, 2024).This approach has gained popularity in higher education due to its ability to enhance accessibility, flexibility, and the personalization of learning (Balladares Burgos, 2018; Aguilar Abanto et al., 2022).

Recent research highlights that hybrid learning not only improves students' learning experience but also strengthens their digital skills, learning autonomy and technological proficiency (Corsi et al., 2021; Avellaneda, 2022). The incorporation of digital platforms and adaptive learning tools fosters self-regulated learning while allowing educators to customize content based on student needs. Additionally, it allows teaching processes to be adapted to different learning styles and individual needs, promoting a more inclusive and effective educational environment (Ramírez et al., 2024).

Hybrid learning spaces have the flexibility and ability to integrate diverse educational resources, facilitating the creation of richer and more dynamic learning experiences (Mejía Gallegos et al., 2017; Moreira et al., 2022). This flexibility benefits not only university students but also faculty, allowing them to design learning environments better suited to the current demands of digital education (Balladares Burgos, 2018; Corsi et al., 2021).

Hybrid learning therefore represents a significant evolution in higher education, offering unique opportunities to improve educational quality and prepare students for future challenges (Semanate-Quiñonez et al., 2021; Aguilar Abanto et al., 2022).

2.2. Andragogy and Motivation in Hybrid Education

Andragogy, based on Knowles' principles (1980), emphasizes the autonomy and prior experience of adult learners, characteristics that naturally align with the principles and benefits of hybrid education. In this context, educational design must adopt an environmental vision that integrates both physical and virtual learning spaces, ensuring a seamless learning experience. As education increasingly shifts toward the hybridization of modalities, courses are more likely to incorporate online sessions interwoven with face-to-face interactions, independent study, and opportunities for both individual and collective learning (Chan, 2021). The mediational model, grounded in communicative principles, highlights the importance of structuring interactions thoughtfully, balancing logistical aspects with the deeper generation of meaning in learning (Chan, 2021).

Knowles proposed that adults are more likely to be self-directed in their learning, prefer relevant learning, and apply what they have learned directly to practical situations. In the context of hybrid education, this translates into students having greater control over how, when, and where they access educational content, leveraging the temporal and spatial flexibility offered by combined virtual and face-to-face environments (Merriam & Bierema, 2013; Cox, 2008). This flexibility enables adult learners to align their academic commitments with their professional and personal responsibilities, ultimately enhancing their educational experience.

Doctoral students, benefiting from this approach, can deepen their understanding of complex theories through the practical application of acquired knowledge in virtual simulations or face-to-face discussions, strengthening their academic and professional development (Brookfield, 2015).

On the other hand, Ryan and Deci's self-determination theory (2020) underscores the importance of autonomy, competence, and social relationships in students' intrinsic motivation. Hybrid learning for doctoral students reinforces autonomy by providing them with the opportunity to choose between different learning modalities and adapt the pace of study to their individual needs (Ryan & Deci, 2020; Reeve, 2018). Additionally, integrating face-to-face and virtual elements helps students to demonstrate competencies in various contexts, increasing their perception of competence and strengthening their confidence in future professional skills (Vansteenkiste & Ryan, 2013).

Social interaction in hybrid environments is also crucial, because it provides students with opportunities to build professional networks and receive forma-

tive feedback, essential aspects for their professional and academic development (Deci & Ryan, 2000). According to Dewi et al. (2017), hybrid learning environments facilitate high-quality interaction between teachers and students and develops greater trust and empathy through meeting face-to-face. Current digital technology, such as group video calls, allows for close human interaction (Moran, 2012), "humanizing" these learning environments. However, there are some drawbacks, such as limited bandwidth and high cost, which can exclude certain groups and create new inequalities (Molina et al., 2015). Tedesco (2014) emphasizes that information technologies do not define social objectives by themselves; their impact depends on the social and pedagogical models in which they are used.

The combination of andragogical principles with the specific characteristics of hybrid education therefore not only improves education quality but also enriches doctoral students' learning experience. By focusing on autonomy, perceived competence and social relationships, hybrid environments effectively prepare students to face future challenges with confidence and skill in their respective professional fields.

3. Methodology

The research was quantitative with a cross-sectional survey design. The study population included the students and graduates of the doctoral program in education with a specialization in learning technology at UPRRP who had completed a hybrid course at the doctoral level. Participants were selected through non-probabilistic convenience sampling.

Data was collected using a self-administered questionnaire via Google Forms. The questionnaire development process occurred in two main phases. In the first, the survey objectives were defined during the instrument design, and the questions were designed, selected, and tested, following the guidelines established by Fowler (2014).

The second phase, the questionnaire development, was divided into three specific stages. The initial questionnaire was developed and adjusted through expert judges' evaluation and cognitive interviews with students. Subsequently, the researchers collected additional evidence of validity related to the content and response process to evaluate and adjust the questionnaire based on the feedback received. Finally, they incorporated the recommendations, and drafted the version of the questionnaire used in the pilot study.

3.1. Data Analysis

Following the procedure recommended by Medina-Díaz (2010) to analyze the responses:

1. Data Review and Coding:
- Review of participants' responses.
- Coding responses by assigning numerical values and variable types in a codebook.
- Exporting data from Google Forms to SPSS version 23.

2. Descriptive Analysis:
- Calculation of central tendency measures, frequencies, and percentages.

3. Factor Analysis and Correlation:
- Exploratory factor analysis (EFA) of the interaction and overall perception subscales, using the principal components method and Varimax rotation.
- Calculation of Pearson correlation coefficient between subscale scores.

4. Reliability Analysis:
- Calculation of Cronbach's alpha coefficient for each subscale.
- Comparison of pilot study results and formal study results.
- This procedure facilitated a detailed and rigorous analysis of the data.

4. Results and Discussion

4.1. Reliability Analysis

To estimate the internal consistency of the questionnaire subscales, the researchers conducted reliability analyses by calculating the Cronbach's alpha coefficient. These analyses were applied to both the pilot study (α_{pilot}) and the formal study (α_{formal}).

Table 1 shows that α_{formal} for all subscales and the total scale is classified as excellent according to George and Mallery (as cited in Gliem and Gliem, 2003). The αpilot is excellent in most subscales, except for two, where it is considered good. Most of the formal administration coefficients exceed those of the pilot study, which is expected since the reliability coefficient increases with the number of cases.

Table 1. *Cronbach's Alpha Coefficient and Categorization According to George & Mallery*

Scale	N° of Items	α_{pilot}	α_{formal}	George & Mallery (2003)
Course Design	13	.909	.937	Excellent
Teaching and Learning Activities	12	.913	.924	Excellent
Virtual Education Platform	14	.931	.907	Excellent
Interaction	13	.856	.937	Excellent
Evaluation Techniques	10	.898	.928	Excellent
Overall Perception	13	.967	.982	Excellent
Total Scale	75	.981	.980	Excellent

Categorization of Cronbach's Alpha internal consistency coefficient according to George & Mallery (2003): α ≥ .90 excellent, .80 ≤α ≥.89 good, .70 ≤α ≥ .79 acceptable, .60 ≤α ≥.69 questionable, .50 ≤α ≥ .59 poor and .50 ≤α unacceptable.

4.2. Comparison of Internal Consistency Coefficients

The researchers calculated whether there was a statistically significant difference between the internal consistency coefficients α_{pilot} and α_{formal} for each subscale of the questionnaire. They used a statistical program in R (Diedenhofen & Musch, 2016), and compared the following hypotheses:

- Null Hypothesis: α_{pilot} is equal to α_{formal}.
- Alternative Hypothesis: α_{pilot} is not equal to α_{formal}.

The analysis revealed no statistically significant difference between α_{pilot} and α_{formal} for all subscales except for the interaction subscale (Table 2).

Table 2. *Comparison of Internal Consistency Coefficients* α_{pilot} *and* α_{formal}.

Scale	N° of Items	α_{pilot} (***n*** **= 26)**	α_{formal} (***n*** **= 33)**	$X^2_{(1)}$
Course Design	13	0.909	0.937	0.8157 (p=0.3664)
Teaching and Learning Activities	12	0.913	0.924	0.1083 (p=0.7421)
Virtual Education Platform	14	0.931	0.907	0.5302 (p=0.4665)
Interaction	13	0.856	0.937	4.0965 (p<0.0**5)**
Evaluation Techniques	10	0.898	0.928	0.6971 (p=0.4038)
Overall Perception	13	0.967	0.982	2.2144 (p=0.1367)
Total Scale	75	0.981	0.980	0.0179 (p=0.8935)

4.3. Course Design

The course design addressed planning, clarity of instructions, technical support, the relevance of learning objectives and their alignment with the course activities and resources. It also examined the accessibility and currency of the ICT used.

Table 3. *Frequency and Percentage of Responses: Course Design*

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
1. The course planning is provided from the beginning (e.g., syllabus, activity schedule).	29 (87.9)	3 (9.1)		1 (3)	
2. The syllabus instructions clearly indicate how to start the course activities.	24 (72.7)	5 (15.2)	3 (9.1)	1 (3)	
3. The instructions allow students to find the course components (contents, activities, tasks and grades).	21 (63.6)	10 (30.3)	1 (3)	1 (3)	
4. The professor offers technical support for using the educational platform (support for acquiring knowledge and skills in using the platform).	18 (54.5)	9 (27.3)	2 (6.1)	4 (12.1)	
5. Technical support information for using the educational platform is included (e.g. tutorial videos and instruction manuals).	12 (36.4)	7 (21.2)	7 (21.2)	4 (12.1)	1 (3)
6. The learning objectives are appropriate for the course level.	21 (63.6)	10 (30.3)	1 (3)	1 (3)	
7. The learning objectives describe achievable outcomes.	21 (63.6)	9 (27.3)	1 (3)	1 (3)	1 (3)
8. The relationship between the learning objectives and course activities is clearly established.	22 (66.7)	8 (24.2)	1 (3)	2 (6.1)	
9. The educational resources included in the course support the learning objectives (e.g., books and videos).	21 (63.6)	9 (27.3)	2 (6.1)	1 (3)	
10. The course design facilitates meeting the objectives set by the instructor.	20 (60.6)	9 (27.3)	2 (6.1)	2 (6.1)	
11. The technological tools in the course promote student participation (e.g. chat, forum).	22 (66.7)	6 (18.2)	4 (12.1)	1 (3)	

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
12. The ICT proposed for use in the course were accessible.	23 (69.7)	8 (24.2)	1 (3)	1 (3)	
13. The ICT used in the course were up to date.	20 (60.6)	10 (30.3)	1 (3)	1 (3)	1 (3)

Notes. $n = 33$. *f* = frequency. *P* = percentage. Instances where percentages do not total 100 percent are due to rounding error or omitted cases. CDA means strongly agree; DA agree; N neutral; ED disagree and CED strongly disagree.

Table 3 shows that the majority of participants (87.90 percent) strongly agreed that they received the course planning from the beginning, a crucial factor for the effectiveness of learning according to Posey & Pintz (2017). The organization of the course and the teaching-learning process were highlighted as predictors of student satisfaction, according to the literature (Sanjuán Gómez et al., 2011, cited by Zambrano, 2016).

A similar trend was observed in other evaluated aspects, indicating that participants perceived that the course met the established design criteria. However, some participants suggested improvements, such as the need for flexible institutional guidelines for emergencies like the current pandemic, ensuring the quality of learning without compromising its rigor. This concern reflects the sudden adaptations required by education during the pandemic, with a possible transition towards more permanent hybrid educational models (Arias et al., 2020).

Participants also made practical suggestions, such as recording online classes, including small breaks during synchronous classes, and considering internet connectivity issues, which are key for improving the hybrid learning experience. A total of 45.50 percent of the participants emphasized the importance of verifying the communications infrastructure for online meetings, which highlights its impact on the educational experience.

4.4. Teaching and Learning Activities (TLA)

The TLA in the hybrid learning environment were well received by participants, who gave a positive value to aspects such as planning, flexibility, usefulness, comprehension, variety and the ease of achieving learning objectives (Table 4).

Table 4. *Frequency and Percentage of Responses: Teaching and Learning Activities*

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
1. The TLA were useful for my doctoral training.	20 (60.6)	8 (24.2)	3 (9.1)	1 (3)	
2. The TLA were pertinent to the objectives set in the course.	22 (66.7)	8 (24.2)	3 (9.1)		
3. The TLA were planned according to the difficulty level of the content discussed/ addressed in the course.	17 (51.5)	9 (27.3)	6 (18.2)	1 (3)	
4. The TLA were timely for fostering class participation.	21 (63.6)	8 (24.2)	3 (9.1)		1 (3)
5. The TLA were comprehensible because clear instructions were provided.	19 (57.6)	8 (24.2)	4 (12.1)	2 (6.1)	
6. The TLA were varied (a combination of synchronous and asynchronous).	19 (57.6)	8 (24.2)	2 (6.1)	1 (3)	2 (6.1)
7. The TLA were completed according to the schedule established in the course.	20 (60.6)	11 (33.3)			1 (3)
8. The TLA were developed in different educational contexts (face-to-face meetings and online meetings).	19 (57.6)	8 (24.2)	1 (3)		2 (6.1)
9. The TLA were flexible, so could be adjusted to the time available for study.	19 (57.6)	7 (21.2)	4 (12.1)	2 (6.1)	
10. The TLA were collaborative, allowing each student's viewpoint to be reconciled to achieve a common goal.	20 (60.6)	9 (27.3)	2 (6.1)		1 (3)
11. The TLA were planned by the instructor to give students enough time to complete them.	17 (51.5)	12 (36.4)		1 (3)	1 (3)
12. The TLA facilitated achieving the established learning objectives.	22 (66.7)	6 (18.2)	3 (9.1)	1 (3)	

Notes. $n = 33$. f = frequency. P = percentage. Instances where percentages do not total 100 percent are due to rounding error or omitted cases. CDA means strongly agree; DA agree; N neutral; ED disagree and CED strongly disagree.

However, in response to an open-ended question about suggestions, 39.40 percent of the participants felt that, for a hybrid learning experience to be successful, students' prior knowledge of the course topics needs to be evaluated. This aligns with Knowles (1980), who emphasizes the importance of intellectually challenging adults, adapting the difficulty level of activities to maintain

an optimal balance between challenge and skill. According to Ryan & Deci's self-determination theory (2020), the perception of competence is crucial for maintaining students' intrinsic motivation, which highlights the importance of ensuring that they perceive activities as challenging yet achievable.

4.5. Use of the Virtual Learning Platform (VLP) Utilized in the Course

According to the results presented in Table 5, the majority of participants in this study (69.70 percent) used the Moodle VLP. A total of 66.70 percent did not receive any training in its use, while 33.30 percent did, mostly through the course instructors. In general, the participants had a positive perception of the VLP in several of the aspects evaluated, such as ease of use, usefulness for both group and individual activities, and ease of synchronous and asynchronous interaction. However, the lowest percentage of agreement (51.50 percent) was observed in the VLP's ability to search for information in specialized databases, possibly due to the fact that many participants lacked prior preparation in its use.

Table 5. *Frequency and Percentage of Responses: Virtual Learning Platform*

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
1. The VLP is easy to use as its navigation is user-friendly (simple, intuitive).	18 (54.5)	11 (33.3)	1 (3)	2 (6.1)	1 (3)
2. The VLP is useful for performing individual activities.	19 (57.6)	11 (33.3)	3 (9.1)		
3. The VLP is useful for performing group activities.	11 (33.3)	12 (36.4)	6 (18.2)	4 (12.1)	
4. The VLP provides an interactive interface (menus and icons that appear on the screen).	15 (45.5)	10 (30.3)	3 (9.1)	3 (9.1)	1 (3)
5. The VLP lets you see your academic progress.	14 (42.4)	7 (21.2)	5 (15.2)	5 (15.2)	1 (3)
6. The VLP makes the course organization easy to follow.	18 (54.5)	8 (24.2)	4 (12.1)	3 (9.1)	
7. The VLP lets you search for information through links to specialized databases (e.g., ProQuest, EBSCOhost).	13 (39.4)	4 (12.1)	7 (21.2)	6 (18.2)	2 (6.1)
8. The VLP lets you learn anywhere.	21 (63.6)	10 (30.3)	1 (3)		

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
9. The VLP lets you learn at any time.	19 (57.6)	11 (33.3)	2 (6.1)		
10. The VLP promotes greater autonomy in my learning process.	20 (60.6)	8 (24.2)	4 (12.1)		
11. The VLP allows the instructor to answer questions quickly.	13 (39.4)	12 (36.4)	4 (12.1)	2 (6.1)	
12. The VLP facilitates synchronous interaction (chat, call, video calls).	14 (42.4)	11 (33.3)	4 (12.1)	3 (9.1)	
13. The VLP facilitates asynchronous interaction (discussion forum, email, blog).	19 (57.6)	9 (27.3)	2 (6.1)	1 (3)	
14. The VLP can be used on different mobile devices (e.g., laptops, tablets, smartphones).	19 (57.6)	8 (24.2)	3 (9.1)	1 (3)	

Notes. $n = 33$. *f* = frequency. *P* = percentage. Instances where percentages do not total 100% are due to rounding error or omitted cases. CDA means strongly agree; DA agree; N neutral; ED disagree and CED strongly disagree.

Participants' suggestions for improving the experience in a hybrid course included prior preparation of students in the use of the VLP, highlighting the importance of practical workshops and ongoing support. They also emphasized the need to ensure that students possess the minimum required technological skills at the beginning of the course, with 60.60 percent of participants indicating that this was crucial. The availability of adequate technical support for both students and instructors was highlighted by 54.50 percent of participants, underscoring its role in reducing frustration and improving the educational experience in hybrid environments.

4.6. Participants' Perception of Interaction

Participants' perceptions of interaction in the course focused on three types: student-instructor, student-student, and student-content. The results showed that 87.90 percent to 97 percent of participants agreed with student-instructor interaction, 78.80 percent to 94 percent with student-student interaction, and 84.90 percent to 97 percent with student-content interaction (Table 6). This indicates that most participants considered the hybrid course facilitated various forms of interaction.

Table 6. *Frequency and Percentage of Responses: Interaction*

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
1. The professor provided different alternatives for communicating with students (e.g., in person, email, cell phone, and through the virtual learning platform).	21 (63.6)	9 (27.3)	1 (3)	1 (3)	1 (3)
2. The professor responded promptly to messages to clarify doubts.	20 (60.6)	10 (30.3)	1 (3)	1 (3)	1 (3)
3. The professor provided feedback on the tasks performed.	19 (57.6)	10 (30.3)	3 (9.1)	1 (3)	
4. The professor held synchronous meetings to address the content.	25 (75.8)	7 (21.2)	1 (3)		
5. Spaces were provided to work with classmates.	22 (66.7)	9 (27.3)	1 (3)		1 (3)
6. There was enough time for discussions on a topic in online meetings.	22 (66.7)	9 (27.3)		1 (3)	1 (3)
7. There was enough time for discussions on a topic in face-to-face meetings.	17 (51.5)	11 (33.3)		1 (3)	1 (3)
8. Collaborative work was prioritized.	16 (48.5)	10 (30.3)	5 (15.2)	1 (3)	1 (3)
9. The course content was organized.	23 (69.7)	6 (18.2)	3 (9.1)	1 (3)	
10. The established order in the syllabus was followed to develop the course content.	19 (57.6)	11 (33.3)	2 (6.1)		1 (3)
11. The resources (e.g., videos and readings) were relevant to the required tasks.	22 (66.7)	10 (30.3)		1 (3)	
12. The content presented was easy to understand.	19 (57.6)	9 (27.3)	4 (12.1)		1 (3)
13. Interaction with classmates contributed to learning.	20 (60.6)	10 (30.3)	2 (6.1)		1 (3)

Notes. $n = 33$. f = frequency. P = percentage. Instances where percentages do not total 100 percent are due to rounding error or omitted cases. CDA means strongly agree; DA agree; N neutral; ED disagree and CED strongly disagree.

These findings are consistent with the literature, suggesting that hybrid learning environments foster high-quality interactions between instructors

and students (Dewi et al., 2017), as they combine face-to-face and virtual elements, generating greater trust and empathy. Additionally, Ryan & Deci's Self-Determination Theory (2000) underscores the importance of the need for relatedness and belonging for intrinsic motivation, while Knowles (1980) emphasizes the need for adult learners to feel accepted and supported.

Quality Matters (QM) standards emphasize the importance of interaction in hybrid courses, suggesting establishing clear policies for instructor-student interaction from the beginning of the course. Social interactions and collaborative learning are fundamental for adults to prefer hybrid learning environments in their graduate studies (Morán, 2012), while Kistow (2011) highlights adults' preference for social interaction.

4.7. Evaluation Techniques (TPE) Used in the Hybrid Course

According to the results presented in Table 7, most participants agreed with various aspects of the evaluation techniques in the hybrid course. These aspects include the clarity and sequencing of evaluation policies from the beginning of the course, and the variety and appropriateness of evaluations to the course level. The participants also highlighted the importance of providing multiple opportunities to track learning progress with timely feedback, principles which are aligned with QM standards for quality hybrid courses.

Table 7. *Frequency and Percentage of Responses: Evaluation Techniques*

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
1. The TPE measured the established learning objectives.	20 (60.6)	10 (30.3)		2 (6.1)	
2. The TPE offered varied alternatives to measure learning (e.g., written work, oral presentation).	21 (63.6)	10 (30.3)	1 (3)	1 (3)	
3. The TPE provided specific criteria to be met in the tasks performed.	20 (60.6)	8 (24.2)	2 (6.1)	2 (6.1)	1 (3)
4. The TPE were applied at different times during the learning experience and not just at the end.	20 (60.6)	10 (30.3)		2 (6.1)	
5. The TPE employed varied options to demonstrate my mastery of the topic.	17 (51.5)	11 (33.3)	2 (6.1)	3 (9.1)	
6. The TPE provided a guide for developing course assignments.	19 (57.6)	7 (21.2)	3 (9.1)	4 (12.1)	

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
7. The TPE allowed measuring my skill level in applying acquired skills (e.g., a project).	21 (63.6)	8 (24.2)	2 (6.1)	1 (3)	
8. The TPE provided space for student-professor feedback that contributed to strengthening my learning.	21 (63.6)	5 (15.2)	5 (15.2)	1 (3)	
9. The TPE provided space for student-student feedback that helped strengthen my learning.	20 (60.6)	7 (21.2)	5 (15.2)	1 (3)	
10. The TPE provided resources to monitor my academic progress.	16 (48.5)	9 (27.3)	4 (12.1)	1 (3)	1 (3)

Notes. n =33. f= frequency. P= percentage. Instances where percentages do not total 100 percent are due to rounding error or omitted cases. CDA means strongly agree; DA agree; N neutral; ED disagree and CED strongly disagree.

Among the suggestions to improve the experience in hybrid courses, 39.40 percent of participants emphasized the evaluation of students' prior knowledge at the beginning of the course. They also mentioned the need for instructors to provide clear and consistent rubrics for all evaluative activities, and one participant requested guidance through the rubrics for the final assignment.

Although participants favoured Item 10 ("The TPE provided resources to monitor my academic progress") least within the subscale (75.80 percent in the CDA or DA categories), in general most perceived the techniques used positively. These results highlight the importance of ensuring transparency, variety, and continuous support in evaluation practices in hybrid learning environments.

4.8. Participants' General Perception of their Experience in a Hybrid Learning Environment

The study participants predominantly expressed a positive perception of the hybrid learning environment, as evidenced by the predominant selection of the CDA or DA categories in the evaluative items (Table 8). Notably these include the flexibility to access course content online at any time (item 4), interactions among students (item 11), and interactions between students and instructors (item 12). The use of hybrid learning environments should be promoted to fully understand their potential in a 'normal' context and analyze the possibilities they offer for education and student acceptance. However, this requires visionary leadership in universities and a greater culture of innovation (Cabero-Almenara, 2024).

Table 8. *Frequency and Percentage of Responses: General Perception.*

Item	CDA *f (P)*	DA *f (P)*	N *f (P)*	ED *f (P)*	CED *f (P)*
1. The course was intellectually stimulating.	19 (57.6)	7 (21.2)	2 (6.1)	2 (6.1)	1 (3)
2. The course permitted the learning of valuable content.	21 (63.6)	6 (18.2)	2 (6.1)	1 (3)	1 (3)
3. The course provided the opportunity to study at my own pace.	19 (57.6)	9 (27.3)		2 (6.1)	1 (3)
4. The course promoted flexibility to access class content online at any time.	23 (69.7)	7 (21.2)		1 (3)	1 (3)
5. The course increased my opportunities to access supplementary information.	21 (63.6)	7 (21.2)	1 (3)	2 (6.1)	1 (3)
6. The course fostered the development of written communication skills.	18 (54.5)	7 (21.2)	3 (9.1)	2 (6.1)	1 (3)
7. The course fostered the development of oral communication skills.	18 (54.5)	7 (21.2)	3 (9.1)	2 (6.1)	1 (3)
8. The course provided a pleasant learning experience.	19 (57.6)	8 (24.2)	2 (6.1)	1 (3)	1 (3)
9. The course met my prior expectations.	18 (54.5)	8 (24.2)	2 (6.1)	2 (6.1)	1 (3)
10. The course provided the opportunity to reflect on what was learned.	20 (60.6)	8 (24.2)	1 (3)	1 (3)	1 (3)
11. The course allowed interactions among students.	20 (60.6)	10 (30.3)	1 (3)		1 (3)
12. The course allowed interactions between students and content.	20 (60.6)	10 (30.3)			1 (3)
13. The course allowed interactions between students and instructors.	21 (63.6)	8 (24.2)			2 (6.1)

Notes. $n = 33$. f = frequency. P = percentage. Instances where percentages do not total 100 percent are due to rounding error or omitted cases. CDA means strongly agree; DA agree; N neutral; ED disagree and CED strongly disagree.

The flexibility in accessing online content was especially valued by participants, who agreed that this feature allowed them to assume personal, academic, and professional responsibilities more effectively. This finding aligns with previous research that highlights flexibility as one of the main benefits of hybrid learning environments, because it facilitates self-paced study and convenient access to materials and discussions (Donato et al., 2010; Drozd & O'Donoghue, 2007; Ireland et al., 2009; Koch et al., 2010, cited by Posey & Pintz, 2017).

Additionally, the researchers observed that 90.90 percent of participants were employed at the time of completing the questionnaire, and devoted considerable time to their job each week. This social dynamic reflects the need to balance work, family, and academic responsibilities, a common reality among adult students. Hybrid learning environments were appreciated for their ability to offer spatial and temporal flexibility, allowing participants to adapt to technological changes and stay current in their professional fields.

The experience of students in the doctoral program therefore suggests that hybrid learning environments are effective in facilitating the balance between advanced studies, professional careers and personal responsibilities, which emphasizes the importance of flexibility and meaningful interactions as key elements for a satisfactory educational experience.

4.9. Participants' Perception of Interaction and Satisfaction

The study explored the relationship between the perception of interaction and student satisfaction in a hybrid learning environment. The researchers used factor analysis for subscales V and VII to confirm one-dimensionality, and summed the participants' scores on the corresponding items.

After conducting the factor analyses, the researchers calculated total scores for each participant on subscales V (interaction) and VII (general perception) by summing the scores obtained on each item of each subscale. They subsequently calculated Pearson's correlation coefficient *r* between the total scores of subscales V and VII (Table 9).

The calculated Pearson correlation coefficient was r (33) = .798, p = .000, classified as moderately high according to Chan (2003). This indicates that as students perceive greater interaction in the hybrid course, their overall satisfaction with it increases.

Table 9. *Pearson correlation between interaction and general perception*

	Subscale V	Subscale VII
Pearson Correlation	1	.798**
Sig. (2-tailed)		.000
N	33	33
Pearson Correlation	.798**	1
Sig. (2-tailed)	.000	
N	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

These findings are consistent with the literature that highlights the importance of student interaction with content, instructors and peers as determinants of student satisfaction (Swan, 2001; Zambrano, 2016). Furthermore, as noted by Pérez & De Juana (2013), special emphasis must be placed on dialogic learning as an integral part of adult learning.

Students' positive perception of interactions in the hybrid context suggests that these are crucial for promoting a satisfactory educational experience, which underscores the importance of designing courses that actively foster interaction among all participants in the educational process.

5. Conclusions

This research examined the perception of doctoral students regarding course design, teaching and learning activities, the virtual educational platform, interaction, assessment techniques and overall perception in hybrid courses.

The results revealed that most participants were satisfied with the various aspects evaluated in each subscale of the questionnaire. Participants suggested improvements to course design such as having short breaks during synchronous online classes and recording sessions for future reference. They highlighted the planning, flexibility, and usefulness of the teaching and learning activities in achieving learning objectives, and the need to assess students' prior knowledge.

Most participants used the virtual educational platform Moodle, although many did not receive prior training for using it. This highlights the importance of preparation and ongoing technical support to enhance the experience.

Participants considered interaction among students, instructors, and content to be fundamental, which reflects the importance of social relationships and collaborative learning in hybrid courses. The participants also evaluated the assessment techniques positively. Researchers found a moderately high correlation between the perception of interaction and overall student satisfaction with the course, which underscores the importance of fostering meaningful interactions in the design of hybrid courses.

This study provides a solid foundation for future research on factors that positively affect the learning experience in hybrid courses at the graduate level. The researchers recommend using the developed questionnaire as a tool to continuously improve the quality of hybrid courses, with particular emphasis on developing effective interactions between instructors, students and content. Further research could benefit from mixed methodologies to delve into the factors that facilitate or hinder learning in this environment. Additionally, it is

crucial to explore the motivators for choosing hybrid learning and the expansion of the hybrid model to different educational levels.

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