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Experience of using virtual environments applied for learning among students at a Peruvian university

Experiência de uso de ambientes virtuais aplicados à aprendizagem de alunos de uma universidade peruana

Experiencia de uso de entornos virtuales aplicados al aprendizaje en estudiantes de una universidad peruana

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ABSTRACT

This study explores Peruvian university students' perceptions of the use of virtual learning environments (VLEs) at the Faculty of Social Sciences of the National University of the Altiplano. Using a non-experimental, cross-sectional quantitative design, 112 students (fourth-eighth semesters) selected through stratified random sampling were surveyed. The results reveal that 57.1% rated their experience as positive, highlighting the accessibility of materials (22.3%) and the usefulness of videoconferencing (Zoom/Google Meet, 84%). However, challenges persist: 50.9% reported occasional technical problems, and 38.4% perceived VLEs as less effective than face-to-face classes. Teacher-student interaction was rated as moderate (62.5% "moderate"), with 20% reporting communication difficulties. The study is based on the uses and gratifications theory but highlights the need to integrate broader frameworks that consider pedagogical and structural dimensions. Methodological limitations include the cross-sectional design (which prevents causal analysis) and the overrepresentation of women (59.8%) in the sample. The findings underscore the urgency of: (1) improving teacher training in digital tools, (2) optimizing institutional technical infrastructure, and (3) developing strategies to strengthen personalized interaction. This work provides valuable empirical evidence for Latin American contexts, where virtual education—accelerated by the pandemic—requires adjustments that balance accessibility, pedagogical quality, and digital equity. Future research should adopt longitudinal and comparative approaches to assess the impact of institutional interventions on the adoption of VLEs.

Keywords: Virtual learning environments, higher education, student satisfaction, digital divide, digital pedagogy.

RESUMO

Este estudo explora as percepções de estudantes universitários peruanos sobre o uso de ambientes virtuais de aprendizagem (AVAs) na Faculdade de Ciências Sociais da Universidade Nacional do Altiplano. Utilizando um delineamento quantitativo não experimental e transversal, foram entrevistados 112 alunos (4º ao 8º semestre) selecionados por meio de amostragem aleatória estratificada. Os resultados revelam que 57,1% classificaram sua experiência como positiva, destacando a acessibilidade dos materiais (22,3%) e a utilidade da videoconferência (Zoom/Google Meet, 84%). No entanto, os desafios permanecem: 50,9% relataram problemas técnicos ocasionais e 38,4% consideraram as EVAs menos eficazes do que as aulas presenciais. A interação professor-aluno foi classificada como moderada (62,5% "moderada"), com 20% relatando dificuldades de comunicação. O estudo baseia-se na teoria dos usos e gratificações, mas destaca a necessidade de integrar estruturas mais amplas que considerem dimensões pedagógicas e estruturais. As limitações metodológicas incluem o delineamento transversal (que impede a análise causal) e a super-representação de mulheres (59,8%) na amostra. Os resultados sublinham a urgência de: (1) melhorar a formação de professores em ferramentas digitais, (2) otimizar a infraestrutura técnica institucional e (3) desenvolver estratégias para fortalecer a interação personalizada. Este trabalho fornece evidências empíricas valiosas para contextos latino-americanos, onde a educação virtual — acelerada pela pandemia — requer ajustes que equilibrem acessibilidade, qualidade pedagógica e equidade digital. Pesquisas futuras devem adotar abordagens longitudinais e comparativas para avaliar o impacto de intervenções institucionais na adoção de EVA.

Palavras-chave: Ambientes virtuais de aprendizagem, ensino superior. satisfação do aluno, exclusão digital, pedagogia digital.

RESUMEN

Este estudio explora las percepciones de estudiantes universitarios peruanos sobre el uso de entornos virtuales de aprendizaje (EVA) en la Facultad de Ciencias Sociales de la Universidad Nacional del Altiplano. Mediante un diseño cuantitativo no experimental y transversal, se encuestó a 112 estudiantes (4°-8° semestre) seleccionados mediante muestreo estratificado aleatorio. Los resultados revelan que el 57.1% calificó su experiencia como positiva, destacando la accesibilidad de materiales (22.3%) y la utilidad de videoconferencias (Zoom/Google Meet, 84%). Sin embargo, persisten desafíos: el 50.9% reportó problemas técnicos ocasionales y el 38.4% percibió los EVA como menos efectivos que las clases presenciales. La interacción docente-estudiante fue valorada como moderada (62.5% "moderada"), con un 20% reportando dificultades comunicativas, el estudio se sustenta en la teoría de usos y gratificaciones, pero evidencia la necesidad de integrar marcos más amplios que consideren dimensiones pedagógicas y estructurales. Metodológicamente, las limitaciones incluyen el diseño transversal (que impide análisis causales) y la sobrerrepresentación de mujeres (59.8%) en la muestra. Los hallazgos subrayan la urgencia de: (1) mejorar la capacitación docente en herramientas digitales, (2) optimizar la infraestructura técnica institucional, y (3) desarrollar estrategias para fortalecer la interacción personalizada. Este trabajo aporta evidencia empírica valiosa para contextos latinoamericanos, donde la educación virtual —acelerada por la pandemia— requiere ajustes que equilibren accesibilidad, calidad pedagógica y equidad digital. Futuras investigaciones deberían adoptar enfoques longitudinales y comparativos para evaluar el impacto de intervenciones institucionales en la adopción de EVA.

Palabras clave: Entornos virtuales de aprendizaje, educación superior. satisfacción estudiantil, brecha digital, pedagogía digital.

INTRODUCTION

In recent years, higher education has undergone significant transformation due to the adoption of digital technologies. This change has been driven by the need to adapt to an increasingly connected and digitized world, where educational institutions seek to improve the accessibility, flexibility, and quality of education. Virtual teaching-learning platforms have become essential tools to facilitate this process, allowing students to access educational resources, interact with teachers and peers, and participate in academic activities from anywhere and at any time (Incacutipa-Limachi et al., 2024).

The COVID-19 pandemic further accelerated this transition to online education, forcing educational institutions to quickly adopt technological solutions to continue with the teaching-learning process. This context has highlighted the importance of virtual environments in higher education, not only as a temporary alternative, but as a modality that can complement or even replace face-to-face classes in certain contexts (Griselda et al., 2022). However, the implementation of these platforms has also revealed significant challenges, such as the lack of adequate technological infrastructure, the need for training for teachers and students, and the importance of ensuring an effective and satisfying learning experience.

The National University of the Altiplano of Puno (UNA) is no stranger to this trend. Since 2021, UNA has implemented its own virtual platform, called LAURASIA, as part of its institutional quality system. This platform is accessible to all teachers, students and members of the university community through an institutional account provided by the university. LAURASIA offers a variety of tools and resources, such as virtual classrooms, discussion forums, video conferencing, and repositories of teaching materials, that allow students and teachers to interact and collaborate in a digital environment (Rosanigo et al., 2016).

Despite their recent implementation, it is essential to evaluate how students perceive and use these virtual environments, since their effectiveness and acceptance can influence the success of online education. The user experience on these platforms depends not only on the technology itself, but also on factors such as usability, interaction with teachers and peers, the quality of available resources, and the ability of students to adapt to this new learning environment (Arteaga Toro & Osorio Carrera, 2024). In addition, students' perception of the usefulness and effectiveness of virtual environments compared to face-to-face classes is a key aspect that must be explored to identify areas for improvement and ensure a satisfactory learning experience.

This study focuses on the experience of students of the Faculty of Social Sciences of the UNA in the use of virtual environments for their learning. The aim is to understand how students interact with these platforms, what factors influence their satisfaction and what areas require improvement. In addition, students' perception of the usefulness and effectiveness of virtual environments compared to face-to-face classes is analyzed. The results of this study can provide valuable information to improve the implementation and use of virtual environments in higher education, not only at UNA, but also at other institutions facing similar challenges.

In this context, it is important to highlight that the adoption of virtual environments in higher education not only implies the implementation of technology, but also a change in the way the teaching-learning process is conceived and carried out. Students must develop digital skills to navigate and make the most of these platforms, while teachers must adapt their teaching methods to ensure an effective learning experience in a digital environment (Garzón-Domínguez et al., 2024; Orozco Morales & Osorio García, 2024). In addition, educational institutions must ensure that students have access to the necessary resources, such as technological devices and internet connection, to fully participate in online education.

According to Calatayud Mendoza et al. (2022), the study evaluated how psychological stress, measured using the PHQ-9 questionnaire, was related to the academic performance of university students from three programs at the National University of the Altiplano during the COVID-19 pandemic. Through a probit model applied to a sample of 1,064 students, it was concluded that the increase in stress, together with limitations in internet connectivity, significantly increased the risk of deterioration in grades and learning achievements.

This study not only assesses perceptions of usability but also incorporates a critical analysis of how structural inequalities—such as the urban-rural digital divide and differences in cultural capital—mediate the virtual educational experience. Through this approach, we seek to contribute to the global debate on digital education from a Global South perspective, offering empirical evidence to rethink pedagogical models in environments with limited resources but high potential for educational innovation.

Literature review

Use and Gratification

The theory of uses and gratifications of Katz et al., (1973), suggests that people select and use media based on their individual needs and desires (Bello, 1999). Now, in the context of educational digital media, university students can perceive

these media as tools that meet their needs to acquire knowledge, improve skills, and actively participate in their educational environment. This theory focuses on the active role that people play in the choice and use of media. Rather than viewing audiences as passive, this theory posits that people select and use media to satisfy specific needs and desires. This perspective emphasizes understanding why and how people use the media and the gratification they receive.

Valuation of virtual resources

Virtual resource valuation refers to the process of critically evaluating the quality, relevance, and reliability of online resources used to obtain information, learn, or conduct research. In today's digital environment, there are a wealth of resources available, such as websites, databases, e-publications, and online learning platforms. The valuation of these resources is essential to ensure that they are reliable, accurate, and fit for purpose (Santoveña, 2010). In other words, it involves analysis and evaluation of key aspects of resources, such as their quality, usefulness, accessibility, efficacy, safety and relevance. This assessment can be applied to a variety of resources, such as websites, mobile apps, online learning platforms, multimedia content.

Factors Influencing the Perception of Digital Media

Digital media design that embraces usability, aesthetics, and accessibility can have a significant impact on students' perception. Resources with attractive design and intuitive navigation tend to have a higher rating and are more attractive to the user who uses them (Caballero et al., 2022). Another factor that influences perception is previous experience with technology is the familiarity and previous experience of students with technology since they can influence their perception of educational digital media, so students with more solid digital skills can feel more comfortable and find more value in the use of these resources. Finally, another factor comes to be the learning objective since the perception of digital media is closely related to its ability to support learning objectives. Students value positively the resources that facilitate the achievement of specific academic goals (Santoveña, 2010).

Virtual Media Usage Experience

User experience includes students' subjective perceptions as they interact with virtual media. It includes aspects such as immersion, satisfaction, usability, interaction and the emotions experienced when interacting with these media. User experience can vary depending on the type of virtual media, goals, and user profile, within which there is a user experience theory that focuses on how people interact with technology systems and products. In the context of virtual media, perception is closely related to students' experiences, this includes usefulness, usability, and overall satisfaction when using the media (Sangrà, 2001).

Emotion is also considered in relation to digital media (Almenara et al., 2018). This is because students explore how digital media, including virtual media, can generate and manage emotions in them. The experience of use relates to the emotions experienced during interactions with the environment and how these emotions can influence engagement and satisfaction.

The perception of digital educational media among university students is a fundamental aspect that must be taken into account when improving the quality of higher education (Quispe-Mamani et al., 2022). Theories of use and gratification, motivation, and situated cognition provide valuable conceptual frameworks for understanding how students perceive and use these resources. Design factors, prior experience with technology, and alignment with learning objectives are key aspects that influence student perceptions.

METHODS

Study design

The study was developed in the department, province and district of Puno, with students from the Faculty of Social Sciences of the UNA-Puno. The total population of students considered, between men and women, consists of 508 students who are dispersed in each of the 5 professional schools that make up the faculty. Students who are between the 4th and 8th semester were chosen, since it is a population that already has an experience of using the virtual environments of the UNA-Puno. The sample size represents part of the total population, with a stratified random sample of 112 students.

Approach and type of research

The level of complexity of this work demanded to be approached from a quantitative approach, with a non-experimental-cross-sectional design, since data were collected at a single time. The type of research is exploratory, since it aims to give a general vision and approach a certain reality (Hernández Sampieri et al., 2014). This type of study serves to increase the degree of familiarity with the students' perception of the virtual media used in their learning process.

Data collection instrument

The survey technique was applied to 112 students from the 5 professional schools that make up the Faculty of Social Sciences. The instrument used was a questionnaire, which according to (Hernandez Sampieri et al., 2010), is an instrument to measure the variables conceptualized when posing the research problem. The questions were designed considering the research problem and the population that would answer them. All ethical procedures and measures to safeguard the integrity and confidentiality of the participants were followed.

Data analysis

The description of the correlational analysis of data was carried out prior to the study, identifying the variables that intervene in the perception of digital environments, the experience of their use and the degree of satisfaction with virtual educational environments. The data collection was carried out through the application of a virtual form to groups of students from the Professional Schools of Anthropology, Sociology, Tourism, Communication Sciences and Art of the Faculty of Social Sciences of the UNA-Puno. The responses were sent by digital means such as email and WhatsApp. These variables were correlated with the ranges of age, sex, and academic semester, selecting those variables that obtained a degree of significance less than 0.05 by the Chi-square test.

RESULTS AND DISCUSSION

Experience of using virtual environments applied in student learning

To determine the perception of students of the Faculty of Social Sciences of the National University of the Altiplano – Puno about their experience in the use of virtual environments used in the teaching-learning process, we have grouped this perception into experience, frequency of use, function, interaction, ease, usefulness, effectiveness, evaluation, importance and accessibility with the virtual environments used.

Complementing what has been described, table 1 shows the distribution by category of the student's experience in the use of virtual environments, where 11.6% of the participants rate their experience as very positive and 45.5% as positive. Together, both categories add up to 57.1%, that is, more than half of the total responses of the 112 participants, leans towards a positive evaluation that considers that their general virtual educational experience was beneficial compared to the Negative and Very negative categories that represent a minority percentage of 6.3%, indicating that negative experiences are minimal, but they point to critical areas that require attention to improve overall user satisfaction.

The presence of the "Neutral" category of 36.6% indicates that a significant proportion have unbiased opinions about their experience that we are still unaware of, the authors Villasana & Dorrego (2012), showed that a virtual environment promotes the development of social conversational skills, and assertive acceptance and opposition in students, according to the authors Martín et al. (2019) They show the relationship and positive influence between the perceived usefulness and the subjective norm towards the intention of use variable, which is decisive in the learning perceived by the students.

Table 1. Perception of the general experience in the use of virtual environments used by students in their learning process

SCALE	Gender						Semester										P* Value		
	M		F		Total		III		IV		V		VIII		Total				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
How would you rate your overall experience with educational virtual environments so far?																			
Very positive	4	3.6	9	8.0	**13**	**11.6**	1	0.9	12	10.7	0	0.0	0	0.0	**13**	**11.6**			
Positive	24	21.4	27	24.1	**51**	**45.5**	18	16.1	30	26.8	3	2.7	0	0.0	**51**	**45.5**			
Neutral	15	13.4	26	23.2	**41**	**36.6**	16	14.3	23	20.5	1	0.9	1	0.9	**41**	**36.6**	**0.709**	**0.352**	**0.500**
Refusal	1	0.9	3	2.7	**4**	**3.6**	3	2.7	1	0.9	0	0.0	0	0.0	**4**	**3.6**			
Very negative	1	0.9	2	1.8	**3**	**2.7**	1	0.9	2	1.8	0	0.0	0	0.0	**3**	**2.7**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			

Source: Author's development based on the research data

Table 2 shows a distribution by category of the frequency of use of virtual environments, where 16.1% of participants use virtual environments for studies every day, 46.4% use virtual environments several times a week, 17.0% use them once a week, 18.8% use them rarely and only 1.8% never use virtual environments for their studies. The comparative analysis of the total responses of 112 participants indicates that the category "Every day" and "Several times a week" represent 62.5%, indicating the predominance of the use of virtual environments compared to the categories "Rarely" and "Never", which

together add up to 20.6%, which would indicate a sporadic or limited use of the frequency of use of virtual environments for their studies.

In relation to the preference and frequency of use of virtual environments used simultaneously, the analysis reveals a strong emphasis (84.0%) on the frequency of use of videoconferencing platforms and the possibility of using multiple platforms simultaneously. The learning platform category of the educational institution represents only 16.1%, compared to video conferencing platforms (Zoom, Microsoft Teams, etc.) with 35.7%. It is necessary to clarify that to these categories we must add in the frequency and preference the simultaneous use of more than one platform (2 or 3) that together represent 32.2% of the responses of the participants who would be considered to have a greater computer proficiency. In turn, a minority, but no less significant percentage, 2.7% recognizes the use of other virtual environments (Edmodo, Schoology, etc.), which would indicate a trend towards greater knowledge and innovation on the use of already known platforms, finally the category "Other" could indicate the presence of specific platforms not mentioned, which justifies further research to better understand individual preferences. As for the crossing of variables analyzed, gender fluctuation has a high degree of significance among the other categories analyzed.

This same table shows the preference of platforms used, starting with 54.5% who use Google Meet, Classroom, JamTable, Google Docs, Google Scholar, etc., followed by 25.0% who use Canva, then the virtual classroom of the UNA Puno with 3.6%, followed by the 1.8% who use both Moodle and zoom, and other platforms that have less than 1% Microsoft Team, YouTube, Brave among others. However, surprisingly, 10.7% do not use any learning platform that would partially correspond to the frequency of use of platforms in the first table. When making the comparative analysis, it is found that Google's educational tools have the highest preference for use, followed by Canva and Moodle, with the other platforms presenting a very low use, Brave, Microsoft Team and YouTube, which could indicate the need to review their relevance and usefulness in the educational context.

Finally, regarding the ease of use and navigation in virtual environments, between the extremes of students' perceptions, we find that 14.3% have navigation difficulties, 45.5% consider that navigation in virtual environments is easy and very easy, and another 40.2% have an indifferent opinion about navigation in these environments. The comparative analysis allows us to determine that a large percentage of students' opinions consider that navigation in virtual environments is relatively easy, however, there is a smaller percentage of students (14.3%), who require help or training that improves their browsing experience in these environments, which would help a faster and more effective adoption in teaching, Durán et al. (2015) In their research, they present students' opinions on the usefulness and perceived advantages of using the BlackTable virtual platform and on its potential as a substitute tool for the traditional face-to-face class system, this study shows that the variables satisfaction, frequency of use and usefulness of the virtual platform have no influence on the student's final grade or on their class attendance. Thus, these activities complement but do not replace face-to-face learning.

Furthermore, Table 3 shows a distribution by category of the most important functions of virtual environments identified by students in their learning process. Here, the category of "Ease of navigation and access to materials" 22.3% represents the most important function, followed by "Variety of teaching resources" with 12.5% and "Interaction with teachers and peers" with 6.3%, "Opportunities for online assessment and testing" with 3.6% and "Immediate feedback on progress" with 2.7%. However, among these alternatives we must consider those opinions that attribute more than one important function to virtual environments, whose percentages are quite significant among the different combinations that add up to a total of 52.7%, which leads us to think about the relevance of the function that virtual environments play in teaching, especially in access to materials and interaction between teacher and students, which were the most preferred opinions by the 112 participants who highlight the need to offer a variety of resources and adapt to different learning styles and expectations of the participants, the authors Tapia et al. (2019), consider that students perceive a high degree of acceptance between the different technologies, with a higher degree of acceptance in terms of WhatsApp communication versus the Moodle platform.

In the same vein, Table 4 shows a distribution by category of the frequency of problems in the use of virtual environments. The results show that 50.9% of the students have experienced technical problems or interruptions "occasionally", followed by 25.9% who have experienced problems "rarely", in contrast to 19.6% who have experienced technical problems or interruptions "frequently". These perceptions of the participants indicate that most students have occasionally, rarely or never experienced technical problems or interruptions during their online classes (80.4%), compared to only 19.6% who had frequent problems, where the trend of the participants is mostly positive in relation to the existence of technical problems or interruptions during online classes. However, there is still a no less significant percentage to be addressed than if it had frequent problems that emphasizes the need for effective solutions and proactive measures to improve the user experience in virtual learning environments, according to the authors Valencia et al. (2014), showed that studies in this field of knowledge should aim for the inclusion of rigorous research methodologies and reliable and validated instruments that allow accounting for the effectiveness and efficiency of the methods implemented.

Table 2. Perception of the greater frequency of use and ease of the virtual environment used by students in their learning process

SCALE	Gender						Semester										P* Value		
	M		F		Total		III		IV		V		VIII		Total				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
How often do you use virtual environments for your studies?																			
Every day	5	4.5	13	11.6	**18**	**16.1**	4	3.6	14	12.5	0	0.0	0	0.0	**18**	**16.1**			
Several times a week	16	14.3	36	32.1	**52**	**46.4**	17	15.2	32	28.6	3	2.7	0	0.0	**52**	**46.4**			
Once a week	14	12.5	5	4.5	**19**	**17.0**	5	4.5	13	11.6	1	0.9	0	0.0	**19**	**17.0**	**0.017**	**0.201**	**0.142**
Rarely	9	8.0	12	10.7	**21**	**18.8**	13	11.6	7	6.3	0	0.0	1	0.9	**21**	**18.8**			
Never	1	0.9	1	0.9	**2**	**1.8**	0	0.0	2	1.8	0	0.0	0	0.0	**2**	**1.8**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			
What is the virtual environment that you use most frequently in your studies?																			
El Learning Platform	11	9.8	7	6.3	**18**	**16.1**	4	3.6	14	12.5	0	0.0	0	0.0	**18**	**16.1**			
Video conferencing platform (Zoom, Microsoft Teams, etc.)	16	14.3	24	21.4	**40**	**35.7**	9	8.0	27	24.1	3	2.7	1	0.9	**40**	**35.7**			
Educational social networks (Edmodo, Schoology, etc.)	1	0.9	2	1.8	**3**	**2.7**	3	2.7	0	0.0	0	0.0	0	0.0	**3**	**2.7**			
Other	4	3.6	11	9.8	**15**	**13.4**	7	6.3	7	6.3	1	0.9	0	0.0	**15**	**13.4**	**0.300**	**0.840**	**0.220**
Use two platforms at once	10	8.9	21	18.8	**31**	**27.7**	15	13.4	16	14.3	0	0.0	0	0.0	**31**	**27.7**			
Use three platforms at once	3	2.7	2	1.8	**5**	**4.5**	1	0.9	4	3.6	0	0.0	0	0.0	**5**	**4.5**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			
What is the online learning platform you use most often in college?																			
UNAP Virtual Classroom	2	1.8	2	1.8	**4**	**3.6**	1	0.9	3	2.7	0	0.0	0	0.0	**4**	**3.6**			
Brave	0	0.0	1	0.9	**1**	**0.9**	0	0.0	0	0.0	1	0.9	0	0.0	**1**	**0.9**			
Canva	9	8.0	19	17.0	**28**	**25.0**	12	10.7	15	13.4	1	0.9	0	0.0	**28**	**25.0**			
Google educational tools (Google Meet, Classroom, JamTable, Google docs, Google Academic, etc.)	24	21.4	37	33.0	**61**	**54.5**	19	17.0	39	34.8	2	1.8	1	0.9	**61**	**54.5**			
Microsoft Team	0	0.0	1	0.9	**1**	**0.9**	0	0.0	1	0.9	0	0.0	0	0.0	**1**	**0.9**			
Moodle	2	1.8	0	0.0	**2**	**1.8**	2	1.8	0	0.0	0	0.0	0	0.0	**2**	**1.8**	**0.47**	**0.000**	**0.05**
YouTube	0	0.0	1	0.9	**1**	**0.9**	0	0.0	1	0.9	0	0.0	0	0.0	**1**	**0.9**			
Zoom	1	0.9	1	0.9	**2**	**1.8**	0	0.0	2	1.8	0	0.0	0	0.0	**2**	**1.8**			
None	7	6.3	5	4.5	**12**	**10.7**	5	4.5	7	6.3	0	0.0	0	0.0	**12**	**10.7**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			
How would you rate the use and ease of navigation of the educational virtual environments you have used?																			
Very difficult	1	0.9	3	2.7	**4**	**3.6**	2	1.8	2	1.8	0	0.0	0	0.0	**4**	**3.6**			
Difficult	3	2.7	9	8.0	**12**	**10.7**	5	4.5	7	6.3	0	0.0	0	0.0	**12**	**10.7**			
Neuter	21	18.8	24	21.4	**45**	**40.2**	18	16.1	25	22.3	2	1.8	0	0.0	**45**	**40.2**	**0.67**	**0.69**	**0.92**
Easy	15	13.4	23	20.5	**38**	**33.9**	11	9.8	24	21.4	2	1.8	1	0.9	**38**	**33.9**			
Very easy	5	4.5	8	7.1	**13**	**11.6**	3	2.7	10	8.9	0	0.0	0	0.0	**13**	**11.6**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			

Source: Author's development based on the research data

Table 2 Perception of the most important functions in the use of virtual environments used by students in their learning process

SCALE	Gender						Semester										P* Value		
	M		F		Total		III		IV		V		VIII		Total				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
Which of the following functions do you consider most important in a virtual learning environment?																			
Ease of nav. and access to materials	11	9.8	14	12.5	**25**	**22.3**	7	6.3	18	16.1	0	0.0	0	0.0	**25**	**22.3**			
Interaction with teachers and colleagues	1	0.9	6	5.4	**7**	**6.3**	1	0.9	6	5.4	0	0.0	0	0.0	**7**	**6.3**			
Variety of HR Didác. (videos, readings, etc.)	5	4.5	9	8.0	**14**	**12.5**	4	3.6	10	8.9	0	0.0	0	0.0	**14**	**12.5**			
Retroalim. Immediate Progress	1	0.9	2	1.8	**3**	**2.7**	1	0.9	2	1.8	0	0.0	0	0.0	**3**	**2.7**			
Oport. of Eval. and online tests	3	2.7	1	0.9	**4**	**3.6**	1	0.9	2	1.8	1	0.9	0	0.0	**4**	**3.6**	**0.607**	**0.011**	**0.468**
Consider 2 learning functions	10	8.9	9	8.0	**19**	**17.0**	7	6.3	10	8.9	2	1.8	0	0.0	**19**	**17.0**			
Consider 3 learning functions	5	4.5	12	10.7	**17**	**15.2**	9	8.0	7	6.3	0	0.0	1	0.9	**17**	**15.2**			
Consider 4 learning functions	5	4.5	8	7.1	**13**	**11.6**	6	5.4	7	6.3	0	0.0	0	0.0	**13**	**11.6**			
Consider 5 learning functions	4	3.6	6	5.4	**10**	**8.9**	3	2.7	6	5.4	1	0.9	0	0.0	**10**	**8.9**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			

Source: Author's development based on the research data

Table 3. Perception of the most frequent problems in the use of virtual environments used by students in their learning process

SCALE	Gender						Semester										P* Value		
	M		F		Total		III		IV		V		VIII		Total				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
Have you experienced technical issues or interruptions during your online classes?																			
Yes, often	5	4.5	17	15.2	**22**	**19.6**	9	8.0	11	9.8	1	0.9	1	0.9	**22**	**19.6**			
Yes, occasionally	21	18.8	36	32.1	**57**	**50.9**	24	21.4	32	28.6	1	0.9	0	0.0	**57**	**50.9**	**0.06**	**0.77**	**0.25**
Rarely	17	15.2	12	10.7	**29**	**25.9**	5	4.5	22	19.6	2	1.8	0	0.0	**29**	**25.9**			
Never	2	1.8	2	1.8	**4**	**3.6**	1	0.9	3	2.7	0	0.0	0	0.0	**4**	**3.6**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			

Source: Author's development based on the research data

Table 5 shows the distribution by category of the ease of communication in the use of virtual environments, where the analysis of the extremes between "very difficult and very easy" shows quite interesting results. Participants who consider having communication difficulties with both teachers and classmates between very difficult and difficult represent 20.5% and 20.6% respectively in contrast to those who consider that virtual environments facilitated communication between teachers and classmates between "easy and very easy" represent 47% and 49.1% respectively, highlighting in both cases a slightly higher percentage in interaction with their peers. where communication is not perceived as a significant problem and would imply that participants have a moderate command of virtual environments and feel comfortable and able to communicate with their professors and fellow students. However, to these assessments an impartial opinion must be added of 32.1% and 30.4%, who consider communication through virtual environments indifferent or habitual.

These assessments are complemented by the frequency or amount of interaction between students with virtual environments, whose results show a distribution between "very low and low" of 7.1% and 15.2% respectively, while in the other external environment the opinion of considering an interaction "high and very high" is 7.1% and 8.0% respectively, which leads us to suppose that virtual environments do not have a direct determinant relationship with interaction between students. The "moderate" category being the most predominant with 62.5%, indicating that the interaction interfaces of the different platforms should be improved so that the user experience has a more dynamic and fluid interaction.

From this second interpretation, participants were also asked about the most useful communication tools that encourage interaction with educational virtual environments. The results show a distribution by category, where 26.8% perceive videoconferences as the most useful tool, followed by 12.5% who consider discussion forums, then 6.3% find chat and finally 1.8% find email as a tool that encourages interaction with virtual environments. Within these same categories, some participants indicate the use of 2 or more communication tools, however, their percentages are not far from the main categories, which consider the category of "videoconferences" as the most useful communication tool to promote educational virtual interaction.

These results make us aware of the need to develop better educational virtual environments that adapt to the needs of users in terms of their ease of use, degree of interaction and integration with the most used tools, whose sum of detailed aspects should make the user experience significantly improve. Borgobello & Roselli (2016), analysed clicks – entries in different areas of the environment – made on the platform to navigate the environment, messages written in forums, answers to a questionnaire on habits and opinions and grades obtained in regular exams. The three axes of analysis were: 1) relationship between use of the platform with academic grades, opinions and habits; 2) construction of subject profiles based on class analysis in relation to the previous variables; 3) characteristics of the messages written in forums of five subjects with high and low general academic performance. The results show that 1) there were significant differences in ratings and liking for using the platform; 2) three classes were distinguished: low, medium and high use of the platform with different preferences in resources, pleasure in using it, among others; 3) there were notable differences in the content of the messages, especially in the non-strictly cognitive.

Table 6 shows a distribution by category of the usefulness and effectiveness of virtual environments, where the analysis of the extremes between "much more useful and more useful" represent 27.7% (9.8% and 17.9% respectively) and the categories "less useful and much less useful" with a total of 27.7% (22.3% and 5.4% respectively), with the category "equally useful" being the most representative with 44.6%. which indicates that the perception of students perceives virtual classes as equally useful as face-to-face classes. However, the variability of the distribution groups has a significant percentage whose opinion is negative, especially in the lower semesters (I-IV), where the largest number of less favorable opinions are concentrated, which suggests that this group encounters pedagogical or didactic difficulties in the adaptive process to virtual education that is important to address to improve the educational experience.

A second category analyzed, related to this first aspect, addresses the degree of effectiveness of virtual environments for student learning. The distribution by category shows that 19.6% consider that virtual environments are as effective as

face-to-face classes, 42.0% consider that they are almost as effective, 31.3% think that they are less effective and 7.1% think that they are much less effective. When comparing, a fairly significant percentage of the participants consider that the effectiveness of virtual environments is less effective 38.4%, this trend is quite worrying, which, compared to the previous table on the usefulness of online classes, would have a correlation, which needs to be explained in terms of an evaluation of learning and highlights the importance of addressing possible challenges and improving the online learning experience.

Likewise, educational institutions could benefit from collecting detailed feedback on the specific aspects that contribute to the perception of effectiveness or lack thereof in virtual environments, according to Mercado et al. (2019) In their research, they analyze the need to rethink the evaluation and monitoring of interactivity, to provide key methodological contributions that generate an improvement in this process and favor social interaction in a virtual learning environment. (Barra-Quispe et al., 2024) the topic of interest is not only valid in the training process but also in the socialization of fundamentals that can contribute to educational quality in virtual environments. Also, judgments are shared based on theoretical elements that optimize ICT-mediated interactivity and virtual interaction. In this text, it is possible to establish as a main conclusion, that some virtual environments do not incorporate monitoring tools to enhance the development of interactivity processes from requirements exposed by educational actors.

Table 4. Perception of the ease of communication and interaction in the use of virtual environments used by students in their learning process

SCALE	Gender						Semester										P* Value		
	M		F		Total		III		IV		V		VIII		Total				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
How easy is it for you to communicate with your teachers through virtual environments?																			
Very difficult	4	3.6	6	5.4	**10**	**8.9**	4	3.6	6	5.4	0	0.0	0	0.0	**10**	**8.9**			
Difficult	5	4.5	8	7.1	**13**	**11.6**	6	5.4	6	5.4	1	0.9	0	0.0	**13**	**11.6**			
Neuter	13	11.6	23	20.5	**36**	**32.1**	14	12.5	21	18.8	0	0.0	1	0.9	**36**	**32.1**	**0.95**	**0.86**	**0.53**
Easy	13	11.6	19	17.0	**32**	**28.6**	10	8.9	19	17.0	3	2.7	0	0.0	**32**	**28.6**			
Very easy	10	8.9	11	9.8	**21**	**18.8**	5	4.5	16	14.3	0	0.0	0	0.0	**21**	**18.8**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			
How easy is it for you to communicate with your colleagues through virtual environments?																			
Very difficult	1	0.9	5	4.5	**6**	**5.4**	3	2.7	3	2.7	0	0.0	0	0.0	**6**	**5.4**			
Difficult	5	4.5	12	10.7	**17**	**15.2**	5	4.5	11	9.8	1	0.9	0	0.0	**17**	**15.2**			
Neuter	16	14.3	18	16.1	**34**	**30.4**	14	12.5	19	17.0	1	0.9	0	0.0	**34**	**30.4**			
Easy	12	10.7	18	16.1	**30**	**26.8**	9	8.0	18	16.1	2	1.8	1	0.9	**30**	**26.8**	**0.55**	**0.8**	**0.88**
Very easy	11	9.8	14	12.5	**25**	**22.3**	8	7.1	17	15.2	0	0.0	0	0.0	**25**	**22.3**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			
How would you describe the amount of interaction you have with your classmates in virtual environments?																			
Very low	2	1.8	6	5.4	**8**	**7.1**	4	3.6	4	3.6	0	0.0	0	0.0	**8**	**7.1**			
Casualty	7	6.3	10	8.9	**17**	**15.2**	6	5.4	10	8.9	1	0.9	0	0.0	**17**	**15.2**			
Moderate	26	23.2	44	39.3	**70**	**62.5**	27	24.1	40	35.7	2	1.8	1	0.9	**70**	**62.5**			
Loud	5	4.5	3	2.7	**8**	**7.1**	1	0.9	6	5.4	1	0.9	0	0.0	**8**	**7.1**	**0.47**	**0.01**	**0.74**
Very high	5	4.5	4	3.6	**9**	**8.0**	1	0.9	8	7.1	0	0.0	0	0.0	**9**	**8.0**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			
In your opinion, which communication tools (chat, forums, videoconferences, etc.) are the most useful to promote interaction in educational virtual environments?																			
Live Chat	2	1.8	5	4.5	**7**	**6.3**	3	2.7	4	3.6	0	0.0	0	0.0	**7**	**6.3**			
Discussion Forums	6	5.4	8	7.1	**14**	**12.5**	5	4.5	8	7.1	1	0.9	0	0.0	**14**	**12.5**			
Video conferencing	14	12.5	16	14.3	**30**	**26.8**	8	7.1	21	18.8	1	0.9	0	0.0	**30**	**26.8**			
Email	2	1.8	0	0.0	**2**	**1.8**	0	0.0	2	1.8	0	0.0	0	0.0	**2**	**1.8**			
Use 2 communication tools. at the same time	6	5.4	18	16.1	**24**	**21.4**	8	7.1	14	12.5	1	0.9	1	0.9	**24**	**21.4**	**0.39**	**0.18**	**0.860**
Use 3 communication tools. at the same time	8	7.1	8	7.1	**16**	**14.3**	10	8.9	6	5.4	0	0.0	0	0.0	**16**	**14.3**			
Use 4 communication tools. at the same time	2	1.8	7	6.3	**9**	**8.0**	3	2.7	5	4.5	1	0.9	0	0.0	**9**	**8.0**			
Use 5 communication tools. at the same time	2	1.8	2	1.8	**4**	**3.6**	0	0.0	4	3.6	0	0.0	0	0.0	**4**	**3.6**			
Other	3	2.7	3	2.7	**6**	**5.4**	2	1.8	4	3.6	0	0.0	0	0.0	**6**	**5.4**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			

Source: Author's development based on the research data

Table 6. Perception of the usefulness and effectiveness of the use of virtual environments used by students in their learning process

SCALE	Gender						Semester										P* Value		
	M		F		Total		III		IV		V		VIII		Total				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%			
How helpful do you find online or virtual classes compared to in-person classes?																			
Much more useful	3	2.7	8	7.1	**11**	**9.8**	2	1.8	9	8.0	0	0.0	0	0.0	**11**	**9.8**			
More Helpful	13	11.6	7	6.3	**20**	**17.9**	7	6.3	12	10.7	1	0.9	0	0.0	**20**	**17.9**			
Just as useful	19	17.0	31	27.7	**50**	**44.6**	16	14.3	33	29.5	1	0.9	0	0.0	**50**	**44.6**	**0.110**	**0.33**	**0.5**
Less useful	9	8.0	16	14.3	**25**	**22.3**	10	8.9	12	10.7	2	1.8	1	0.9	**25**	**22.3**			
Much less useful	1	0.9	5	4.5	**6**	**5.4**	4	3.6	2	1.8	0	0.0	0	0.0	**6**	**5.4**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			
Do you think virtual environments are as effective as face-to-face classes for your learning?																			
Yes, they are just as effective	11	9.8	11	9.8	**22**	**19.6**	5	4.5	17	15.2	0	0.0	0	0.0	**22**	**19.6**			
Yes, they are almost as effective	20	17.9	27	24.1	**47**	**42.0**	15	13.4	30	26.8	2	1.8	0	0.0	**47**	**42.0**			
No, they are less effective	12	10.7	23	20.5	**35**	**31.3**	13	11.6	19	17.0	2	1.8	1	0.9	**35**	**31.3**	**0.52**	**0.12**	**0.24**
No, they are much less effective	2	1.8	6	5.4	**8**	**7.1**	6	5.4	2	1.8	0	0.0	0	0.0	**8**	**7.1**			
Total	**45**	40.2	**67**	59.8	**112**	**100.0**	**39**	34.8	**68**	60.7	**4**	**3.6**	**1**	**0.9**	**112**	**100.0**			

Source: Author's development based on the research data

CONCLUSIONS

Quality is a characteristic that is perceived as absent and distant in technical and technological education in Ecuador, the main problems they face are the lack of support from the state, considering that public policies regarding the improvement of higher education are oriented more towards universities and polytechnic schools, the lack of resources, the devaluation of third level technical and technological degrees in the labor market, lack of efficiency in the management and use of resources, make the paradigm of technical and technological education unfavorable for these institutions, which is reflected in the representative percentage of institutes that have not been accredited in previous evaluations and are conditioned or strongly conditioned. To promote the development of this education sector, an interesting tool is the ISO 21001 standard, which is aimed at the management of educational institutions. There are relevant aspects in the standard that are directly related to the components and indicators of the evaluation and accreditation model determined by the council for quality assurance in higher education.

Positive perception but with challenges the 57.1% of students evaluated their experience in virtual environments as positive, highlighting the accessibility of materials and interaction. However, technical problems persist (50.9%) and a perception of lower effectiveness compared to in-person classes (38.4%). Videoconferencing platforms (Zoom, Google Meet) were the most used, while institutional tools such as LAURASIA were less widely adopted, suggesting a preference for external solutions. Although communication with teachers and classmates was rated as relatively easy, 20% reported difficulties, and interaction was considered moderate (62.5%), highlighting areas for improvement in engagement.

Effectiveness and satisfaction the 42% considered virtual environments "almost as effective" as in-person classes, but 38.4% perceived them as less effective. Overall satisfaction was moderate, with requests for more training and technical support. There is a clear need to optimize training in digital tools, resolve technical issues, and promote pedagogical strategies that improve interaction and personalization in virtual learning. In summary, virtual environments are valued as viable educational complements, but they require technical, pedagogical, and training adjustments to maximize their potential in higher education.

Regarding satisfaction in the use of the virtual environments used in the teaching-learning process, the perceptions of satisfaction with the virtual environments used, show a fairly acceptable level of satisfaction with the use of virtual environments (57.2%, 59%, 52.7% and 44.7), satisfaction with online resources shows that 38.4% are satisfied, Regarding the satisfaction of the browsing experience, 49.1% are satisfied with the usability and ease of navigation of the online platforms, regarding the satisfaction of the evaluation in the virtual environments, 43.8% of the students are satisfied with the online evaluation process, finally in the satisfaction of the communication and availability of the teachers in the virtual environments, 34.8% of the students are satisfied, the negative extremes being not so significant in terms of the assessment of the satisfaction of the experience of the use of virtual environments in general. The analysis of the satisfaction of the students of the FCS of the UNA Puno with the virtual environments used in their learning process shows a variety of opinions. A moderate level of satisfaction has been observed, with some students expressing high levels of satisfaction due to the

comfort and convenience provided by virtual environments, while others show lower levels due to perceived limitations in learning effectiveness. The identification of these levels of satisfaction provides valuable information for the continuous improvement of virtual environments and the adaptation of educational practices to the needs and expectations of students.

Research limitations and future research agenda

The study is primarily based on the uses and gratifications theory (Mamani-Flores et al., 2025), which limits the analysis to individual perceptions without integrating broader theoretical frameworks (e.g., socioconstructivist theories of learning in digital environments). There is no critical discussion of how structural factors (e.g., digital inequality, institutional policies) influence the virtual experience, focusing only on satisfaction and usability. Cross-sectional design: As this is a non-experimental, cross-sectional study, causal relationships cannot be established or changes in perceptions assessed over time. Data collection through online surveys may exclude students with less internet access or digital skills, underrepresenting vulnerable populations. The findings are primarily applicable to social science students at a Peruvian university and cannot be automatically extrapolated to other disciplines or regions with different technological realities. The future research agenda would be focusing on study the impact of socioeconomic status, internet access, and the digital divide on the virtual learning experience, especially in rural regions or those with limited infrastructure. To analyze how institutional policies and teacher training influence the adoption and effectiveness of virtual environments. This agenda proposes to overcome the limitations of the current study by integrating more robust theoretical approaches, diverse methodologies, and expanded contexts. The objective is to generate applicable evidence to improve virtual education in terms of equity, pedagogical quality, and technological adaptation.

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