

Academic Support of Virtual Environments Perceived by Higher Education Students During Covid-19

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ABSTRACT

It will be very useful for the E-Learning departments, dean's offices, and academic monitoring of the higher education institutions (HEI) of El Salvador to know the perception that students have regarding the academic support of the virtual learning environments (VLE) implemented or strengthened as a response to the events generated by the Covid-19 pandemic. Although this event is in the health area, it has had an impact on other areas, including education, leading HEIs to advance in the virtualization of content for the care of their students. This research allowed us to know the perception of students regarding virtual environments as facilitators of learning and guarantors of favorable social environments in the development of content. Opportunely, the topic is relevant during the social distancing due to the pandemic and, undoubtedly, provides new data to support other studies. In this descriptive study, with a quantitative approach, with a non-probabilistic sample, 279 students from several HEIs from El Salvador participated, to which an online survey was given to know their perception of VLE as learning facilitators. As a main result, it was obtained that such perception depends on your previous experience in VLE.

Keywords: Virtual Learning Environments (VLE), Learning Facilitator, Social Learning Environment, Student Perception, Higher Education.

INTRODUCTION

In recent decades, the distance education modality has gained its share in the higher education market over face-to-face training (García Aretio, 2009, p. 12); and according to Carmona Suarez & Rodríguez Salinas (2017), it is due to good practices in compliance with e-Learning standards, which are supported by information and communication technologies (ICT) applied to education in search of guaranteeing high-quality virtual programs; however, Pando (2018) expresses that:

"The impact of ICT breaks with some expectations, placed on them for the improvement of teaching-learning processes, which has found in this trend little utility: the objectives, concept, methods, organization, components of such processes, obviate the role of the student as the constructor of his learning, or if he does, then, it derives in spontaneous processes of knowledge apprehension under undefined criteria and probably, far from formal educational ideals. This has a negative influence on the student, both academically, emotionally and axiologically" (pp. 481-482).

For their part, Aguirre, Viano, & García (2015) express that ICTs offer the possibility of reconstructing and reinterpreting the possibilities of teaching and present a challenge for higher education consisting of finding more open and flexible models that favor the student to become responsible for the construction of their learning.

It is this last point that has led higher education institutions (HEIs) to offer virtual education and attract a portion of students interested in this form of learning. In the same dynamic, they are the ones who evaluate the virtual environments in which they are participating, giving way to their perception regarding the functional value of virtual environments for education (Serna-Loaiza et al., 2020) and their facilitating role in learning (Aguirre et al., 2015). This perception is influenced by age, gender, previous experiences, attitude towards technology, learning styles (Keller & Cernerud, 2002), and the way the university would have implemented the virtual teaching system.

HEIs decide to implement virtual education due to various circumstances, just as students choose to enroll in their programs motivated by their interests (Sánchez Miranda et al., 2019); however, due to the COVID-19 pandemic, in 2020 the legislative authorities of El Salvador decreed a State of National Emergency and the suspension of classes and work in the national education system (Decreto Legislativo 593, 2020 art. 7) and the Ministry of

Education of El Salvador issued instructions for educational continuity indicating virtual education strategies, including HEIs (Ministerio de Educación Ciencia y Tecnología de El Salvador, 2020).

Some universities had already ventured into this form of teaching and learning more than others; however, all of them had to abruptly implement ICTs to have virtual environments for education, with the result that all students enrolled in face-to-face mode became virtual education students. Given this, this study aims to determine the academic support of virtual learning environments (VLE) perceived by students of Higher Education Institutions (HEIs) in El Salvador during the social distancing by COVID-19 in the period from August to September 2020, and is broken down into two specific objectives:

- To assess the perception that students of Higher Education Institutions (HEI) in El Salvador have of virtual environments as facilitators of their learning, implemented during COVID-19.
- To assess the perception of the social learning environment held by students of Higher Education Institutions (HEI) in El Salvador regarding the imminent implementation of virtual learning environments during COVID-19.

This study is novel because, during the pandemic, at the time of data collection, only a few columns have been written in national newspapers about this educational phenomenon, but there has not been a study presenting the perception of the students involved in the process. It presents a brief bibliographical review of the main topics under review, followed by the research questions. The methodology used is non-experimental and descriptive, with a quantitative approach, having applied a Likert scale questionnaire to 279 students from different Higher Education Institutions nationwide. It highlights as results that 70.61% are familiar with virtual platforms and have skills to participate in virtual learning environments, 57,35% perceive that the virtual environments implemented facilitate learning and 58,42% perceive a favorable social environment. These data are followed by discussion, conclusions, and recommendations.

Literature review

Connectivity

According to the Secretariat of Innovation of the Presidency of El Salvador (2020), the penetration of fixed broadband (7.7%) and mobile broadband (54.5%) in the country is among the lowest in Latin America and is far from the average of the Organization for Economic Cooperation and Development (OECD) (33.7% and 121.1% respectively), which hinders access to online education services due to the limited level of digital infrastructure and the low level of digital skills and capabilities.

Similarly, it states that 42% of those under 25 years of age and 54% of those over 66 years of age do not have an Internet connection, and more than 90% of those connected do so with low-speed plans that do not allow online education solutions.

In the same document, the institution states that the main reason for these situations is that telecommunications service providers are mainly located in densely populated areas.

The consultation of the connectivity coverage maps by Internet service providers shows that San Salvador, in the central area of the country, is a department with almost complete coverage, in addition to being home to the largest number of universities in the country. This factor can make a difference in the perception that university students from the different zones of political division in the country have about VLE as academic support.

Virtual Education: Advantages and Disadvantages

The connectivity available to students is an important factor for HEIs in the implementation of the virtual education strategy, which has been growing in recent years. According to García Aretio (2017), non-face-to-face education is taking more advantage than the conventional modality, having to face the challenge of new technologies; of course, since distance education appeared to date, there have been significant changes in the way of teaching until reaching what is now known as virtual education.

Academic support of virtual learning environments has become part of the education system all over the planet (Nambiar, 2020). The situation generated by the COVID-19 pandemic was a key factor that shifted teaching and learning from the traditional classroom to a virtual approach. Therefore, because of this, universities were forced to change their academic activity with students and teachers to an exclusively virtual world (Coman et al., 2020). To make this academic online process work, the essential elements are internet coverage and the availability of electronic devices in the involved population (Basilaia & Kvavadze, 2020). Besides the aforementioned, other factors of online learning are related to flexibility in time and house, learners' and teachers' involvement, and other different elements that online learning possesses (Simamora, 2020). On one hand, Segura Vera (2021) in his study

suggests that in virtual learning environments (VLEs), the process of mediation through feedback takes on greater relevance given the structural characteristics that determine the success of learning in these environments. Moreover, Villacis Lizano et al. (2021), in their study, found that until five years ago, academic research on VLEs in education has increased significantly.

As expressed by Rodríguez (2011), higher education finds among its challenges the incorporation of ICTs to generate pedagogical models based on virtual education. Thus, Aguirre(2015) identifies virtual learning environments as spaces to support face-to-face or, as included by Hinojo & Fernández(2012), blended or even completely virtual education. These spaces use technological platforms both hardware and software for teaching and learning where students, teachers, and study materials are found to support education in different modalities, among which is Moodle used to create virtual classrooms.

Virtual Learning Environments (VLEs) have been incorporated into many higher education institutions (HEI) (Al-Nofaie, 2020). These are delivered in two modes of online courses: Synchronous and asynchronous. The former refers to the real-time delivery of course content designed; meanwhile, the latter might occur through tools such as e-mails, discussion boards, blogs, wikis, chats, or multimedia resources. Therefore, this has led HEI to offer virtual education and attract a portion of students interested in this form of learning. In the same dynamic, they are the ones who evaluate the virtual environments in which they are participating, giving way to their perception regarding the functional value of virtual environments for education (Serna-Loaiza et al., 2020).

Some investigations have studied the importance of this topic before. For example, Yandri Zambrano-Zambrano & Carlos García-Vera (2020), found that the promotion of the use of VLEs is a necessity to adapt teaching practices to today's educational demands. Likewise, Soto (2020) suggests that the teacher must give timely and clear answers to the students' doubts, and the students, and the latter must maintain permanent and effective communication. Therefore, being a teacher requires a social responsibility, and a commitment, to play an active role in the virtual environment, fulfilling each of the functions so that students acquire knowledge and skills (Rizo, 2020). On the other hand, the student must also be an active subject of his/her learning, considering the roles represented in self-discipline, self-learning, and knowing how to analyze, reflect and participate in collaborative work, and participate in collaborative work (Rizo, 2020).

Nevertheless, in the Salvadorean HEIs context, little research has been studied regarding this issue. Unlike the aforementioned, it is important to identify factors that the shift from face-to-face classes to a virtual environment affected the student's learning and how professors accompanied it. Given the aforementioned, this study aims to determine the academic support of virtual learning environments (VLE) perceived by students of Higher Education Institutions (HEIs) in El Salvador during the social distancing by COVID-19 in the period from August to September 2021.

This study is novel because, during the pandemic, at the time of data collection, only a few columns have been written in national newspapers about this educational phenomenon; nevertheless, there has not been a study presenting the perception of the students involved in the process. This is formed from the recognition of the benefits they were promised when moving from a face-to-face modality to a completely virtual one. Naffah (2016) identifies variables that intervene in this construct, such as their attitude towards its use, usefulness, ease of use, skills shown by the teacher, autonomy in learning, and others.

Also, it presents a brief bibliographical review of the main topics under review, followed by the research questions. The methodology used is non-experimental, and descriptive, with a quantitative approach, having applied a Likert scale questionnaire to 279 students from different Higher Education Institutions nationwide. It highlights as results that 70.61% are familiar with virtual platforms and have skills to participate in virtual learning environments, 57,35% perceive that the virtual environments implemented facilitate learning and 58,42% perceive a favorable social environment. These data are followed by discussion, conclusions, and recommendations.

Among the advantages and disadvantages of virtual education are in table 1:

Table 1. Advantages and disadvantages of virtual education

Advantages of virtual learning	Disadvantages of virtual education
- The development of modern and advanced technologies offers multiple opportunities for educators, especially in the development of new educational models (Estrada Sentí et al., 2015).	- Virtual dialogue is not functional because online communication is asynchronous and dialogues in chats or discussion groups usually revolve around a few students (Ralón et al., 2004).

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| <ul style="list-style-type: none"> - Although it may be a more complex task, they facilitate personalized feedback for the student (Hinojo & Fernández, 2012). - Better participation in collaborative work (Ezequiel & Mendoza, 2013). - Reduces students' travel, food, and lodging costs. - The student is supported in the creation of meaning and construction of knowledge (Eiliana & Castro, 2012). - Dung (2020) lists some of those: <ul style="list-style-type: none"> Protecting individual health and community safety Saving the travel time Exposing to new forms of learning Keeping up with the original plan for the semester Having extra time for self-study Having easy access to online resources | <ul style="list-style-type: none"> - Inconsistent use of the platform. Some teachers are not always willing to respond extensively to student queries (Keller & Cernerud, 2002). - Little knowledge of the minority of students about the use of ICT for learning (Monge Nájera & Méndez Estrada, 2007). - Dung (2020) lists the following: <ul style="list-style-type: none"> Extensive time staring at digital screens Lack of body movements Lack of conditions for developing social interaction skills Fear of online assessment Suffering from concentration lost Lack of peer interaction in a virtual classroom Difficulties in hearing the voice of the instructors Lack of time and condition to practice speaking with peers and teachers Difficulties in acquiring the contents of the lessons Lack of interaction with instructors Difficulties in following the study schedules, lack of self-discipline |
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Students experience virtual learning environments (VLE)

Even though ICTs offer opportunities to venture into virtual education (Estrada Sentí et al., 2015), few students are knowledgeable about the use of these technologies for learning (Monge Nájera & Méndez Estrada, 2007). According to Abad López & Saenz Niño (2020), the student must have the digital competencies that allow him/her to manage basic elements related to Information and Communication Technologies (ICT), as well as the technological resources for the optimal development of the tasks. Similarly, study habits may be affected when suddenly moving from a face-to-face modality to a completely virtual one because under virtual environments, as Sierra Varón (2013) expresses, the student is the holder of knowledge and can make sense of what is found in his teaching-learning process through a more active position in his academic training process.

On one hand, Sierra Varón (2013) defends the thesis that the virtual education modality favors the development of autonomous learning in students, thanks to the support of ICT, being possible when the objective is that students learn to learn; of course, for this, it is necessary to develop the appropriate conditions such as virtual learning environments that are easy to use, appropriate design of materials, develop the competence of text interpretation and others that favor learning governed by the student himself.

On the other hand, the social environment generated during online learning involves the teacher and the student; however, there is another interactivity between the members of the group of students and according to Estrada Sentí et al. (2015), the interaction between collaborative work groups and new educational technologies generally produces positive results in students.

Finally, these environments include discussion forums, platforms for group video calls, social networks used for educational purposes, and learning communities, among others. For this to be favorable, the materials designed must be easy to understand and with the possibility of discussion among peers in the group. This leads to instructional design models that, according to Chiappe Laverde (2008), focus on the organization of an instructional process composed of phases, within which activities or sets of activities are developed that make up more specific processes, focused on the achievement of a particular objective. In this sense, this author indicates that the design of materials can have the following purposes:

- a) Receptive: Elaborated to facilitate the transmission of a lot of information.
- b) Directed: Elaborated from the simple to the complex, contemplating moments of evaluation and feedback.
- c) Guided discovery: Provides adequate scenarios for problem-solving and the necessary resources to achieve it.
- d) Exploratory: Elaborated for the student to find and process relevant information

Research Questions

Since, in higher education institutions in El Salvador, virtual learning environments were suddenly implemented, converting all students from a face-to-face modality to a completely virtual one, the following research questions were formulated:

General Question

What is the academic support of virtual learning environments (VLE), perceived by students of higher education institutions (HEI) in El Salvador during the social distancing by COVID-19 in the period from August to September 2020?

Specific Questions

How do students of higher education institutions (HEIs) in El Salvador perceive virtual learning environments as Facilitators of their learning, implemented during COVID-19, Will there be significant differences between the perception of virtual learning environments (VLE) as facilitators of learning, according to their gender and political division zone of the country (Eastern, Western and Central), How do students of higher education institutions (HEIs) in El Salvador perceive the social learning environment in the face of the imminent implementation of virtual learning environments during COVID-19?

METHODOLOGY

Research Design

This research is descriptive as defined by Hernández-Sampieri et al. (2014) as it describes the perception of students of a non-probabilistic sample coming from different universities in El Salvador regarding virtual environments as learning facilitators during the COVID-19 pandemic.

A multiple-choice survey was conducted to collect the data required to know the students' perspectives. This study was developed with a quantitative approach in a non-experimental and cross-sectional design executed from August 15 to September 14, 2020.

Participants

The instrument to determine the perception of academic support of virtual learning environments (VLE), perceived by students of Higher Education Institutions (HEI) in El Salvador during the social distancing by COVID-19, was applied to 279 students average age range was between 21 and 30 years old, from different Higher Education Institutions nationwide.

Table 1: Participants

Characterization	Quantity
Gender	
- Female	172
- Male	107
Region of country	
- Eastern	86
- Central	109
- Western	84
Type of university	
- Public	40
- Private	236

Instrument

A self-application instrument was conducted for the participants. However, before sharing the instrument with the participant sample, it was validated by experts to know their assessment and modified according to their observations. Subsequently, a pilot test was conducted with 30 participants who share similar characteristics to the study population to validate and improve the quality of the items contained in the questionnaire. The instrument is divided into two parts: the first reveals aspects of sociodemographic information and the second includes eight questions that respond to the academic perception that students have of the virtual environments in which they participate in the virtual modality. Each statement is constructed to be answered on a Likert scale with the following options: 0=Not present, 1=Slight, 2=Moderate, 3=Severe, and 4=Very severe.

Procedure

Once the analysis corresponding to the pilot test had been carried out, the field phase was continued by providing the instrument to the sample selected by convenience, being the students identified by professors at each classroom,

during data collection which was processed using the free software Perfect Professionally Presented Statistics (PSPP).

The data collected were subjected to Cronbach's Alpha reliability test, which resulted in a score of 0.84, indicating good internal consistency (Frias-Navarro, 2020; Oviedo & Campo, 2005).

The Kaiser Meyer and Olkin test reported KMO = .89 while Bartlett's test of sphericity determined the Chi-Square Approx. = 804,30 with degrees of freedom = 28 and significance = .000. According to Crespín Elías (2016), the KMO value obtained is in the acceptable range and the significance of Bartlett's test contrasts that the correlation matrix is an identity matrix, so the Exploratory Component Factor Analysis was performed, which identified three factors that explain 71,9% of the variance: *virtual environments as a learning facilitator*, *previous experience in virtual platforms* and *social learning environment strategy*, which can be seen on table 2.

Table 2: *Exploratory component factor analysis*

	VE as a learning facilitator	Previous experience	Social learning environment strategy
I am not familiar with the virtual platform of my university.	.19	1.33	.07
Virtual education impedes autonomous learning for both teachers and students.	.40	.34	.54
The assignments to be developed in my virtual classes are confusing.	.79	.28	.28
The academic skills to cope with online educational processes are lacking.	.97	.22	.34
The materials used online are scarce for the real demand of the subjects.	1.06	.00	.43
The e-learning environment limits my academic social environment.	.61	-.11	.74
Online collaborative tasks are complicated to achieve the real educational challenges.	.21	.12	1.10
The design of the material affects the reception of meaningful learning in online subjects.	.49	.06	.90

Following the tests described above, the results were presented in summary tables that reduce the Likert scale options to two results that indicate a perception in favor or against the factor evaluated by the students. The results are presented mainly in tables with a percentage reading, distributed in sociodemographic data, previous experience of students in online education platforms, perception of virtual environments as conducive to learning, social learning environment perceived by students, followed by an analysis of mean differences. Each factor is disaggregated by gender and area of the country, adding age range to the statistical tests.

Finally, the results are discussed and contrasted with other studies and the respective conclusions and recommendations are generated.

RESULTS

Previous Experience

The implementation of virtual education for all careers and subjects taught, during the social distancing by COVID-19, became a challenge for Salvadoran HEIs since all students who were enrolled in face-to-face mode suddenly had to switch to virtual mode. Many of them had no previous experience in virtual learning environments.

Of the 279 students participating in the study, only 71% said they were familiar with virtual platforms and had the skills to participate in virtual learning environments. See Table 3. Of these, 44% were female and 27% were male. That leaves 29% of students who had no previous experience in formal or non-formal courses under ICT-supported education platforms. Of these, 18% are female and 11% male.

Table 3. *Previous experience in virtual learning environments (VLE) according to gender.*

Experience	Female		Male		Total	Percent
	Female	Percent	Male	Percent		
Previous experience	121	44%	76	27%	197	71%
No previous experience	51	18%	31	11%	82	29%
Total	172	62%	107	38%	279	100%

On the other hand, the participating students were distributed in the three zones of the political division of El Salvador. Table 4 shows that of the 71% of the students with previous experience in virtual learning environments, 22% are students from the Eastern zone of the country, 26% from the Central zone, and 23% from the Western zone. Similarly, 29% of the students with no previous experience are distributed as follows: 9% from the Eastern zone, 13% from the Central zone, and 8% from the Western zone.

Table 4. Previous experiences in virtual learning environments by zone

Experience	Zone			Total	Percent			
	East	Percent	Central			Percent	West	Percent
Previous experience	61	22%	73	26%	63	23%	197	71%
No previous experience	25	9%	36	13%	21	8%	82	29%
Total	86	31%	109	39%	84	30%	279	100%

Virtual Environments as Learning Facilitators

Of the 279 students participating in the study, 57% perceive that the virtual environments implemented by Salvadoran HEIs facilitate learning, while 43% consider that they do not facilitate learning. Of those who perceive them as facilitators, 37% are female and 20% are male. Of those who perceive that virtual environments do not facilitate learning, 25% are female and 18% are male.

Table 5. Perception of virtual environments as facilitators of learning according to gender

Facilitator	Gender		Total	Percent		
	Female	Percent			Male	Percent
Learning facilitator	103	37%	57	20%	160	57%
No learning facilitator	69	25%	50	18%	119	43%
Total	172	62%	107	38%	279	100%

Table 6 shows the students' perception of virtual environments as learning facilitators, distributed among the three zones into which the country is divided. Of the 279 participants in the study, 57% perceive virtual environments as facilitators of learning, with 20% in the Eastern zone, 19% in the Central zone, and 18% in the Western zone. Similarly, of those who perceive that virtual environments do not facilitate learning, 10% study in the Eastern zone, 20% in the Central zone, and 13% in the Western zone.

Table 6. Perception of virtual environments as facilitators of learning by zone

Facilitator	Zone			Total	Percent			
	East	Percent	Central			Percent	West	Percent
Learning facilitator	57	20%	54	19%	49	18%	160	57%
No learning facilitator	29	10%	55	20%	35	13%	119	43%
Total	86	30%	109	39%	84	31%	279	100%

Social Learning Environment Strategy

The social learning environment is important because it allows students to express their perception as to whether they feel they can socialize with other students to favor their learning. Thus, as can be seen in Table 7, of the 279 students surveyed, 59% perceive a favorable social environment, with 39% being female and 20% male. The gender distribution of the 41% who perceive a non-favorable social environment is as follows: 23% are female and 18% male.

Table 7. Perception of the social environment strategy of learning by gender

Social learning environment strategy	Gender		Total	Percent		
	Female	Percent			Male	Percent
Favorable social environment strategy	107	39%	56	20%	163	59%
Non-favorable social environment strategy	65	23%	51	18%	116	41%
Total	172	62%	107	38%	279	100%

On the other hand, Table 8 shows that those who perceive favorable social environments as learning strategies are distributed in the zones of the country as follows: 21% are students from the Eastern zone, 18% from the Central zone, and 20% from the Western zone. Those who perceive the social learning environment strategy as not favorable are distributed as follows: 10% in the Eastern zone, 21% in the Central zone, and 10% in the Western zone.

Table 8. Perception of the social learning Environment Strategy by zone

Social environment	Zone						Total	Percent
	East	Percent	Central	Percent	West	Percent		
Favorable social environment strategy	57	21%	51	18%	55	20%	163	58%
No favorable social environment strategy	29	10%	58	21%	29	10%	116	42%
Total	86	31%	109	39%	84	30%	279	100,00%

Differences in perception according to gender, zone, and age range

Given that the Kolmogorov and Smirnov test represented in Table 9, reflects that the sample does not come from a population with normal distribution for the study variables' previous experience in virtual environments and virtual environments as learning facilitators (significance .000 and .016 respectively), the Mann-Whitney U test is applied to establish the differences of medians compared with gender and the Kruskal Wallis test for the geographical area where the participant studies and his age range; while the social learning environment variable indicates that it corresponds to a normal population (significance .156), the Student's t-test is applied to compare with gender and ANOVA of one factor for the difference of means according to the geographical area and age range.

Table 9. Kolmogorov and Smirnov test

		Previous experience	learning facilitator	Social learning environment strategy
N		279	279	279
Parameters	Mean	1,69	6,01	7,80
Normal	Standard Deviation	1,38	3,11	3,78
More extreme differences	Absolute	.19	.09	.07
	Positive	.19	.09	.07
	Negative	-.16	-.07	-.06
Z de Kolmogorov-Smirnov		3,13	1,49	1,11
Asymp. Sig. (2-tailed)		.000	.016	.156

Table 10 shows the results of evaluating students' previous experiences and their perception of virtual environments as learning facilitators, according to gender. With a p.value > .05, the null hypothesis indicating that the differences observed in the variables analyzed according to gender are reasonably due to chance and, therefore, there are no significant differences according to gender, is not rejected.

Table 10. Statistical tests by gender

	U of Mann-Whitney	Asymp. Sig. (2-tailed)
Previous experience	9158,50	.946
Learning facilitator	8295,50	.165

Table 11 shows the results of evaluating students' previous experiences and their perception of virtual environments as facilitators of learning, according to the geographical area of the country (Western, Central, and Eastern).

With p.value > .05, the null hypothesis is not rejected, indicating that the differences observed in the variable of previous experiences in virtual environments analyzed according to the geographical area of the students are reasonably due to chance and therefore there are no significant differences in the students' previous experiences according to zone.

On the other hand, with p.value < .05 the null hypothesis is rejected so the differences observed in the perception of virtual environments as learning facilitators are not due to chance and, therefore, there are significant differences according to the geographical area of the students in terms of the perception about virtual environments as learning facilitators.

Table 11. Kruskal Wallis statistical tests according to zone

	Previous Experience	Learning Facilitator
Chi-squared	1,05	6,65
df	2	2
Asymp. Sig.	.592	.036

Table 12 shows the results of evaluating students' previous experiences and their perception of virtual environments as learning facilitators, according to their age range (15-20, 21-30, 31-40, 41-50, 51-60, 61-70).

With an alpha greater than .05, the null hypothesis indicating that the differences observed in the variable of previous experiences in virtual environments analyzed according to age range, are not reasonably due to chance and therefore there are no significant differences in the previous experiences of students according to their age, is not rejected.

On the other hand, with p.valor < .05 the null hypothesis is rejected so the differences observed in the perception of virtual environments as learning facilitators are not due to chance and therefore there are significant differences according to the age of the students in terms of perception about virtual environments as learning facilitators.

Table 12. Kruskal Wallis statistical tests by age ranges

	Previous Experience	Learning Facilitator
Chi-squared	2,97	9,21
Df	3	3
Asymp. Sig.	.396	.027

Table 13 shows that there are differences in the means of perception of the social learning environment according to gender; however, the Student's t-test, presented in Table 14, shows that the differences are not significant, at p.value > .05.

Table 13. Statistics of social learning environment by gender

	Gender	N	Mean	SD	Mean Sta. Err.
Learning Social Environment Strategy	Male	172	7,56	3,78	.29
	Female	107	8,18	3,77	.36

Table 14. Student's t-test for independent samples: social learning environment by gender.

	F	Sig.	t	df	Sig. (2-tailed)	Dif. of Mean	Sta. Err. of Dif.	Inf.	Sup.	
Social learning environment strategy	of	.02	.902	-1.33	277,00	.184	-.62	.47	-1,53	.30
Equality of variances of variances not assumed	of			-1.33	225,19	.184	-.62	.46	-1,54	.30

Table 15 shows differences in the means of student perception of the social learning environment generated by the virtual environments implemented by the HEIs of El Salvador; for its respective verification, Table 16 presents the ANOVA test for one factor in which it is shown that the differences by geographic area of study are significant at p.value < .05.

Table 15. Descriptive statistics for social learning environment strategy by geographic zone

	N	Mean	Standard Deviation	Standard Error	Limit Inferior	Limit Superior	Min.	Max.
Social Learning Environment Strategy	Esat	86	7,31	3,50	.38	6,56	8,06	.00 16,00
	Central	109	8,51	3,95	.38	7,76	9,26	.00 16,00
	West	84	7,36	3,74	.41	6,55	8,17	.00 16,00
	Total	279	7,80	3,78	.23	7,35	8,24	.00 16,00

Table 16. One-factor ANOVA for social learning environment strategy by geographic zone

	Sum of Squares	df	Mean Square	F	Sig.	
Social learning environment strategy	Inter Groups	9,32	2	46,16	3,8	.039
	Intra Groups	3885,04	276	14,08		

	Sum of Squares	df	Mean Square	F	Sig.
Total	3977,35	278			

DISCUSSION

According to table 18, of the 197 students who stated that they had previous experience in virtual learning environments, 65% perceive that the VLE implemented during COVID-19 *facilitates learning*, while 35% consider that they *do not facilitate learning*.

On the other hand, of the 82 students who state that they have *no previous experience* in VLE, only 38% perceive that these environments are *learning facilitators* against 62% who state that they *do not facilitate learning*.

Pearson's χ^2 reports a p.value = .000 which rejects the premise that the students' previous experience in VLE is not determinant for perceiving support from these as facilitators of learning and, therefore, the hypothesis that such perception depends on their previous experiences is accepted.

Table 18. *Previous experiences in virtual learning environments as a determinant of learning facilitator.*

Previous experiences in virtual learning environments	Learning facilitator %	No Learning% facilitator	Total	%
Previous experience	129,00	65,48%	68,00	34,52%
No previous experience	31,00	37,80%	51,00	62,20%
			197,00	100,00%
			82,00	100,00%

According to Table 19, of the 163 students who stated that they had previous experience in virtual learning environments, 61% perceive that the VLE implemented during COVID-19 is a *favorable social environment strategy*, while 39% consider that they *are not a strategy favorable social environment to learning*.

On the other hand, of the 116 students who state that they have *no previous experience* in VLE, only 51% perceive that these environments are a *favorable social environment strategy* against 49% who state that they *are not a favorable social environment strategy to learning*.

Pearson's χ^2 reports a p.value = .115 which does not reject the premise that the student's previous experience in VLE is not determinant for perceiving support from these as a social learning environment and, therefore, the hypothesis that such perception depends on their previous experiences is rejected.

Table 19. *Previous experiences in virtual learning environments as a determinant of social learning environment strategy*

Previous experiences in virtual learning environments	strategy favorable% social environment	Favorable % social environment strategy	Total	%
Previous experience	121,00	61,40%	76,00	38,60%
No previous experience	42,00	51,20%	40,00	48,80%
			163,00	100,00%
			116,00	100,00%

As also stated by Barbrow et al. (1996) and Taberner(2014), besides the learning environment of students, several additional considerations must be examined before implementing an online computer system: students' experiences with and attitudes toward a computer. On the other hand, Landrum (2020) found that prior experience did maintain a significant relationship with satisfaction with online learning, as was found in the present study regarding the perception of VLEs as learning facilitators (Table 18). However, said experience is not determinant to perceive the VLE as a social learning environment (Table 19). Therefore, by having previous experiences, students can perceive the benefits provided by virtual learning environments and establish their relationship with their learning, taking advantage of the resources available in the virtual platforms that the university has implemented.

According to Tables 10 and 14, gender is not a determinant for the perception of virtual environments as learning facilitators and Social Learning Environment Strategy, respectively; nevertheless, according to Keller and Cernerud (2002) "male students were less positive to virtual education ... than other students" (p. 55); however, Hederich et al. (2013) show the male preference for exploring virtual spaces to access information of various kinds, while women resort to this scenario mainly as part of their socialization learning process. In this order of ideas, there has currently been an increase in the demand and enrollment of women in higher education (Coreas-Flores, 2020, 2022) which gives them a different perspective regarding virtual learning environments since they have had to face them as resources to learn and participate in the socialization of their learning. Even though Coreas-Flores

(2022) also found that gender is not a determinant for the selection of a study modality (face-to-face, virtual, or blended) in their academic demand for university degrees, they found that more women than men prefer face-to-face to continue with their higher education studies.

At the moment of perceiving virtual environments as learning facilitators and as social learning environment strategies, gender is not a determining factor, which implies that, currently, both women and men have developed the necessary user experiences to attend to their learning.

According to Aguirre et al. (2015), the incorporation of a virtual classroom allowed students to work collaboratively, with independence of schedules and space, offered more agile communication channels, and contributed to more flexible training during the teaching and learning process, through the realization of non-face-to-face activities; given this, there is a contrast in the results of this study since the perception that students have of VLE as social learning environments is associated with the geographical area but not with gender.

Ramírez-Mera & Barragán López (2018) identified that, for their learning, students seek easy-to-use technological platforms to participate in virtual education; like Ramírez-Mera & Barragán López (2018) the students participating in the present study state that they seek socialization to carry out the teaching-learning process, indicating that they have a favorable social environment during their participation in virtual education.

Given the circumstances under which Internet connectivity works in El Salvador, the rural area lacks a wired connection, so students access their classes and virtual content through a mobile data connection, which makes participation in virtual environments more expensive of learning and makes it difficult to carry out collaborative academic activities (social learning environment).

On the other hand, the geographical areas of the country's political division (Western, Central, and Eastern) have their particularities concerning Internet connectivity because, normally, improvements to the service are implemented by the telephone companies first in the Central area and then they spread to other areas, which can lead to long wait times for subscribers; for example, 5G and fiber optic connectivity is not uniformly available nationwide.

Both connectivity factors make a difference in the perception that students have of VLE as learning facilitators and as a social learning strategy. This implies that not all students are accessing the VLE under the same connectivity conditions, so their learning requires the incorporation of other strategies such as providing connection to HEI services through virtual private networks to favor students who have less connectivity.

This study did not delve into the characterization of the participants beyond gender, geographic area, and age range. Previous experience in virtual education platforms, perception of VLE as learning facilitators, and perception of VLE as a social learning strategy were the product of Exploratory Factor Analysis based on the questions that were originally posed based on student perception indicators regarding virtual learning environments.

The study also does not delve into the characteristics of VLE because the participants were students, who are unaware of the technical details of the platforms that their universities make available to them. Another limitation on this aspect is that teachers and other administrative personnel of the HEI did not participate because only the perception of the students was sought.

Conclusions

- The perception of the support of virtual environments as *facilitators of learning* depends on the student's previous experience in EVA.
- The geographical area in which the participants study is a determining factor for the perception of VLEs as *facilitators of learning*, while it is not for the *previous experience* expressed by the students.
- Students' age is a determining factor for their perception of VLEs as *learning facilitators*, but it is not for *previous experience* in virtual education.
- The perception of *social learning environments* implemented during social distancing is not associated with the student's gender, but it is about the geographic area in which they study.

Recommendations

- Given that *previous experience* is a determining factor for the perception of virtual environments as *learning facilitators*, Salvadoran HEI should include introductory workshops on the use of virtual platforms developed in preparatory courses aimed at new students.

- Taking care of the age groups of the students, HEI must include different academic activities that strengthen learning and, therefore, their perception of VLE as learning facilitators.
- For future research, HEI could investigate the relationship between students' experience in video games and the perception of virtual learning environments as *learning facilitators* and their performance in *collaborative activities*.
- The results of this study also open up opportunities to continue investigating *learning styles* and their relationship with the perception of VLEs as *facilitators of learning*.

REFERENCES

- Abad Lopez, A. P., & Saenz Niño, M. J. (2020). Hábitos de estudio y estrategias de aprendizaje para el desarrollo de la autonomía en educación virtual. In *Hábitos de estudio y estrategias de aprendizaje para el desarrollo de la autonomía en educación virtual* (Vol. 53, Issue 9).
- Aguirre, J., Viano, H., & García, B. (2015). Una experiencia para fortalecer los procesos de enseñanza de la programación mediante el uso de entornos virtuales de aprendizaje. *Enseñanza y Aprendizaje de Ingeniería de Computadores*, 5(5), 69–78.
- Al-Nofaie, H. (2020). Saudi University Students' Perceptions towards Virtual Education During Covid-19 Pandemic: A Case Study of Language Learning via Blackboard. *Arab World English Journal*, 11(3), 4–20. <https://doi.org/10.24093/awej/vol11no3.1>
- Barbrow, E. P., Jeong, M., & Parks, S. C. (1996). Computer experiences and attitudes of students and preceptors in distance education. *Journal of the American Dietetic Association*, 96(12), 1280–1281. [https://doi.org/10.1016/S0002-8223\(96\)00334-3](https://doi.org/10.1016/S0002-8223(96)00334-3)
- Basilaia, G., & Kvavadze, D. (2020). Transition to Online Education in Schools during a SARS-CoV-2 Coronavirus (COVID-19) Pandemic in Georgia. *Pedagogical Research*, 5(4). <https://doi.org/10.29333/pr/7937>
- Carmona Suarez, E. J., & Rodríguez Salinas, E. (2017). Buenas prácticas en la educación superior virtual a partir de especificaciones de estándares e-Learning. *Sophia*, 13(1), 13–26. <https://doi.org/10.18634/sophiaj.13v.1i.345>
- Chiappe Laverde, A. (2008). Diseño instruccional: oficio, fase y proceso instruccional Design: Role, Phase and Process Desenho instruccional: ofício, fase e processo. *Informática Educativa*, 11(2), 229–239.
- Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective. *Sustainability (Switzerland)*, 12(24), 1–22. <https://doi.org/10.3390/su122410367>
- Coreas-Flores, E. O. (2020). *Caracterización de estudiantes de nuevo ingreso en una universidad de El Salvador*. <https://ugb.edu.sv/images/pdf/investigacionesusu/Caracterizacin%20de%20estudiantes%20universitarios.pdf>
- Coreas-Flores, E. O. (2022). *Demanda académica de carreras actuales y potenciales UGB-CRU 2022*.
- Crespin Elías, E. (2016). *Análisis multivariante* (UFG Editores, Ed.). UFG Editores. <https://ri.ufg.edu.sv/jspui/handle/11592/9612>
- Decreto Legislativo 593, Pub. L. No. 593 (2020).
- Dung, D. (2020). The advantages and disadvantages of virtual schools. *IOSR Journal of Research & Method in Education (IOSR-JRME)*, 10(3), 45–48. <https://doi.org/10.9790/7388-1003054548>
- Eiliana, L., & Castro, D. (2012). *Red Tercer Milenio Educación virtual* (1st ed.). Red Tercer milenio S.C.
- Estrada Sentí, V., Febles Rodríguez, J. P., Passailaigue Baquerizo, R. M., Ortega Santos, C. E., & León Mendoza, M. (2015). La educación virtual. Diseño de cursos virtuales. In Á. M. González Laucirica (Ed.), *Journal of Chemical Information and Modeling* (Vol. 53, Issue 9). Editorial Universidad ECOTEC.
- Ezequiel, M., & Mendoza, B. (2013). Emerging communicative tensions in collaborative learning strategies. *Entramado*, 9(1), 188–201.
- Frías-Navarro, D. (2020). Apuntes de consistencia interna de las puntuaciones de un instrumento de medida. In *Universidad de Valencia*. <https://www.uv.es/friasnav/AlfaCronbach.pdf>
- García Aretio, L. (2009). *¿Por qué va ganando la educación a distancia?* - Lorenzo GARCÍA ARETIO - Google Libros.
- García Aretio, L. (2017). Educación a distancia y virtual: calidad, disrupción, aprendizajes adaptativo y móvil. *RIED. Revista Iberoamericana de Educación a Distancia*, 20(2), 9. <https://doi.org/10.5944/ried.20.2.18737>
- Hederich, C., Camargo, Á., López, O., Páramo, P., & Sanabria, L. (2013). Aprendizaje situado: género y entornos de aprendizaje. *Nodos y Nudos*, 4(35). <https://doi.org/10.17227/01224328.2263>
- Hernández-Sampieri, R., Fernández-Colado, C. y Baptista-Lucio, P. (2014). *Metodología de la investigación* (6a ed.). McGraw-Hill Education.
- Hinojo, M. A., & Fernández, A. (2012). El aprendizaje semipresencial o virtual: nueva metodología de aprendizaje en Educación Superior. *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud*, 10(1), 159–167.

- Keller, C., & Cernerud, L. (2002). Students' Perceptions of E-learning in University Education. *Journal of Educational Media*, 27(1–2), 55–67. <https://doi.org/10.1080/0305498032000045458>
- Landrum, B. (2020). Examining students' confidence to learn online, self-regulation skills and perceptions of satisfaction and usefulness of online classes. *Online Learning Journal*, 24(3), 128–146. <https://doi.org/10.24059/olj.v24i3.2066>
- Ministerio de Educación Ciencia y Tecnología de El Salvador. (2020). *Circular ministerial No. 10/2020*. <https://www.mined.gob.sv/circulares-institucionales/>
- Monge Nájera, J., & Méndez Estrada, V. H. (2007). Ventajas y desventajas de usar laboratorios virtuales en educación a distancia: La opinión del estudiantado de un proyecto de seis años de duración. *Revista Educación*, 3(1), 91–108.
- Nambiar, D. (2020). The Impact of Online Learning during Covid-19 Pandemic: Students Perspective Maharashtra, India. *International Journal for Research in Applied Science and Engineering Technology*, 8(11), 686–690. <https://doi.org/10.22214/ijraset.2020.32277>
- Oviedo, H. C., & Campo, A. (2005). Metodología de Investigación y Lectura Crítica de Estudios Aproximación al Uso del Coeficiente Alfa de Cronbach. *Revista Colombiana de Psiquiatría*, XXXIV(4), 572–580. <http://www.scielo.org.co/pdf/rcp/v34n4/v34n4a09.pdf>
- Pando, V. F. (2018). Tendencias didácticas de la educación virtual: Un enfoque interpretativo. *Propósitos y Representaciones*, 6(1), 463–505. <https://doi.org/10.20511/pyr2018.v6n1.167>
- Ralón, L., Vieta, M., & Vásquez-de-Prada, M. L. (2004). On line (de)formation: e-learning disadvantages. *Comunicar*, 11(22), 171–176. <https://doi.org/10.3916/c22-2004-26>
- Ramírez Mera, U., & Barragán López, J. F. (2018). Autopercepción de estudiantes universitarios sobre el uso de tecnologías digitales para el aprendizaje. *Apertura (Guadalajara, Jal.)*, 10(2), 94–109. <https://doi.org/10.18381/ap.v10n2.1401>
- Rizo, M. (2020). Role of the professor and the student in virtual education. *Revista Multi-Ensayos*, 6(12), 28–37.
- Rodríguez, A. L. (2011). Retos y oportunidades en la educación superior virtual de El Salvador. In *Akademios*.
- Sánchez Miranda, J. J., González Polo, A., & Monroy Rodríguez, A. (2019). La formación de docentes normalistas: De la tradición pedagógica a los entornos virtuales de aprendizaje. *RIDE Revista Iberoamericana Para La Investigación y El Desarrollo Educativo*, 10(19), 25. <https://doi.org/10.23913/ride.v10i19.539>
- Secretaría de Innovación de la Presidencia de El Salvador. (2020). *Plan de conectividad nacional - Agenda digital 2020*. <https://www.bing.com/ck/a?!&&p=47af8f85d6a3759bJmltdHM9MTY4NjYxNDQwMCZpZ3VpZD0zM2VjOTI1YS0wMzgxLTY3MGYtMWRjZi04MGY2MDJmYTUyZWUmaW5zaWQ9NTE3Mw&ptn=3&hsh=3&fclid=33ec925a-0381-670f-1dcf-80f602fa669e&psq=conectividad+por+zonas+pol%3%adticas+en+El+Salvador&u=a1aHR0cHM6Ly93d3cudHJhbnNwYXJlbnNpYS5nb2luc3YvaW5zdGl0dXRpb25zL2Nhcy9kb2N1bWVudHMvNDMzNzkyL2Rvd25sb2Fk&ntb=1>
- Segura Vera, M. (2021). The teacher as a mediator: Foundation, characteristics, and importance in virtual learning environment. *Revista Enfoques Educativos*, 18(2), 66–79. <https://doi.org/10.25215/0802.094>
- Serna-Loaiza, D. M., Rojas-Berrio, S. P., & Robayo-Pinzón, Ó. J. (2020). Valor percibido en instituciones de educación superior por parte de estudiantes de modalidad virtual. *Revista Científica Pensamiento y Gestión*, 46, 79–107. <https://doi.org/10.14482/pege.46.1805>
- Sierra Varón, C. A. (2013). La educación virtual como favorecedora del aprendizaje autónomo. *PANORAMA*, 5(9). <https://doi.org/10.15765/pnrm.v5i9.37>
- Simamora, R. M. (2020). The Challenges of Online Learning during the COVID-19 Pandemic: An Essay Analysis of Performing Arts Education Students. *Studies in Learning and Teaching*, 1(2), 86–103. <https://doi.org/10.46627/silet.v1i2.38>
- Soto, I. (2020). The Student-Teacher Relationship in Times of Quarantine: Challenges and Opportunities for Learning in Virtual Environment. *Saberes Educativos*, 5, 70–99.
- Taberner, R. (2014). Should we incorporate new technologies as teaching aids? *Piel*, 29(1), 1–3. <https://doi.org/10.1016/j.piel.2013.09.006>
- Villacis Lizano, M., Moreno Genovés, M., & Benavides Lara, R. (2021). Virtual environments as teaching-learning spaces. “A theoretical approach for higher education. *Horizontes. Revista de Investigación En Ciencias de La Educación*, 5(19), 695–708. <https://doi.org/10.33996/revistahorizontes.v5i19.230>
- Yandri Zambrano-Zambrano, & Carlos García-Vera. (2020). Plan of virtual learning environments and its application in the subject of social sciences in time of pandemic COVID-19 for High School Students in Portoviejo, Ecuador. *Dominio de Las Ciencias*, 6(3), 232–245.