Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6, 1-15
2025
Publisher: Learning Gate
DOI: 10.55214/25768484.v9i6.7731

Impact of virtual modality on university education during the COVID-19 pandemic: A public affairs study in Chiclayo, Peru

Lorena Liseth Cubas Salazar[1*], Ricardo Augusto Zapata Lozada[2], Percy Junior Castro Mejía[3]
[1,2,3]School of Administration, Doctorate in Public Management and Governance Program, César Vallejo University, Chiclayo, Peru; lcubass@ucvvirtual.edu.pe (L.L.C.S); zlozadar@ucvvirtual.edu.pe (R.A.Z.L); percycm@ucvvirtual.edu.pe (P.J.C.M.).

Abstract: University education was greatly impacted worldwide from the onset of COVID-19, which posed unprecedented challenges for learning. This led educators to adapt their in-person classes to an online format due to the highly contagious nature of the disease. As a result, the Peruvian government imposed a nationwide lockdown, suspending all forms of student classes. In this context, our project aims to determine the relationship between virtual modality and university education in response to the COVID-19 pandemic. We employed a basic correlational quantitative approach, collecting data from a sample of 114 university students in the city of Chiclayo, Peru, using online questionnaires with a Likert scale, based on two variables. The results show a very strong positive relationship between virtual modality and university education (Rho=0.921, p=0.00), rejecting our null hypothesis and accepting our specific hypothesis 1, which asserts that there is a significant relationship between organization and accessibility among university students. There is also a demonstrative relationship between planning and technology among university students, as indicated in specific hypothesis 2. Additionally, there is an important relationship between knowledge and pedagogy among university students, as suggested by specific hypothesis 3. This empirical evidence defines that virtual modality has a positive impact on university education. It provides easy access to online learning from anywhere without the need to attend physical classrooms. Most students have internet connectivity and suitable technology for their virtual classes, demonstrating high and positive levels of satisfaction with virtual teaching. This is due to good organization and planning in adapting traditional classes to the virtual modality, which has emerged as a new way to enhance the learning process.

Keywords: *Economy, Educational gaps, Face-to-face modality, University education, Virtual Modality.*

1. Introduction

It is very difficult to talk about the era of the COVID-19 pandemic, as it resulted in many human lives lost worldwide. This terrible virus did not discriminate by race or social status and caused a devastating economic crisis. Schools and universities had to close, leading to many students delaying their learning and others putting their university careers on hold. This situation necessitated the implementation of distance education strategies through the updating of digital tools, as universities were exclusively required to conduct classes online. According to the directives of the Peruvian government, attending physical classrooms was not allowed.

This form of teaching during the pandemic became a fundamental element in maintaining academic activity and brought about changes in students' learning. Through this article, we will attempt to demonstrate how this shift in modality was embraced and the importance of adaptability for both students and teachers. This adaptability was crucial to ensure that education did not come to a standstill due to the pandemic. It is evident that there was a radical shift from 100% in-person instruction to

History: Received: 10 March 2025; Revised: 23 April 2025; Accepted: 28 April 2025; Published: 2 June 2025
* Correspondence: lcubass@ucvvirtual.edu.pe

virtual, motivating both teachers and students to acquire the necessary skills to effectively use digital tools and deliver their virtual classes without disruptions.

According to Rivadeneira [1] and Castro [2] the virtual modality has shown that many university students lack electronic devices such as computers, laptops, or high-end cell phones to access their online classes. This type of education has revolutionized the way of teaching, as it now allows thousands of people to pursue their university degrees online, breaking down the barriers of time and distance. It enables students to regulate their pace of learning and adapt to their new online class schedules while managing their daily responsibilities.

It is believed that the reasons for non-attendance in virtual classes are primarily related to economic factors. This is because a significant number of students do not have access to the internet, especially those residing in remote areas. In light of this context, this report aims to address the following general problem: What is the relationship between virtual modality and university education as a result of the COVID-19 pandemic? The specific problems to be addressed are: What is the relationship between organization and accessibility among university students? How can we determine the relationship between planning and technology among university students? What is the relationship between knowledge and pedagogy among university students?

Theoretical Justification: The purpose of this research is to demonstrate that the shift from in-person to virtual modality was not as chaotic or difficult to manage as perceived. Furthermore, this research shows that university students can achieve optimal learning through virtual modality. As indicated by Figueroa, et al. [3] virtual education is a relevant option in the university sector, as well as in all educational sectors, including early childhood, primary, and secondary education. It is crucial to provide comprehensive and high-quality education, especially in times of COVID-19.

Practical Justification: From an academic perspective, it has been evident that the relationship between virtual modality and university education in response to the COVID-19 pandemic has a very high positive trend. This demonstrates that both teachers and university students are prepared to deliver and receive virtual education with the same quality and experience as in-person classes. It is essential for educators to continually update their skills in virtual platforms. This study has shown that if students and teachers adjust their schedules, it becomes easier to implement this new mode of learning, showcasing their adaptability to virtual education.

Methodological Justification: Our project is non-experimental, cross-sectional, and has a quantitative approach with a basic correlational design. Data will be collected through surveys using a questionnaire as our instrument, which will be measured using the Likert scale.

According to Ávila, et al. [4] and Paola, et al. [5] the definition of a survey is a technique used to empirically gather information. It is applied to a number of individuals through a questionnaire to access personal data and gather their opinions on the causes or consequences of a particular issue. Surveys are used to seek potential solutions and gain a comprehensive understanding of all those involved in the research of a problem.

As stated by Reyes Cruz, et al. [6] the Likert scale is used to collect data in various social studies. It measures the degree to which dimensions, categories, attitudes, or characteristics are present by quantitatively assessing something qualitative.

With the general objective of determining the relationship between virtual modality and university education as a result of the COVID-19 pandemic, the following specific objectives were set: SO1: Determine the relationship between organization and accessibility among university students. SO2: Identify the relationship between planning and technology among university students. SO3: Determine the relationship between knowledge and pedagogy among university students.

1.1. Literature Review

Arms and Morocco [7] state that when analyzing the current state of virtual education post-pandemic, it can be concluded that this modality has posed a significant challenge for authorities and

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6: 1-15, 2025
DOI: 10.55214/25768484.v9i6.7731

teachers in any institution. The use of digital tools was not a constant practice in traditional face-to-face classes, and now they had to adapt to everything new that was coming, all in the pursuit of enhancing their own professionalism.

Internationally, as referred to by Pulido [8] in their study on attitudes towards virtual education among 21 Venezuelan university students, conducted with a quantitative, non-experimental, cross-correlational design, it was determined that university students expressed favorable attitudes towards virtual education, with approximately 87.5% of men, 92% of women, 86% of students from IMPM, and 100% from IPSM. However, a number of university students mentioned certain shortcomings in terms of using digital media, expressing anxiety about their future projects in the virtual modality. Furthermore, 50% of university students aged 25 to 30 expressed a willingness to embrace virtual education. Regarding the ease of understanding the utility of virtual education, there was inconsistency among university students aged 31-35 (100%), between 36-41 (50%), and those older than 41 (60%).

According to Heydari, et al. [9] in their cross-sectional descriptive study on the state of virtual education at Khalkhal University of Medical Sciences during the COVID-19 pandemic, from the perspective of a total of 231 students and 22 professors who participated in the research, with a response rate of 66.57%, the mean and standard deviation of student assessment scores (3.3 ± 0.72) were lower than those of the professors (3.94 ± 0.64), which showed a statistically significant difference ($p < 0.01$). User access to the virtual education system (3.8 ± 0.85) and lesson presentation (4.28 ± 0.71) received the highest scores from the perspective of students and teachers, respectively. There was a statistically significant association between employment status and professor assessment scores ($p = 0.01$), field of study ($p < 0.01$), year of university enrollment ($p = 0.01$), and student assessment scores. The results showed above-average assessment scores in both the teacher and student groups. There was a difference between teachers and students regarding virtual education scores, particularly in areas requiring the creation of better processes and more comprehensive skills in the systems. This suggests that more detailed planning and new reforms will improve the virtual education process.

As indicated by Khan, et al. [10] in their study aimed at determining the utility of e-learning resources, it was found that 58.7% of respondents believed that studying through e-learning provides the flexibility to study at a convenient time for the student. Additionally, 73.4% of respondents believed that e-learning allows students to continue their studies regardless of geographical disparities, facilitates the taking of exams and submission of assignments electronically, and 68% of respondents agreed that effective communication between the instructor and the student is possible without face-to-face interaction. Concerning the "Perceived Ease of Use of e-Learning," the study found that 52.2% of students believed that e-learning platforms are easy to use, and 50% of the sampled respondents believed that web-based learning systems simplify the learning process for students. The study revealed students' preferences for e-learning, considering easy access to study resources as one of the main reasons why students opt for e-learning. This leads to the formation of a positive attitude among students toward e-learning. This finding is based on the utility, self-efficacy, ease of use, and behavior of students toward the utility of e-learning, such as the convenience of studying from any geographical location, which is not possible in the case of traditional in-person education. Furthermore, the study illustrates a similar learning experience to that of being educated through in-person teaching, as students perceive e-learning as analogous to face-to-face learning.

At the national level, according to Lima [11] a study was conducted at a private university in Lima, where it was found that university students studying through virtual education did not meet the expected mastery models. In a quantitative, transactional, and non-transactional experimental design, a sample of 68 students mentioned that they disagreed with their teacher's research methodology, expressing disinterest and struggle with some virtual platforms. In addition, the number of assignments without any review after each class and the lack of immediate response to any doubts or queries through the only means of communication, email, have caused annoyance, discomfort, and pressure among university students, generating hostility towards virtual learning. Conclusion: 69% (female) and 31%

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6: 1-15, 2025
DOI: 10.55214/25768484.v9i6.7731

(male), aged 27 to 60, reported moderate stress levels in a stress study. 12% reported low stress levels, and 22% reported high stress levels.

At the local level, according to Millions [12] points out that in their quantitative, descriptive, correlational, and cross-sectional study conducted in 2021 at a university in Lambayeque, the main objective was to find the connection between virtual academic guidance and the development of capabilities in first-year students of Human Medicine. A sample of 50 students was used, and the survey technique was employed, using a questionnaire through the Google Forms virtual platform with a Likert scale. The results obtained revealed a direct and significant correlation between the presentation of virtual academic guidance (rho= .747), structure (rho= .837), accessibility (rho= .899), and utility (rho= .832), and the development of competencies. Based on these findings, it was concluded that there is a direct (rho= .860) and significant (p= .000) correlation between virtual academic guidance and competencies. This implies that a more structured and practical virtual academic guidance helps improve the competencies of first-year Human Medicine students at the University of Lambayeque in 2021. The implementation of virtual guides in subjects, especially those developed in laboratories, was important in contributing to the training and competency development of university students.

Based on these findings, we formulate the general hypothesis that there is a significant relationship between virtual modality and university education as a result of the COVID-19 pandemic. In addition, the following specific hypotheses were outlined: HE1: There is a significant relationship between organization and accessibility among university students. HE2: There is a relationship between planning and technology among university students. HE3: There is a relationship between knowledge and pedagogy among university students. Furthermore, our null hypothesis (Ho) states that there is no significant relationship between virtual modality and university education as a result of the COVID-19 pandemic.

2. Materials and Methods

2.1. Type of Investigation

Our research is of a basic nature with a quantitative approach, as described by Nieto [13] This type of basic or substantive study is named as such because it is closely related to the research objective. Its interest originates from within the research itself, driven by a strong desire to explore recent knowledge and a passion for gaining knowledge for the sake of knowledge. It serves as a source for other technological and applied studies, making it fundamental because it is indispensable for the advancement of science. As Sampieri, et al. [14] explain in the quantitative approach, the starting point is to identify and formulate a scientific problem, followed by a review of the literature related to the topic, which is used to construct a theoretical-reference framework. Subsequently, based on these two aspects, research hypotheses are formulated, specifying the fundamental variables of the research, which are defined both conceptually and operationally.

2.2. Research Design

It is non-experimental, cross-sectional, and correlational. According to Hernández et al. (2016) the non-experimental, cross-sectional design with a correlational scope involves an interpretation of the analysis of the relationship between variables.

2.3. Variables

This project has two variables:

2.3.1. Independent Variable

The virtual modality has a conceptual definition that encompasses the use of new technologies to implement optional teaching methodologies for students from populations with special characteristics, whose geographical location is nearly inaccessible, and where factors like the quality of education and

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6: 1-15, 2025
DOI: 10.55214/25768484.v9i6.7731

available time, in many cases, are constrained due to limited economic resources, as indicated by Loaiza [15] additionally, as an operational definition, the use of virtual teaching environments facilitates optimal access to education and information. This, however, does not replace traditional pedagogical tools but rather enhances and diversifies the means of learning. This demonstrates that it poses a significant challenge for universities, as noted by La Madriz [16].

2.3.1.1. Indicators: First Dimension Accessibility

Internet access indicator. Second technological dimension: its indicator is connectivity. Third dimension pedagogy: its indicator is the adequate technological resources.

2.3.1.2. Measurement Scale: it is Ordinal

According to Polished [17] the ordinal scale has a notion of organization that is assumed but is not measurable in terms of magnitude or quantity. Therefore, it does not have an associated unit of measurement. However, there are tools used to assess a condition where the author assigns a number to facilitate its interpretation.

2.3.2. Dependent Variable

The conceptual definition of university education is that 21st-century university education must adapt to all students through comprehensive development, aiming to enhance their skills and attitudes by providing teaching that stimulates and harmonizes their understanding, reflective capacity, and sensitivity, as stated by Orozco [18] as for the operational definition, it indicates that an inferential study begins with a set of indications and ends in the search for a series of conclusions that proceed from logical forms and mutually guaranteed premises to establish some relationship between various variables and concepts, as described by Sperber and Wilson [19].

2.3.2.1. Indicators: First Organization Dimension

Its indicator is time management. Second planning dimension: its indicator is performance. Third dimension knowledge: its organizational strategies indicator.

- Measurement scale: Ordinal.
- Population: The purpose of this project is to observe the population of 161 university students from the city of Chiclayo, who receive online classes.
- Inclusion criteria: Students who attend regularly and consecutively according to the classes scheduled and established by a private university in the city of Chiclayo-Peru were studied.
- Exclusion criteria**:** students with 50% absences at the university center, in order to avoid errors in the research.
- Sample: data will be collected from a population of 114 university students, determined using the formula to find the sample size for a finite population, where (n) is equal to the desired sample size, (N) is the population size, (z) is the statistical parameter depending on the level of confidence, (e) is the maximum acceptable estimation error, (p) is the probability of the studied event occurring, and (q) is the probability of the studied event not occurring. According to Tille and Hekimi [20] the sample is based on an extract or subset of the population intended to be representative.
- Sampling: It was probabilistic, calculated in a population of 161 university students, using simple random sampling, with a confidence level of 95% and a standard error of 5%, resulting in a sample size of 114 university students. According to Castro [2] this procedure is based on the sample calculation process.
- Unit of analysis**:** it is made up of university students from a private university in Chiclayo-Peru.
- Data collection techniques**:** We used a survey, which is a process in which interviewers gather information using a pre-designed questionnaire. In this regard, Carrasco [21] points out that it is

a widely used method in research due to its generality, simplicity, and objectivity of data. This study was applied to a selected sample of students from a private university in Chiclayo, Peru.

- Instrument: The questionnaire, which is a basic written means of information exchange between the interviewer and the respondent, the researcher, and the subject. According to Hernández Sampieri, et al. [22] they define it as the formulation of questions about one or more measurable variables. In this study, two questionnaires were used, one for the virtual modality variable with a total of 14 questions, and another for the university education variable with 13 questions, making a total of 27 items, for which an estimated time of 10 minutes per student was calculated.
- Validity: We can say that an instrument is valid if the developed tools are applicable and allow us to obtain reliable information. According to Hernández Sampieri, et al. [22] validity is the measure of the variable in a study, for which content validity is conducted, taking into account all aspects included in the research variable, as well as relevance, suitability, and clarity. These aspects were confirmed by 3 experts using instruments, where 2 experts are from the engineering field and 1 from the statistics field, who supported the instrument used for our research.

Table 1.
Thematic Expert Validators of the Developed Area

No.	Expert name _ _	Result
1	Mg. Rafael Martel Acosta	Applicable
2	Mg. Walter Ruiz Pena	Applicable
3	Lic. Viviana Mendez Diaz.	Applicable

- Reliability: Reliability is related to the accuracy and precision of the measurement process. According to Hernández Sampieri, et al. [22] reliability, when applied to a sample of the same subject, provides reliable and consistent results. To determine the reliability of the instrument, the Cronbach's Alpha coefficient was used, obtaining a score of 0.966 for the virtual modality questionnaire, reflecting high reliability, and a score of 0.970 for the university education questionnaire, indicating high consistency. According to Alcas, et al. [23] Cronbach's alpha measures the reliability of the research structure dimension by dimension and assesses the consistency of internal item correlations, which are performed on a scale.
- Procedures: For the development of the study, we began with the permission granted by Cesar Vallejo University - Chiclayo - Peru, applying our instrument to the students of this private university, using the questionnaires created through the Google Forms application and providing guidelines for correct completion. Furthermore, to achieve the proposed objectives, the instrument was validated by experts, thus obtaining reliable data. Once the questionnaire application process was completed, the results were tabulated in an Excel database and then processed in the SPSS 26.0 program for analysis and interpretation of the results.
- Data analysis method: The information was collected through a Google Forms survey form, gathering a sample of 114 respondents, and then processed using Excel and SPSS 26.0 software. A descriptive analysis was conducted by presenting tables and graphs. For hypothesis testing, the Spearman correlation coefficient was used as the variables did not exhibit normality. According to Lázaro-Álvarez [24] and Macha-Huamán, et al. [25] the SPSS 26.0 program offers the application of complex statistical analyses for larger databases with high efficiency. Variables are established following a step-by-step procedure in a logical order, based on the temporal sequence of occurrence, considering attributes from pre-enrollment to learning outcomes.
- Ethical aspects: Internationally, according to Moscoso and Díaz Heredia [26] when carrying out a project, various factors must be taken into account, such as the principles of beneficence and non-maleficence, justice, equity, respect for autonomy, confidentiality, and privacy to support methodological rigor. According to Álvarez [27] ethics in research refers to a morality that

incorporates research conducted to the highest professional standards but also emphasizes the need to protect and respect individuals who willingly agree to be surveyed, along with principles of justice, decency, and philanthropy.

- At the national level, Rodríguez and Huamanchumo [28] argue that institutional and social aspects are fundamental in research, as they ensure the veracity of responses without altering the survey results. The primary focus is on respecting copyright laws and ethical norms.

3. Results

Within the descriptive analysis of the virtual modality variable, it is detailed that it was structured into three dimensions: accessibility, technology, and pedagogy, with 14 items on a Likert-type scale ranging from 1 to 5.

In Table 2, the perception of university students regarding the virtual modality was examined. Based on the information collected in our questionnaires, it can be observed that 69.3% of university students in Chiclayo perceive virtual teaching at a high level, indicating a positive trend for the present and future of virtual education.

Table 2.
Level of perception of teaching in virtual mode according to university students in the city of Chiclayo, Peru.

Virtual Mode	Frequency	Percentage
Low	0	0.0
Half	35	30.7
High	79	69.3
Total	114	100.0

Table 3. The results of the information collected through our questionnaires to university students are shown, who reported high levels of accessibility to virtual education (68.4%), as more than 50% of the surveyed university students have optimal internet service and connectivity, easy access to their university's virtual platform, a good environment for attending their virtual classes, and satisfaction with the internet connectivity used by the teachers, while minimal percentages of students reported low levels.

Table 3.
Level of accessibility of the virtual modality according to university students in the city of Chiclayo, Peru.

Accessibility // Virtual modality	Never		Hardly ever		Sometimes		Almost always		Always	
	n	%	n	%	N	%	n	%	n	%
Has internet service and connectivity for your virtual classes.	1	0.9	11	9.6	16	14.0	15	13.2	71	62.3
The internet service and connectivity are optimal for your virtual classes.	0	0.0	3	2.6	25	21.9	21	18.4	65	57.0
The university's educational platform is easy to access and navigate.	2	1.8	6	5.3	27	23.7	15	13.2	64	56.1
The environment where you attend your virtual classes is suitable and quiet (without distractions like noise, etc.).	1	0.9	5	4.4	26	22.8	21	18.4	61	53.5
Do you consider that the teacher has a good internet connection to conduct virtual classes?	0	0.0	3	2.6	25	21.9	22	19.3	64	56.1
accessibility level	Low				Half				High	
Frequency	1				35				78	
Percentage	0.9				30.7				68.4	

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6: 1-15, 2025
DOI: 10.55214/25768484.v9i6.7731

In Table 4, university students reported high levels of acceptance of technology in the virtual mode, with 69.3% indicating that they have the technological resources to receive their education in the virtual mode. They expressed that they always have access to a good computer, and they have good access to programs and applications for conducting their virtual classes. They also mentioned that teachers use suitable computers to deliver their classes, showing a very positive trend for taking virtual classes from wherever they are.

Table 4.
Level of technology in the virtual mode according to university students in the city of Chiclayo, Peru.

Technology // Virtual modality	Never		Hardly ever		Sometimes		Almost always		Always	
	n	%	n	%	N	%	n	%	n	%
Has good computer and accessories for virtual classes (I5, I6, etc. Webcam)	2	1.8	11	9.6	18	15.8	20	17.5	63	55.3
Has the appropriate programs and applications for virtual classes (word, power point, pdf, zoom, etc.)	1	0.9	14	12.3	16	14.0	8	7.0	75	65.8
Do you think the teacher uses a good computer for virtual classes?	1	0.9	6	5.3	29	25.4	14	12.3	64	56.1
technology level	Low				Half				High	
Frequency	6				29				79	
Percentage	5.3				25.4				69.3	

In Table 5, The students express that in terms of pedagogy in the virtual mode, they have appropriate participation in virtual classes, with high levels of up to (64.9%). They stated that they always have good learning experiences in virtual classes and have suitable teachers with good pedagogy for virtual teaching. This demonstrates that with proper training and adaptation to virtual learning, teachers are prepared to impart their knowledge in the virtual mode with the same quality as in face-to-face classes.

Table 5.
Level of pedagogy in the virtual mode according to university students in the city of Chiclayo, Peru.

Pedagogy // Virtual modality	Never		Hardly ever		Sometimes		Almost always		Always	
	n	%	n	%	N	%	n	%	n	%
The virtual class mode helps to have a better learning experience.	3	2.6	5	4.4	27	23.7	22	19.3	57	50.0
You are present and attentive in your virtual classes.	0	0.0	5	4.4	23	20.2	18	15.8	68	59.6
You actively participate during the virtual class.	0	0.0	9	7.9	28	24.6	14	12.3	63	55.3
The teachers know how to reach the students with their teaching in a virtual manner.	4	3.5	4	3.5	29	25.4	21	18.4	56	49.1
The teacher motivates and interacts with the student in the virtual class.	0	0.0	5	4.4	21	18.4	29	25.4	59	51.8
Teachers are proficient in using technological tools during virtual classes.	1	0.9	5	4.4	23	20.2	25	21.9	60	52.6
Pedagogy level	Low				Half				High	
Frequency	1				39				74	
Percentage	0.9				34.2				64.9	

Within the descriptive analysis of the university education variable, it is detailed that this was structured into three dimensions: organization, planning, and knowledge, with 13 items on a Likert scale ranging from 1 to 5.

In Table 6, the students' perception of university education was studied, and a high level of 66.7% was observed, demonstrating a positive trend regarding organization, planning, and knowledge.

Table 6.
Level of perception of virtual university education according to university students in the city of Chiclayo, Peru.

college of education	Frequency	Percentage
Low	0	0.0
Half	38	33.3
High	76	66.7
Total	114	100.0

In Table 7, It can be observed that the level of organization, related to time management in university education, the students reported high levels of 66.7% in the adequate management of their time for learning in the virtual mode. They also expressed that receiving virtual classes is beneficial for them due to their time availability. They organize their topics in advance and follow the syllabus to organize their virtual classes. There is a positive trend in the level of organization and time management, with a minimum percentage of students reporting low levels of organization.

Table 7.
Level of organization of university education according to university students in the city of Chiclayo, Peru.

Organization // University education	Never		Hardly ever		Sometimes		Almost always		Always	
	n	%	n	%	N	%	n	%	n	%
Organizes your time adequately to receive virtual instruction	2	1.8	17	14.9	15	13.2	16	14.0	64	56.1
Virtual classes are beneficial according to your time availability	1	0.9	0	0.0	27	23.7	17	14.9	69	60.5
Prepares your necessary materials in advance for each virtual class	0	0.0	4	3.5	21	18.4	22	19.3	67	58.8
Organizes your academic activities guided by the curriculum	2	1.8	5	4.4	27	23.7	19	16.7	61	53.5
organization level	Low				Half				High	
Frequency	2				36				76	
Percentage	1.8				31.6				66.7	

In Table 8, it shows that planning refers to the prior distribution of activities in university education. The surveyed students reported high levels (58.8%) in adequately planning their activities for virtual learning. They do prior preparation of their assignments and plan their work weekly, maintain study habits, and indicate that the teacher demonstrates planning in the virtual classes they teach.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6: 1-15, 2025
DOI: 10.55214/25768484.v9i6.7731

Table 8.
Level of planning in university education according to university students in the city of Chiclayo, Peru.

Planning // College Education	Never		Hardly ever		Sometimes		Almost always		Always	
	n	%	n	%	N	%	n	%	n	%
Do you do any kind of previous preparation for the topic of the virtual class?	2	1.8	7	6.1	26	22.8	23	20.2	56	49.1
Do you plan your time weekly to do your homework and prepare for your virtual classes?	4	3.5	4	3.5	29	25.4	16	14.0	61	53.5
Do you have a "study habit" that helps you in your learning?	2	1.8	5	4.4	28	24.6	21	18.4	58	50.9
The teacher shows prior planning in the class they teach.	1	0.9	8	7.0	19	16.7	29	25.4	57	50.0
planning level	Low				Half				High	
Frequency	4				43				67	
Percentage	3.5				37.7				58.8	

In Table 9, regarding knowledge in university education, the surveyed students indicated high levels of 68.4% in having adequate knowledge of virtual teaching strategies, always having a positive self-learning attitude, having suitable teaching materials, the teacher employing effective teaching methods and strategies, and using rubrics for task completion, showing a positive trend.

Table 9.
Level of knowledge about university education according to university students in the city of Chiclayo, Peru.

Knowledge // University education	Never		Hardly ever		Sometimes		Almost always		Always	
	n	%	n	%	N	%	n	%	n	%
Do rubrics guide you in completing your assignments?	0	0.0	9	7.9	28	24.6	19	16.7	58	50.9
Do you have any strategies that help you with your studies (schedule, music, etc.)?	3	2.6	11	9.6	26	22.8	17	14.9	57	50.0
The teacher's teaching method is appropriate.	1	0.9	4	3.5	21	18.4	32	28.1	56	49.1
The teacher's materials are didactic with suitable content for learning (slides, videos, texts, etc.).	1	0.9	7	6.1	21	18.4	27	23.7	58	50.9
Do you believe you have an attitude (predisposition) for self-learning?	0	0.0	5	4.4	22	19.3	21	18.4	66	57.9
knowledge level	Low				Half				High	
Frequency	6				30				78	
Percentage	5.3				26.3				68.4	

Within the hypothesis testing (inferential analysis), a correlation analysis was conducted to compare the hypotheses because the aim was to examine the relationship between variables. Additionally, the Spearman's Rho statistic was used since the data did not meet the normality assumption required for other statistics.

Table 10.
Tests of normality for the data of the variables under study.

Variables / Dimensions	Kolmogorov-Smirnov to			
	Statistical	gl	Next.	Conclusion
V1: virtual mode	0.238	114	0.000	There is no normality
Accessibility	0.267	114	0.000	There is no normality
Technology	0.284	114	0.000	There is no normality
Pedagogy	0.268	114	0.000	There is no normality
V2: University education	0.257	114	0.000	There is no normality
Organization	0.281	114	0.000	There is no normality
Planning	0.286	114	0.000	There is no normality
Knowledge	0.261	114	0.000	There is no normality
to. Lilliefors significance correction				

As a general hypothesis, it is defined that there is a significant relationship between virtual mode and university education, as a result of the COVID-19 pandemic, for which we used the Spearman correlation. Since the probability sig. = 0.000 is less than the confidence level $\alpha = 0.05$, and following the decision rule, we reject the null hypothesis (H0), therefore, there is a statistically significant relationship between the perception of virtual teaching and university education, according to university students in the city of Chiclayo, Peru. Furthermore, based on the value of the coefficient Rho = 0.921, the effect is very strong and positive, demonstrating that there is a strong relationship between virtual mode and university education.

Table 11.
Correlation between virtual mode and university education.

Spearman's Rho		University education
virtual_mode	Correlation coefficient	0.921
	Next (bilateral)	0.00
	No.	114

Note: *. The correlation is significant at the 0.05 level (bilateral)

Specific hypothesis 1: There is a significant relationship between organization and accessibility in university students, for which we used the Spearman correlation. Since sig. = 0.000 is less than $\alpha = 0.05$, we reject Ho, leading us to accept H1; therefore, there is a significant relationship between the organization of university education and the accessibility of virtual mode, according to university students in the city of Chiclayo, Peru. Additionally, given that the value of the coefficient Rho = 0.883, the relationship is considerably positive.

Table 12.
Correlation between organization and accessibility.

Spearman's Rho		Accessibility
Organization	correlation coefficient	0.883
	Next (bilateral)	0.00
	No.	114

Note: * Correlation is significant at the 0.05 level (bilateral)

Specific hypotheses 2: there is a relationship between planning and technology in university students, for which we used the Spearman correlation. Since sig. = 0.000 is less than $\alpha = 0.05$, we reject H0; therefore, we accept H2, which refers to a significant relationship between the planning of university education and the technology of the virtual mode, according to university students in the city of Chiclayo, Peru. Thus, if the value of the coefficient Rho = 0.826, the relationship is considerably positive.

Table 13.
Correlation between planning and technology.

Spearman's Rho		Technology
Planning	Correlation coefficient	0.826 _
	Next (bilateral)	0.000
	No.	114

Note: *. The correlation is significant at the 0.05 level (bilateral).

Specific hypotheses 3: there is a relationship between knowledge and pedagogy in university students, for which we used the Spearman correlation. With sig. = 0.000 less than α = 0.05, we reject H0; Therefore, we accept H3, which refers to a significant relationship between the knowledge of university education and the pedagogy of the virtual mode, according to university students in the city of Chiclayo, 2023, with a coefficient value of Rho = 0.902, which is very strong and positive.

Table 14.
Correlation between knowledge and pedagogy.

Spearman's Rho		Pedagogy
Knowledge	Correlation coefficient	0.902
	Next (bilateral)	0.000
	No.	114

Note: *. The correlation is significant at the 0.05 level (bilateral).

4. Discussion

The present study aimed to find the relationship between virtual education and university education, conducted with university students in the city of Chiclayo, Peru. A structured questionnaire with 27 items was administered to the students, with an estimated time of 10 minutes per student. Background and theories were reviewed, considering the significant development of virtual teaching in recent years, especially during the COVID-19 pandemic. This mode of education involves the use of technology and communication to facilitate online learning, eliminating the need to be physically present on a university campus. This style of teaching promotes timesaving, enhances critical thinking, and improves decision-making processes.

Regarding our main objective, a statistically significant relationship was determined, with a very strong positive effect, between virtual education and university education among university students in Chiclayo, Peru. These results are in line with another study [27] which analyzed the current state of virtual education after the pandemic, concluding that this mode of education has posed a significant challenge to authorities and educators in any institution. The use of digital tools was not essential in traditional classes, but educators had to adapt to new technology and improve their professionalism.

Furthermore, our research reveals that surveyed students perceive virtual teaching as highly accessible, technologically advanced, and pedagogically sound. Thus, we can argue that in this population, students have internet access with appropriate technology, and they agree with how teachers use technology for teaching. This differs from other studies [1] where students in a Lima university showed disinterest and struggled with some virtual platforms. Communication with teachers for questions and queries was often tedious, with delayed or no responses, Mejía [29] leading to discomfort and pressure among university students and generating hostility toward virtual learning.

Our study identified that 66.7% of the surveyed population perceives a high level of university education based on organization, planning, and knowledge. They feel they have good time management skills and plan their activities according to their study schedule. Virtual university education allows students to access educational content at any time and from anywhere with an internet connection, enabling them to adapt their learning to their schedules and needs. These results are consistent with another study by White, et al. [30] which found a significant relationship in the development of competencies among university students in Lambayeque, contributing to their competency formation.

Regarding specific objective 1, a significant relationship was found between the organization of university education and the accessibility of virtual learning. This relationship was strongly positive, as having internet access and good coverage positively influences time management for academic activities. It facilitates the transition to online learning platforms for university students in Chiclayo, Peru. These results align with other research which found findings based on the usefulness, self-efficacy, ease of use, and behavior of students regarding the utility of e-learning, such as the ease of studying from any geographical location.

For specific objective 2, a significant relationship between the planning of university education and the technology of virtual learning was identified. This relationship was also considerably positive. Having suitable technological infrastructure and compatible devices greatly aids in planning autonomous university education. Students can prepare in advance since they have access to educational content on virtual platforms. The results show that the majority of students always have a computer and the necessary accessories, as well as access to useful programs and applications for virtual learning, which helps them plan their activities in advance. These results are in line with studies that require the creation of better processes and more comprehensive capabilities in systems. Improved planning and new reforms are likely to enhance the virtual education process.

Regarding specific objective 3, a very strong positive relationship was found between knowledge and pedagogy. The online knowledge interaction fosters active collaboration among students through discussion forums, video conferences, and other collaboration tools, resulting in enriched learning where the exchange of ideas encourages participation among peers from different parts of the world. This finding is also consistent with research in Hernández Godoy, et al. [31] where participants expressed favorable attitudes toward university education in the virtual mode, highlighting better attitudes among women (92%) compared to men (87.5%) in terms of ease of understanding virtual teaching.

In summary, among the studied population, there was no major difficulty in adapting to university education in the virtual mode. The vast majority expressed a positive predisposition toward learning and had the necessary technological resources, making access to virtual education information more feasible. There is a very strong and positive trend toward virtual university education in this population.

4.1. Implications

Our project is very interesting as it aims to highlight educational challenges in the face of unforeseen events like COVID-19. It seeks to find solutions not only at the individual level but also at the student and government levels. The pandemic initiated a shift in the learning modality, revealing that some teachers and students were not well-versed in the use of virtual educational tools. Additionally, there was a lack of quality broadband internet and a limited understanding of the platforms for conducting virtual classes. This also highlighted that not all students had the financial resources to afford high-end electronic devices for optimal virtual learning.

Furthermore, from a practical standpoint, the use of technological tools has been vital for this type of education. Therefore, it has underscored the importance of regional and national-level teacher training in virtual platforms and technology tools to prepare for any unforeseen circumstances. Through this study, we contribute to the development of virtual education for both teachers and students, enabling them to adapt to this new learning modality.

Likewise, it will encourage both private and public university authorities to anticipate unforeseen events like the COVID-19 pandemic and provide learning facilities for their students and teachers in the realm of virtual education.

5. Conclusions

Based on the presented results and findings, it can be concluded that there is a very strong positive relationship between virtual teaching and university education in the city of Chiclayo, Peru. Students perceive virtual education as highly beneficial, as they did not report any inconveniences. They

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 6: 1-15, 2025
DOI: 10.55214/25768484.v9i6.7731

expressed that it provides them with many conveniences for connecting with their teachers and peers, preparing their assignments from the comfort of their homes, and with a designated time for doing so. It also allows for easy studying from any part of the city or the country, Peru.

Furthermore, this study demonstrates that the COVID-19 pandemic, as a transformative process, successfully facilitated the adoption of new teaching methods. This supports the existence of a positive and significant relationship between the organization of university education and the accessibility of virtual modality among university students in Chiclayo, Peru. It shows that students have access to virtual platforms, which enhances their ability to organize their time for academic activities.

It was identified that students have the necessary technology in terms of virtual platforms and connectivity devices, enabling them to better plan their tasks and have information readily available. This indicates a significant and positive relationship between the planning of university education and the technology of the virtual modality, according to university students in Chiclayo, Peru.

The study determined that university students in Chiclayo, Peru, actively interact and promote online participation, which results in enhanced learning and contributes to the acquisition of their university knowledge. This confirms the existence of a very strong positive relationship between knowledge of university education and the pedagogy of the virtual modality.

The results obtained in our research highlight the commitment of both university students and teachers to improve their technological skills. It is essential for educators to undergo training in digital competencies for virtual teaching.

In terms of limitations, there is the lack of central government support in closing educational gaps. It is essential to value teachers by offering better financial compensation and access to technological training, enabling them to provide quality education. Public policies are needed to provide better internet services to students living in remote areas with poor connectivity, as this affects their ability to attend virtual classes under optimal conditions.

Funding:
This research was financed by the César Vallejo University.

Transparency:
The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

References
[1] m. Z. M. A. Rivadeneira, "Academic motivation profile in human medicine students of a private university of Lambayeque during the 2020-II semester," Bachelor's Thesis, Santo Toribio de Mogrovejo Catholic University]. USAT Academic Repository, 2022.

[2] E. M. Castro, "Biostatistics applied to clinical research: Basic concepts," *Revista médica clínica las Condes*, vol. 30, no. 1, pp. 50-65, 2019. https://doi.org/10.1016/j.rmclc.2018.12.002

[3] R. J. J. Figueroa, R. J. M. Saldaña, Y. M. A. Ventura, and D. A. M. Avila, "Challenges of virtual university education in Lima," *Veritas et Scientia*, vol. 10, no. 1, pp. 141-149, 2021. https://doi.org/10.47796/ves.v10i1.466

[4] H. F. Ávila, M. M. González, and S. M. Licea, "The interview and the survey: Methods or techniques of empirical inquiry," *Didascalia: Didactics and Education*, vol. 11, no. 3, pp. 62–79, 2020.

[5] A. G. H. Paola *et al.*, "Digital transformation and its relationship to the job performance of employees at a private university in Peru," *F1000Research*, vol. 13, p. 692, 2024. https://doi.org/10.12688/f1000research.151251.1

[6] J. L. Reyes Cruz, M. A. Garzón Castrillón, and B. Tapia Sánchez, "Design and validation of a Likert-type scale to establish entrepreneurial characteristics," *Dimensión Empresarial*, vol. 16, no. 2, pp. 135-160, 2018. https://doi.org/10.15665/dem.v16i2.1599
[7] E. E. A. Arms and E. I. C. Morocco, "Impact of the COVID-19 pandemic on university education through the virtual modality," *CIE Knowledge, Research and Education*, vol. 3, no. 14, pp. 1–17, 2021.
[8] J. E. Pulido, "University students' attitudes toward online education," *Journal of Educational Research*, vol. 34, no. 1, pp. 189–204, 2016.
[9] M. Heydari, Y. Mousazadeh, R. Salmani, and E. Mehraeen, "Assessment of virtual education during the covid-19 pandemic from the perspective of faculty members and students: A cross-sectional descriptive study in northwest Iran," *BMC Medical Education*, vol. 23, no. 1, p. 398, 2023. https://doi.org/10.1186/s12909-023-04378-y
[10] M. A. Khan, M. K. Nabi, M. Khojah, and M. Tahir, "Students' perception towards e-learning during COVID-19 pandemic in India: An empirical study," *Sustainability*, vol. 13, no. 1, p. 57, 2020. https://doi.org/10.3390/su13010057
[11] O. L. Lima, "Work stress, burnout and self-efficacy in university professors from a private university in Lima," Master's Thesis, César Vallejo University]. Repository of the César Vallejo University, 2017.
[12] C. M. Millions, "Virtual academic guide and development of skills in first cycle students of human medicine at a Lambayeque university, 2021," Master's Thesis, César Vallejo University, 2022.
[13] E. Nieto, *Types of research*. Bogotá, Colombia: Santo Domingo de Guzmán University, 2018.
[14] R. Sampieri, C. Fernández, and L. Baptista, *Definitions of the quantitative and qualitative approaches, their similarities and differences*. Mexico City, Mexico: RH Sampieri: Research Methodology, 2014.
[15] R. Loaiza, "Virtual facilitation and training in Latin America," *Quaderns Digital Magazine*, vol. 28, pp. 85–154, 2002.
[16] J. La Madriz, "Factors that promote dropout from the virtual classroom," *ORBIS Electronic Scientific Journal of Human Sciences*, vol. 12, no. 35, pp. 18–40, 2016.
[17] J. E. Polished, "Attitude towards virtual education of UPEL graduate students," *Reason and Word*, vol. 21, no. 98, pp. 606–623, 2017.
[18] L. Orozco, *Comprehensive training: Myth and reality*. Bogotá: Uniandes Editorial, Third World, 1999.
[19] D. Sperber and D. Wilson, *Relevance: Communication and cognition*. Oxford: Basil Blackwell, 1986.
[20] Y. Tille and I. Hekimi, *Sampling and estimation from finite populations*. Hoboken, NJ: Wiley, 2020.
[21] S. Carrasco, *Scientific research methodology*. Peru: San Marcos Publishing House, 2007.
[22] R. Hernández Sampieri, C. Fernández Collado, and P. Baptista Lucio, *Research methodology*, 6th ed. Mexico: McGraw-Hill Interamericana, 2014.
[23] Z. N. Alcas, H. H. Alarcón Díaz, C. O. Venturo Orbegoso, M. A. Alarcón Díaz, J. A. Fuentes Esparrell, and T. I. López Echevarría, "Teaching techno-stress and perception of service quality in a private university in Lima," *Purposes and Representations*, vol. 7, no. 3, pp. 231–247, 2019.
[24] N. Lázaro-Álvarez, "Use of SPSS software to identify predictors of student dropout," *Luz*, vol. 38, no. 1, pp. 38–50, 2022.
[25] R. Macha-Huamán *et al.*, "Business Model Canvas in the entrepreneurs' business model: A system approach," *EAI Endorsed Transactions on Scalable Information Systems*, vol. 10, no. 5, p. 1, 2023. https://doi.org/10.4108/eetsis.3594
[26] L. L. F. Moscoso and L. P. Díaz Heredia, "Ethical aspects in qualitative research with children," *Latin American Journal of Bioethics*, vol. 18, no. 1, pp. 51-67, 2018.
[27] P. Álvarez, *Ethics and research primer*. Colombia: University of Bogotá, 2018.
[28] J. Rodríguez and H. Huamanchumo, *Research methodology in organizations*. Peru: Summit, 2015.
[29] P. J. C. Mejía, "Playful strategies for entrepreneurial minds: An analysis of gamification in education," *Pakistan Journal of Life and Social Sciences*, vol. 22, no. 2, pp. 45-58, 2024. https://doi.org/10.57239/pjlss-2024-22.2.00912
[30] S. White, J. Malley, L. Carton, and B. Dawson, *Basic and clinical biostatistics*. New York: McGraw-Hill, 2020.
[31] V. Hernández Godoy, K. Fernández Morales, and J. E. Pulido, "University students' attitudes toward online education," *Journal of Educational Research*, vol. 36, no. 2, pp. 349–364, 2018.