

How universities have responded to E-learning as a result of Covid-19 challenges

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ABSTRACT

E-learning environments designed with adaptive technology in mind can help students learn and retain information more effectively by enhancing their learning experience and increasing their level of engagement. Here, students' learning styles are considered in creating an adaptable online environment, and the effects on student engagement are examined. For the sake of this study, we've also attempted to describe and compare the suggested adaptive learning environment to an existing e-learning technique. With Covid-19 in the classroom, technology advancements have grown exponentially, and this progress has coincided with the process of teaching and learning. Virtual classrooms necessitated an e-learning process since it was the most user-friendly teaching method. A descriptive, correlative, transversal and prescriptive research approach was used. An online survey was used to gather data to get a random and voluntary sample of 3560 university students from Peru. A lack of reading comprehension is an issue, but students may use communication technologies and the Internet to improve their teaching and to learn via self-learning.

Keywords: Technology; E-Learning; Internet; Covid-19; Learning

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1. Introduction

The widespread presence of the COVID-19 pandemic has significantly influenced human-to-human contact activities, which were formerly taken for granted but now need extensive pre-planning due to the high stakes involved. This new kind of social interaction has impacted colleges and universities around the country. While conventional classroom situations (F2F) are more complicated, they have had little choice but to quickly adjust to the new environment [1]. Peruvian opinions about online education were examined. The ISIL study was based on a sample of 600 people, including people of diverse ages, income levels, and educational backgrounds. End-of-2020 results show intense levels of satisfaction with current online offers, according to the survey's main findings. These are some of the most important results we've made. There is a high degree of contentment among Peruvian university students regarding the quality of their services (18 percent very good and 74 percent good). This is terrific news since many schools and universities have had to adjust to completely online education. However, 72% of students who have an unfavorable opinion of the service haven't thought about going to a different university. "Customer loyalty" is a frequently used term to describe this phenomenon. It is a chance to think about how educational institutions might better serve their students in the long term [1, 2]. Many students,

particularly millennials, enjoy online courses' flexibility and convenience. Demand for these courses was strong for this set of users (aged 32 and 35), indicating that the final qualification was the most important consideration in picking them (64 percent). Teachers' reputations and salaries came in second and third, respectively, with 52% of each vote (34 percent). As a result, when it comes to a specialized educational offer, users prize online courses that help them improve their abilities. In other words, they can use something in the workplace in the future [3, 4].

2. Literature review

Higher education's adoption of e-learning has been slower than projected, and the problems that held it down are still with us. Even though each learner's requirements are unique, the LMS offers everyone the same collection of resources [5, 6]. Since 2019, Covid-19 has led to an increase in the use of e-learning. Several tools were used to conduct evaluations and written examinations [7-9]. Nevertheless, the reliability of these surveys as Big Data and mathematical models to improve predictions would be impacted by the savings in expenses, effort, and time that these online evaluations provide. Machine learning is a great approach for capturing students' faces and recognizing their facial emotions, as it allows for bias and improved approximations [10-12]. The main purpose of utilizing artificial intelligence was to enhance evaluations on the Microsoft Teams platform. A study was conducted to discover if there was a link between online evaluations and in-person learning. Tensor flow software was employed in the study, which was able to identify 98.76% of the distinct facial emotions (such as happiness, sadness, fear, and surprise). We intend that this approach will assist instructors in better comprehending and recognizing the degree of learning in their classrooms and student assessments. Cronbach's alpha, a measure of the OSLO's reliability, shows that students may improve their motivations, cognitive abilities, and behavioral patterns by using this instrument. When it comes to designing and delivering courses, E-learning has had a considerable influence in Peru and most countries worldwide. Lockdowns imposed by the government have disrupted formerly thriving classrooms, requiring educational institutions to quickly implement online learning technology to permit distance contact with students. As a result, innovative learning and communication platforms have been developed, drastically altering how disciplines and institutions historically taught in a physical setting now teach and learn. In these situations, the problem generally revolves around the need for an institution to use current distance education infrastructure to mimic real online classrooms [5, 6, 13, 14]. Amid this epidemic, many educational institutions have attempted to move to online learning, but it isn't easy to get a clear image of the worldwide impact of these initiatives. As a supplement to more conventional classroom teaching mediums like television and radio, many educational institutions have resorted to online teaching (and learning). An outbreak of the new Coronavirus may force schools to close until a vaccine or therapy is found. Even if a second wave of the pandemic does not materialize, temporary closures of specific schools may be essential to limit the spread of COVID-19 [15, 16, 2]. Some schools may be forced to use blended models to maintain social distance if children who encounter an infected individual must self-isolate due to a lack of classroom space or competent instructors who can be deployed in these circumstances. Several Peruvian schools had to be closed for the second time in less than two weeks due to Coronavirus illnesses. Regulating online teaching and learning for maximum efficiency is crucial in light of this unpredictability [17-19]. Most parents are worried that online education is only open to children whose homes have a high-speed internet connection. During lockdown periods, network operators have largely effective ways to maintain services and efficiently utilize pre-existing capacity. However, there is still a lack of service in rural, isolated, low-income locations and among low-income groups. Numerous nations have less than 50% of rural households access fixed broadband at appropriate speeds. As a result, low-income families often struggle to provide their children with the technology and software they need to participate in online learning activities. For some pupils, says Mseleku [5], learning has been difficult due to a lack of internet connection, while others did not have the time to do so. It was found that 71% of public school children in the United Kingdom received no or fewer than one online lesson per day, while in Germany, just 6% of students received online lessons every day and more than half had them no more than once a week. Some economists believe that students in the United States will return to school in 2020 with an average learning gain of 70% compared to a regular school year [7]. Only a 50 percent boost in arithmetic learning may be expected. The lack of infrastructure and inadequate preparation among teachers and the lack of curriculum guidelines in some cases are some of the factors that have prevented some children from receiving adequate instruction. If remedial measures are not taken to address these variables, the risk of educational disparities among socioeconomic classes could be perpetuated. This is because the quality of online learning varies significantly between schools and countries. The top private schools in the United States, where online learning is available to approximately

one-third of students [10] are more likely to reject access than institutions with many low-income students. Students from richer schools had access to more specialized resources (such as online tutoring or chats with teachers). According to research performed in the United Kingdom, they spent 30% more time studying at home during the lockdown than their colleagues from lower-income households [20]. As a result, their parents reported feeling more confident in their ability to care for their kids. It has been suggested by the OECD [21] that students and teachers may have difficulty adapting to the new environment because of a lack of basic digital skills. Because 15-year-olds from all over the world and from all socioeconomic backgrounds were using computers for homework before the outbreak, students who were less used to online learning may be the ones who were hit the worst by the virus.

2.1. Study justification

The covid-19 pandemic has made the need for the internet a basic need, and everyone needs access to the internet to get various services, including shopping, education, entertainment, and other things. Thanks to internet service, universities in every corner of the world can continue with their studies and teachers at the same time have the opportunity to experience scientific literature, which is a crucial feature of the e-learning method. This makes it ideal for teaching and learning; however, e-evolution learning is due to Covid-19, which was developed specifically for educational purposes; therefore, the method's use in educational institutions and widespread acceptance directly results from the educational process itself. For this study, the goals were to learn about Peruvian university students' expectations for e-learning and how they dealt with learning techniques during the Covid-19 era. Therefore, the study analyzes the distribution of the types and uses of technological devices to provide e-learning services and demographic characteristics.

3. Methodology

3.1. Design

This study mainly addresses the descriptive, cross-sectional and correlation analysis under quantitative research design.

3.2. Sample

The study used 3560 university students randomly selected in the country, where 55.3% were male students and 44.7% were female students. The age distribution used was between 16 to 35 years and above. The respondents were randomly selected from online volunteers, the survey was therefore administered via email address where the link generated via Google was used to conduct the survey.

3.3. Instrument

The questionnaire was used with a Cronbach alpha of 0.913, this implies that the questionnaire guarantees conducting other research. The main aim of the survey was to determine how universities in Peru have responded to E-learning as a result of Covid-19 challenges.

3.4. Data analysis

It was decided to randomly assign teachers and students at Peruvian institutions in February 2022, notify them of the study's aim, and obtain their consent to make their responses public when completed. Peruvian national and private university students were polled in this manner.

Despite initial hurdles, Peruvian university students have shown a strong response to e-learning. It startled the whole educational system from elementary school to high school and potentially even doctoral study. We could only answer our research questions once we had analyzed all of the data and determined which information was most relevant to the scientific community.

SPSS 26 was used to analyze the data and confirm the assumptions about linearity, normalcy, independence and residual analysis, and the assumptions about homoscedasticity and non-collinearity.

4. Results

4.1. Descriptive Statistics

4.1.1. Gender Distribution

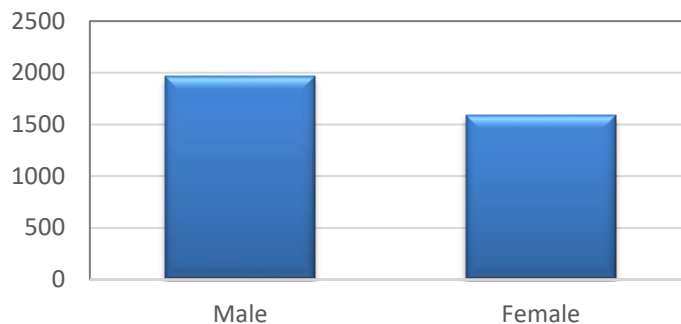


Figure 1. Gender distribution

The above figure shows the gender distribution for the participants in this study. And it's clear from the above figure 1 that there was a higher response rate from male than female gender. According to the figure, the number of male students that responded to the survey was 1969, representing 55.31% and the number of female respondents was 1531, representing 43.01%.

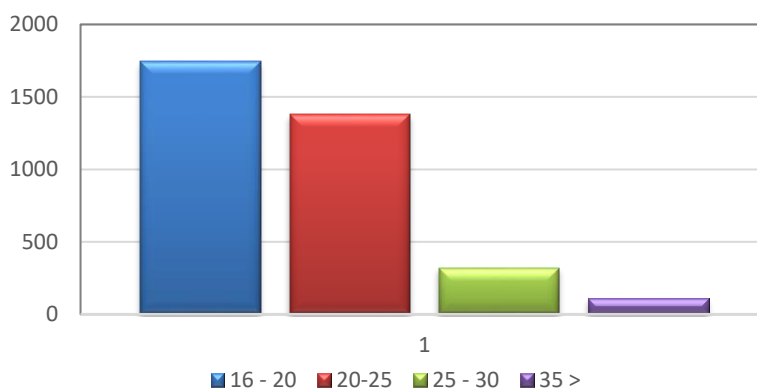


Figure 1. Age distribution result

The figure above shows the age distribution of the students that responded to the survey. A higher number of the respondents were recorded from the students aged between 16 – 20 years, followed by the age group 20 – 25 and the last in the group are age group 35 and above. Results show that the most common means of communication between students and teachers is via WhatsApp and Google Meet; in the results of how students listen to their classes, and in we have results of the type of technology students use for their academic work; and in Figure 4 we have the results of how students communicate with their teachers. Students used various technological devices to receive their classes during the Covid-19 pandemic, with cell phones accounting for a staggering 72.1% of all enrollments, followed by personal computers or tablets at 63.7 percent, virtual learning systems at 39.8%. Video conferencing systems at 29.8 percent. In figure 3 below, the highest number of respondents were recorded from private institutions, implying that most private institutions have the required system for e-learning compared to the national institution in Peru.

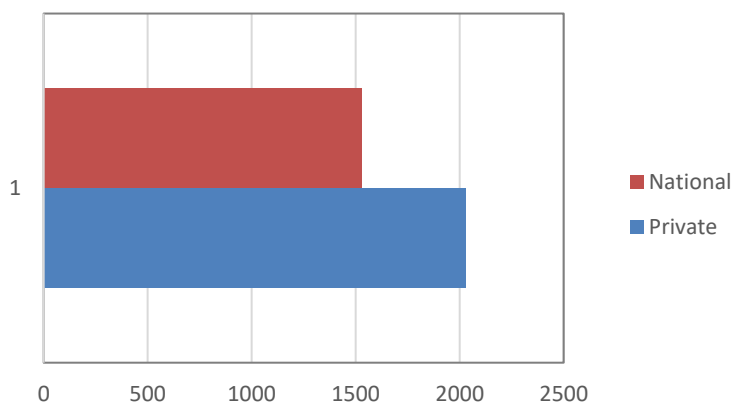


Figure 2. Type of institution

The results on how students communicated with their teachers (student to teacher) were found as follows; 71.2 percent of communication occurs via WhatsApp, 55.2 percent via Google Meet, 47.3 percent via email, e-learning/virtual teaching platforms, 44.3 percent via email, 44.2 percent via Zoom, 10.4 percent via other means of communication, and 9.2 percent via Microsoft Teams. And figure 4 below depicts the distribution of courses and the highest recorded from the respondents were in the field of social sciences. Sciences had the lowest response. This can only mean that most courses under sciences can only be done physically as opposed to social science courses.

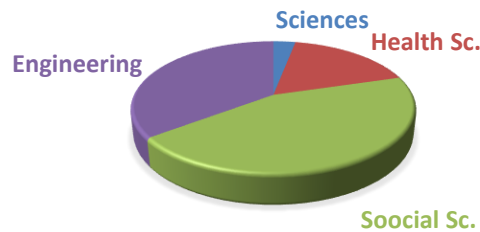


Figure 3. Course distribution

As shown in Table 1, the highest mean score is associated with difficulty comprehending content, with a variance of 7.599 and squared multiple correlations of 0.116. The lowest mean score is associated with the fact that a student can consult course materials at any time of day. It does not aid their comprehension, with a variance of 5.122 and squared multiple correlations of 0.146.

Table 1. Descriptive Statistics for the Questionnaire

	Scale means	Scale variance	Scale variance if the item is suppressed	Squared multiple corr.
If so, what has been the biggest challenge you've encountered in using E-Learning (online education via the Internet and technology)?	21.155	7.511	0.266	0.155
Is it tough for you to comprehend a course's material when taking it?	21.592	5.122	0.052	0.146
A student's ability to retain information is much improved when they have access to the course materials during the day.	21.065	7.599	0.297	0.116
The PowerPoint presentation greatly aids your comprehension of the course.	20.058	7.490	0.175	0.269
Your comprehension is much enhanced when you participate in online meetings (such as those hosted by Zoom or Microsoft Teams, or GoogleMeet, for example).	21.252	7.651	0.291	0.105
In response to your comments and queries, your professors have taken the time to answer.	21.265	7.917	0.27	0.191
The most common online issue is a lack of internet speed.	22.552	7.571	0.212	0.077

4.2. Correlation results

The 7th cycle in which Internet speed was cited as the most problematic online issue had the highest mean score of 4.2545 and the lowest standard deviation of 0.92790; there is a correlation between these two variables as shown in table 2 below. Question 2 (2nd cycle) had the lowest standard deviation of 1.01566 and had the highest mean score of 4.2545 but recorded a negative correlation (see table 2).

Table 2. Correlation result

	Correlation Result						
	1st	2nd	3rd	4th	5th	6th	7th
1st	1						
2nd	0.342	1					
3rd	0.071	-0.022	1				
4th	0.097	-0.048	0.286	1			
5th	0.013	-0.132	0.281	0.468	1		
6th	0.030	-0.088	0.259	0.308	0.392	1	
7th	0.229	0.162	0.108	0.114	0.011	0.028	1

E-learning is extensively employed in educational institutions due to its accessibility and friendliness. For this reason, instructors and students can cope with technology, information and communication in a timely way. Our time to prepare and face schooling with all of the essential resources and circumstances has been severely hampered by the onset of Covid-19. The results of the data analysis show that the sample is overwhelmingly male, that university students are mostly between the ages of 18 and 24, and that the most popular majors are in the social sciences (such as education, law, accounting, and administration) and engineering (such as civil and environmental engineering). University students prefer listening to lectures on their cellphones and computers, even though all Peruvian universities launched the SISFOH program, which allowed students to access the internet via their smartphones and laptops via a Chips card when the epidemic initially started. Even though it's not approved for official use at the university level, WhatsApp is the most popular method of communication among students because of its ease of use, access and daily use. In second place comes Google Meet, which has grown exponentially in access to institutional email accounts, and because it's "official" for universities.

5. Conclusion

Despite the recent spike of interest in this field, there are still several unanswered questions. Developing an active adaptive e-learning environment [22] addresses some of the research gaps in this study. For a course on learning abilities, the goal was to provide an adjustable eLearning environment for interactive learning activities. Studies show that adaptive e-learning is an excellent way to learn in higher education because of the favorable consequences and results it produces [23]. Also, it made a substantial addition to the literature on adaptive e-learning. Adaptive e-learning may assist pupils depending on their chosen learning styles, according to the study. When students' learning styles are considered, they are more likely to participate in e-learning. According to a study, each student has a unique learning style and prefers different instructional materials and activities. The effectiveness of education is also affected by the decisions made by students. Learning environments should therefore alter their output following the preferences of students. High-quality educational materials and activities suited to students' learning styles [24] will boost student engagement and motivation. Instructional materials that consider students' learning styles may be developed using the theories of learning and teaching. All teaching and learning settings, including e-learning, were applauded by pupils, making it clear that using e-learning was an enormous success. Despite our best efforts, we could not secure the requisite permissions from multiple organizations due to a sociosanitary emergency. Research in the future might focus on producing radio listening devices for remote places, allowing university students to complete their studies, move out into the job, and be responsible members of society. The effects will extend beyond the classroom because of the theoretical and practical implications of adopting an online teaching and learning approach. Asynchronous or synchronous connections between students and teachers can be improved by using the e-learning strategy with other technologies. Finally, several studies have found that e-learning has a favorable impact on student performance.

Declaration of competing interest

The authors declare that they have no any known financial or non-financial competing interests in any material discussed in this paper.

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References

- [1] D. Turnbull, R. Chugh, and J. Luck, "Transitioning to E-Learning during the COVID-19 pandemic: How have Higher Education Institutions responded to the challenge?," *Education Information Technologies*, vol. 26, no. 5, pp. 6401-6419, 2021.
- [2] N. A. Jassim, A. Zkear, and B. Majeed, "Smart Learning based on Moodle E-learning Platform and development of Digital Skills for university students," *International Journal of Recent Contributions from Engineering, Science & IT (iJES)*, vol. 10, no. 1, 2022.
- [3] M. A. Almaiah, A. Al-Khasawneh, and A. Althunibat, "Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic," *Education information technologies*, vol. 25, no. 6, pp. 5261-5280, 2020.
- [4] R. M. Al_airaji, H. Salim, and A. M. Alaidi, "Automated Cheating Detection based on Video Surveillance in the Examination Classes," *International Journal of Interactive Mobile Technologies (iJIM)*, vol. 16, no. 10, 2022.
- [5] Z. Mseleku, "A literature review of E-learning and E-teaching in the era of Covid-19 pandemic," *SAGE*, vol. 57, no. 52, p. 6, 2020.
- [6] A. Alaidi, O. Yahya, and H. Alrikabi, "Using Modern Education Technique in Wasit University," *International Journal of Interactive Mobile Technologies*, vol. 14, no. 6, pp. 82-94, 2020.
- [7] L. R. Moustakas, Denise, "The Challenges and Realities of E-Learning during COVID-19: The Case of University Sport and Physical Education," *Challenges*, vol. 13, no. 1, p. 9, 2022.
- [8] L. F. Jawad, and B. Hasan, "The Impact of CATs on Mathematical Thinking and Logical Thinking Among Fourth-Class Scientific Students," *International Journal of Emerging Technologies in Learning*, vol. 16, no. 10, 2021.
- [9] A. Z. Abass, and H. ALRikabi, "The influence E-Learning platforms of Undergraduate Education in Iraq," *International Journal of Recent Contributions from Engineering, Science & IT (iJES)*, vol. 9, no. 4, pp. 90-99, 2021.
- [10] E. Aboagye, J. A. Yawson, and K. N. Appiah, "COVID-19 and E-learning: The challenges of students in tertiary institutions," *Social Education Research*, pp. 1-8, 2021.
- [11] L. F. Jawad, B. H. Majeed, and H. T. ALRikabi, "The Impact of Teaching by Using STEM Approach in The Development of Creative Thinking and Mathematical Achievement Among the Students of The Fourth Scientific Class," *International Journal of Interactive Mobile Technologies*, vol. 15, no. 13, 2021.
- [12] N. A. Jasim, H. T. Salim, and M. S. Farhan, "Internet of Things (IoT) application in the assessment of learning process," in *IOP Conference Series: Materials Science and Engineering*, 2021, vol. 1184, no. 1, p. 012002: IOP Publishing.
- [13] D. Al-Malah , and H. TH., "The Interactive Role Using the Mozabook Digital Education Application and its Effect on Enhancing the Performance of eLearning," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 15, no. 20, pp. 21-41, 2020.
- [14] L. Fouad, and H. S. ALRikabi, "Computational Thinking (CT) Among University Students," *International Journal of Interactive Mobile Technologies (iJIM)*, vol. 16, no. 10, 2022.
- [15] A. R. Alsoud and A. A. Harasis, "The impact of covid-19 pandemic on student's e-learning experience in Jordan," *Journal of Theoretical Applied Electronic Commerce Research*, vol. 16, no. 5, pp. 1404-1414, 2021.
- [16] H. Tauma, and N. Alseelawi, "A Novel Method of Multimodal Medical Image Fusion Based on Hybrid Approach of NSCT and DTCWT," *International journal of online and biomedical engineering*, vol. 18, no. 3, 2022.

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- [17] D. Hermawan, "The rise of e-learning in covid-19 pandemic in private university: challenges and opportunities," *IJORER: International Journal of Recent Educational Research*, vol. 2, no. 1, pp. 86-95, 2021.
- [18] A. Khairy, and H. ALRikabi, "The Detection of Counterfeit Banknotes Using Ensemble Learning Techniques of AdaBoost and Voting," *International Journal of Intelligent Engineering and Systems*, vol. 14, no. 1, pp. 326-339, 2021.
- [19] D. Khalid, and H. Th. Salim, "Enhancement of educational services by using the internet of things applications for talent and intelligent schools," *Periodicals of Engineering and Natural Sciences (PEN)*, vol. 8, no. 4, pp. 2358-2366, 2020.
- [20] M. Mahyoob, "Challenges of e-Learning during the COVID-19 Pandemic Experienced by EFL Learners," *Arab World English Journal*, vol. 11, no. 4, 2020.
- [21] R. Olum, L. Atulinda, E. Kigozi, D. R. Nassozi, A. Mulekwa, F. Bongomin, and S. Kiguli, "Medical education and E-learning during COVID-19 pandemic: awareness, attitudes, preferences, and barriers among undergraduate medicine and nursing students at Makerere University, Uganda," *Journal of Medical Education Curricular Development*, vol. 7, p. 2382120520973212, 2020.
- [22] C. A. Azlan, J. H. D. Wong, L. K. Tan, M. S. N. A. Huri, N. M. Ung, V. Pallath, C. P. L. Tan, C. H. Yeong, and K. H. Ng, "Teaching and learning of postgraduate medical physics using Internet-based e-learning during the COVID-19 pandemic–A case study from Malaysia," *Physica Medica*, vol. 80, pp. 10-16, 2020.
- [23] H. U. N. Nguyen and L. N. T. Duong, "The challenges of e-learning through Microsoft Teams for EFL students at Van Lang University in COVID-19," *AsiaCALL Online Journal*, vol. 12, no. 4, pp. 18-29, 2021.
- [24] R. R. Stefanov, V. D. Ivanova, R. Z. Grigorova, and P. Y. Petkova, "E-learning in the COVID-19 context-epidemiological and educational challenges," in *2020 International Conference Automatics and Informatics (ICAI)*, 2020, pp. 1-6: IEEE.