Geographical context versus technology: a struggle that determines student satisfaction with online university education in Puno - Peru

Contexto geográfico versus tecnología: una pugna que determina la satisfacción estudiantil con la educación virtual universitaria en Puno – Perú

Contexto geográfico versus tecnologia: uma luta que determina a satisfação dos estudantes com o ensino universitário virtual em Puno - Peru

地理环境与技术之间的较量：决定秘鲁普诺大学生对虚拟教育满意度的因素

السياق الجغرافي مقابل التكنولوجيا: الصراع الذي يحدد مدى رضا الطلاب عن التعليم الجامعي الافتراضي في بونو – البيرو

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Abstract

In recent years, university education has had to adapt to various structural, methodological and attitudinal changes. With such changes varying as a function of geographical context, student satisfaction with education provision is unclear. The aim of the present study was to identify student satisfaction with online university education in 2021, as a function of geographical context. The research adopted a non-experimental cross-sectional design and employed a quantitative approach. A case study was conducted of the National University of the Altiplano in Puno, Peru. A simple random probabilistic sample of 2,374 students undertaking the first semester of the 2021 academic year was recruited. Data collection was performed using the Student Satisfaction with Online University Education Questionnaire through Google Forms. Outcomes reveal the predominance of indifference (neither satisfied nor dissatisfied (42%), with the next biggest group tending towards satisfaction (27%). Greatest satisfaction was expressed in relation to the teacher performance and attitude dimension (37% satisfied or very satisfied), whilst least satisfaction pertained to the use of technological resources dimension (40% dissatisfied or very dissatisfied). Significance was set at 95% with a 0.05% margin of error. Statistically significant differences were found for satisfaction with technological resources as a function of geographical context (rural versus urban; p<0.05). In conclusion, student satisfaction with online education is related to their geographical context, with greater dissatisfaction pertaining to rural areas due to the inadequacy of technological resources hindering the provision of quality online educational services.

Keywords: Student satisfaction, educational quality, online education, university education, technology.

Resumen

La formación universitaria, en los últimos años, se ha adaptado a diversos cambios estructurales, metodológicos y actitudinales, según el contexto geográfico en el que se ubican los agentes educativos, dejando incierta la satisfacción de los estudiantes respecto al servicio educativo. El objetivo del estudio fue identificar la satisfacción de los estudiantes con la educación virtual universitaria durante el año 2021, según su contexto geográfico. La investigación asumió un diseño no experimental transversal, dentro del enfoque cuantitativo, basado en el estudio del caso de la Universidad Nacional del Altiplano de Puno – Perú, extrayéndose una muestra probabilística aleatoria simple de 2374 estudiantes en el semestre 2021-I. Para recoger datos de utilizó el Cuestionario de Satisfacción Estudiantil con la Educación Virtual Universitaria, a través de Google Forms. Los resultados muestran la existencia de una satisfacción normal-regular (42%), con tendencia a un nivel satisfactorio (27%); existiendo mayor satisfacción en la dimensión desempeño y actitud del docente (37% satisfechos y muy satisfechos) y menor satisfacción en la dimensión recursos tecnológicos utilizados (40% insatisfechos y muy insatisfechos), encontrando diferencias estadísticas significativas entre la satisfacción con los recursos tecnológicos y el contexto geográfico, rural o urbano (p<0,05), con un nivel de significancia del 95% y un margen de error del 0,05%. Se concluye que la satisfacción estudiantil con la educación virtual está relacionada al contexto geográfico de los estudiantes, encontrando mayor insatisfacción en la zona rural, debido a la insuficiencia de recursos tecnológicos que obstaculizan la recepción de un servicio educativo virtual de calidad.

Palabras clave: satisfacción estudiantil, calidad educativa, educación virtual, educación universitaria, tecnología.

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Resumo

Nos últimos anos, o ensino universitário adaptou-se a diversas mudanças estruturais, metodológicas e atitudinais, em função do contexto geográfico em que se situam os agentes educativos, deixando incerta a satisfação dos estudantes com o serviço educativo. O objetivo do estudo foi identificar a satisfação dos estudantes com o ensino universitário virtual durante o ano de 2021, de acordo com o seu contexto geográfico. A investigação assumiu um design não experimental transversal, dentro da abordagem quantitativa, a partir do estudo de caso da Universidade Nacional del Altiplano de Puno - Peru, extraindo uma amostra probabilística aleatória simples de 2374 estudantes no semestre 2021-I. Para a recolha de dados, foi utilizado o Questionário de Satisfação de Estudantes com o Ensino Universitário Virtual, através do Google Forms. Os resultados mostram a existência de uma satisfação normal-regular (42%), com tendência para um nível satisfatório (27%); existindo maior satisfação na dimensão desempenho e atitude do professor (37% satisfeitos e muito satisfeitos) e menor satisfação na dimensão recursos tecnológicos utilizados (40% insatisfeitos e muito insatisfeitos), encontrando diferenças estatísticas significativas entre a satisfação com os recursos tecnológicos e o contexto geográfico, rural ou urbano (p<0,05), com um nível de significância de 95% e uma margem de erro de 0,05%. Conclui-se que a satisfação dos alunos com a educação virtual está relacionada com o contexto geográfico dos estudantes, encontrando maior insatisfação na zona rural, devido à insuficiência de recursos tecnológicos que dificultam a receção de um serviço de educação virtual de qualidade.

Palavras-chave: Satisfação dos estudantes, qualidade do ensino, educação virtual, ensino universitário, tecnologia.

摘要

近年来，大学教育已经根据教育代理所在的地理环境适应了各种结构性、方法性和态度上的变化，使得学生对教育服务的满意度存在不确定性。本研究的目的是根据学生的地理环境，确定他们在2021年对虚拟大学教育的满意度。研究采用非实验性横断面设计，在量化方法框架内，基于秘鲁普诺国家高原大学的案例研究，抽取了2021年第一学期2374名学生的简单随机概率样本。通过Google Forms使用虚拟大学教育学生满意度问卷收集数据。

结果显示，学生对虚拟教育的满意度为中等（42%），趋向于满意水平（27%）；在教师的表现和态度维度上满意度最高（37%表示满意和非常满意），在使用的技术资源维度上满意度最低（40%表示不满意和非常不满意）。在技术资源满意度与地理环境（农村或城市）之间存在显著统计差异（p<0.05），具有 95%的显著性水平和 0.05 的误差范围。研究结论是，学生对虚拟教育的满意度与其地理环境有关，农村地区由于技术资源不足，导致接收高质量虚拟教育服务的满意度较低。

关键词： 学生满意度、教育质量、虚拟教育、大学教育、技术。

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ملخص

لقد تكيف التعليم الجامعي، في السنوات الأخيرة، مع مختلف التغييرات الهيكلية والمنهجية والمواقفية، بحسب السياق الجغرافي الذي يتواجد فيه الوكلاء التعليميون، مما جعل رضا الطلاب عن الخدمة التعليمية غير مؤكد. هدفت الدراسة إلى التعرف على مدى رضا الطلبة عن التعليم الافتراضي الجامعي خلال العام 2021 حسب سياقهم الجغرافي. افترض البحث تصميماً مقطعياً غير تجريبي، ضمن النهج الكمي، استناداً إلى دراسة حالة جامعة ألتيبلانو الوطنية في بونو - بيرو، وتم استخراج عينة احتمالية عشوائية بسيطة مكونة من 2374 طالباً في الفصل الدراسي الأول من سنة 2021. ولجمع البيانات تم استخدام استبيان رضا الطلاب عن التعليم الافتراضي الجامعي، من خلال نماذج جوجل. أظهرت النتائج وجود رضا طبيعي - منتظم (42%)، مع ميل نحو المستوى المرضي (27%). هناك رضا أكبر في بعد أداء المعلم واتجاهاته (37% راض وراضي جداً) ورضا أقل في بعد الموارد التكنولوجية المستخدمة (40% غير راض وغير راضٍ جداً)، مع وجود فروق ذات دلالة إحصائية بين الرضا عن الموارد التكنولوجية والبعد الجغرافي، السياق الريفي أو الحضري (P>0.05)، بمستوى دلالة 95% وهامش خطأ 0.05%. وخلص إلى أن رضا الطلاب عن التعليم الافتراضي يرتبط بالسياق الجغرافي للطلاب، حيث نجد عدم رضا أكبر في المناطق الريفية، بسبب عدم كفاية الموارد التكنولوجية التي تعيق تلقي خدمة تعليمية افتراضية ذات جودة.

الكلمات الدالة: رضا الطلاب، جودة التعليم، التعليم الافتراضي، التعليم الجامعي، التكنولوجيا.

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Introduction

On the 30th of January 2020, the World Health Organisation (WHO) declared SARS COVID 19 as a global public health emergency, with confinement being imposed in the tentative hope of containing the spread of infection and slowing the death rate (Maguiña, 2020; Maguiña et al., 2020; Trilla, 2020). In this way, the impossibility of social contact forced educational systems in most countries to turn to information communication technology (ICT) to continue with the provision of education. The world fell back on the online educational setting as a means to tackling the challenging emerging landscape (Bonilla-Guachamín, 2020; Sandoval, 2020; Porlán, 2020).

Nonetheless, the majority of Latin American countries were not prepared to meet the needs of this new way of imparting education, meaning that students and teachers had to adapt their activities to suit an online model (Cabrera, 2020) with scarce training, support and resources (UNESCO, 2020). In addition, the infrastructure across diverse regions did not enable good response capacity (Paredes-Chacín et al., 2020). This was combined with the fact that many educational institutions failed to develop the competencies required to take on this huge challenge (Murillo & Duk, 2020). This situation meant that, in many cases, the educational gap suffered by individuals living in geographical regions lacking in or without technological resources grew, becoming an additional barrier to access to quality education (Mendoza et al., 2019).

Online education

Online education is a form of remote education whose implementation requires specific technological resources, including a computer, laptop or tablet, internet connection and use of a multimedia platform, amongst others (Crisol-Moya et al., 2020). At the same time, course materials can be reviewed by students individually and independently, followed by asynchronous or synchronous discussion through forums and other teacher led activities (Hennig & Escofet, 2015). In this way, online education supports the educational system at all levels, especially, the university level, requiring the wholesale acquisition of skills by students for subsequent professional development (Sierra, 2013). Online education enables a large amount of flexibility with regards to the use of time, space and distance, providing better learning opportunities in diverse educational settings (Oliveros et al., 2018).

Nonetheless, whilst online education assists delivery of educational services, due to the ease of downloading content, elaboration of self-learning strategies, search for information and timetabling flexibility, it still lingers behind face-to-face education. Above all, it falls short in contexts that are not prepared for such connectivity, due to the lack of technological support to develop practical skills for professional development (Gonzales & Evaristo, 2021).

Online education comes up against a number of obstacles, from poor connectivity to teachers who are ill equipped for working in this new context (UNESCO, 2020). Specifically, online education has been faced with a lack of training in ICT use, as shown through the handling and mastery of platforms by both teachers and students (Lovón & Cisneros, 2020). Further, shortcomings in infrastructure, connectivity and the teaching conditions of teachers and students became more evident (Ruiz, 2020). Whilst inequalities were already present prior to the COVID-19 crisis, they became heightened in this new context (Beaunoyer et al., 2020), given that society was subjected to extensive and sudden digital change (Iivari et al., 2020). Thus, all of the situations mentioned above led to student malaise and underlying issues regarding academic performance (Estrada-Araoz et al., 2020). Synthetically, three main factors appear to have directly influenced online education provision. Namely, the geographical context of educational institutions, student socioeconomic status and digital enrolment, which includes access to and use of the technological resources needed to establish

services (Gómez-Arteta & Escobar-Mamani, 2021). In this regard, it should be noted that technical issues, such as deficient internet connections, signal loss and lack of suitable digital devices, are more difficult to overcome. This is especially the case for students living in rural areas or whose families have a low income (Coman et al., 2020).

A determining factor, therefore, in the receipt of online educational services is the student's geographical context, as this determines the quality of internet connection and, in this way, is capable of increasing, decreasing or eliminating students' opportunities for continuing with their studies, regardless of whether or not they have other technological resources at hand.

Student satisfaction

Satisfaction refers to the feeling of pleasure when a need is met. It is a subjective element that is inherent to all individuals (Zubiri, 2013). It is related with motivation and, in combination, both play a role in learning processes (Fuertes et al., 2018).

> Describing satisfaction is related with measuring the quality produced when providing any type of service and, therefore, to talk about student satisfaction is to talk about student appreciation of the service provided by the university (Manrique & Sánchez, 2019, p. 18).

"The notion of satisfaction appears to be directly and closely associated with notions of meeting expectations, needs and desires, wellbeing, comfort, happiness, calmness, pleasure, enchantment, contentment, joy, balance and delight" (Sánchez, 2018, p. 20). Student's perceptions of satisfaction are determined through factors such as institutional management, teaching role, online course characteristics, technology and connectivity (Díaz et al., 2021). In this regard, it can be deduced that, in the context of online education, satisfaction is essentially related with technological conditions and the geographical context of students, with these aspects serving either to reinforce or weaken their satisfaction with education provision.

Evaluating student satisfaction with online education has a positive impact on educational processes (Wolverton et al., 2020) and favours the longevity of online studies (Daneji et al., 2019). A satisfactory program raises motivation and leads to better outcomes (Muzammil et al., 2020). Likewise, student satisfaction regarding the training they receive from their university impacts their socio-occupational insertion (Martínez-Clares & González-Lorente, 2021)

With regards to student satisfaction in the context of higher education, Blázquez et al. (2013) urges the importance of considering students' opinions, given that:

> Development of internal quality systems at universities must consider a set of specific indicators pertaining to students themselves. In this way, identification of the most noteworthy elements affecting students' opinions enables such opinions to be incorporated into these aforementioned quality systems […] (Blázquez et al., 2013, p. 478).

Further, quality service provision must be oriented towards student satisfaction given that this will help to build student loyalty towards the institution (Borishade et al., 2021). Findings from student satisfaction assessments should be converted into indicators for planning, policy execution and decision making for administrators at higher education institutions (Teeroovengadum et al., 2019), as "student satisfaction with university education is of vital importance to institutions in this sector, forming the very basis of their ultimate survival […]" (Alves & Raposo, 2004, p. 74).

In this sense, it is important to identify the geographical location of students who are satisfied and dissatisfied with online university education, in order to produce new educational proposals that provide equitable access to quality service. This addresses the educational principles of individual countries, breaking through the geographical barriers that prevent technology from being able to reach into all locations and opening up new ways of teaching and learning.

Technology and geography

In the assessment provided above, two topics stand out that are essential to the context of online education, namely, geography and technology. In this region, these two topics have been addressed only superficially. For this reason, the present research seeks to identify and outline the impact of geographical location (urban and rural) on student satisfaction with online university education, in light of the fact that geography conditions access to online education via internet connectivity.

At present, in a globalised world with diverse issues and tensions, technology is omnipresent and, alongside it, geography defines its limits and hierarchies through space (Mahony, 2021), given that the spatial dimension is fundamental when discussing the expansion of technology (Buzai & Ruiz, 2012). Technology, in line with its simplest and broadest definition, is nothing more than a means of converting inputs into outputs, whether entirely primitive or astonishingly complex (Warf, 2017). In this regard, "traditional aspects of geographic studies, such as the relationship of societies with their surrounding environment, become possible when they focus on the use of the technologies that intervene within it" (Buzai & Ruiz, 2012, p. 89). In this case, technology provides a series of digital resources including the Internet, computers, mobile telephones, virtual libraries, social networks and applications such as WhatsApp. These have enabled online education provision to continue, opening doors to new forms of teaching and learning based on the diverse possibilities offered by technology, always with a view towards its rational and ethical use (Escobar-Mamani & Gómez-Arteta, 2020).

In the context described above, the need arises to identify the extent to which students, located in different geographical spaces, are satisfied with this new educational modality, which was put into place to be able to continue basic university developmental processes.

In this sense, the aim of the present study was to identify university student satisfaction with the provision of online education, in consideration of their geographical context. This will enable identification of strengths and weaknesses and will, in this way, shed light on processes that require perfecting in order to contribute to improved educational quality.

Method

The present research takes a quantitative approach, employs a non-experimental cross-sectional design and is based on a case study of the National University of the Altiplano of Puno (UNAP), Peru, conducted during the first semester of 2021.

Context

The study was conducted in the Peruvian altiplano, specifically, in Puno, a diverse geographic region located in the south eastern mountains of Peru, on the Collao plateau at 13°0066'00" and 17°17'30" south latitude and 71°06'57" and 68°48'46" west longitude of the Greenwich Meridian. 70% of its surface is covered by high peaks, whilst the remaining 30% comprises mountainous terrain and lush rainforest (Vera, 2010). This geographic diversity means that transport, health and education are highly heterogenous in the various places within the region, leading to inequity and gaps in many aspects of the local population. One such gap is the digital gap, encompassing access to connectivity and training on the use of ICT.

Population and sample

The population comprises 16,475 students enrolled on the first semester of the 2021 academic year at one of the 35 professional schools on offer at UNAP. The sample corresponds to all responses received to the Student Satisfaction with Online University Education Questionnaire. This questionnaire was administered via institutional email, being sent out by researchers following explicit permission from the Vice Rectorate of Research at UNAP. The questionnaire was available during a period of 30 calendar days (from August 24th to September 24th, 2021) and

was closed once more than 10% of the total population had responded. This pertained to 2,374 students recruited through probabilistic simple random sampling. Together with the email sent to students, an information pack was attached to gather prior informed consent. This information highlighted the voluntary, anonymous and confidential nature of data. The final sample, generally, represented 14% of the population (Table 1). Specifically, the percentage representation of each professional school ranged between 11 and 20%.

Table 1. Population and research sample

Professional school	Population	Sample	% represented by the sample
Secondary Education Professional School	1175	185	16
Professional School of Veterinary Medicine and	630	127	20
Professional School of Economic Engineering	654	103	16
Professional School of Civil Engineering	717	100	14
Professional School of Topographical Engineering	449	88	20
Professional Law School	579	79	14
Professional School of Accounting Sciences	773	87	11
Professional School of Sociology	445	77	17
Professional School of Electrical Mechanical	469	77	16
Professional School of Human Nutrition	429	76	18
Professional School of Mining Engineering	556	76	14
Professional School of Social Work	549	73	13
Professional School of Administration	558	71	13
Professional School of Geological Engineering	496	67	14
Professional School of Architecture and Urbanism	500	69	14
Professional School of Systems Engineering	520	74	14
Professional School of Electronic Engineering	364	64	18
Professional School of Agricultural Engineering	411	64	16
Professional School of Agronomic Engineering	385	58	15
Professional School of Biological Sciences	372	55	15
Professional School of Anthropology	379	53	14
Professional School of Primary Education	380	52	14
Professional School of Social Communication	441	48	11
Professional School of Nursing	374	48	13
Professional School of Agroindustrial Engineering	305	46	15
Professional School of Statistical and Computer	261	46	18
Professional School of Physics - Mathematics	530	57	11
Professional School of Initial Education	352	40	11
Professional School of Chemical Engineering	329	43	13
Professional School of Physical Education	349	40	12
Professional School of Metallurgical Engineering	305	37	12
Professional School of Tourism	402	55	14
Professional School of Human Medicine	410	60	15
Professional School of Dentistry	265	36	14
Professional School of Art	362	43	12
Total	16475	2374	14

Instrument

The Student Satisfaction with Online University Education questionnaire was used to collect data. This questionnaire employs a Likert scale and was designed in line with that proposed by Molina et al. (2021), Sánchez (2018), Van et al.(2020) and Nurunnami and Abdelhadi (2019). It comprises 35 items and was administered via Google Forms during the last month of the first semester of the 2021 academic year. Student satisfaction was considered in relation to four components covered by the service delivered by UNAP: 1) General educational services, 2) technological resources, 3) engagement and attitude of teachers, and 4) online teaching-learning processes (Table 2). The instrument was submitted to a process of validation via an expert panel, examining content validity and construct validity according to the Aiken v coefficient (Aiken v = 0.9). Likewise, reliability of the instrument was estimated using the Cronbach alpha coefficient which was 0.972, attesting to its high reliability.

Table 2. Structure of the questionnaire administered to students via Google Forms

Block	Indicators	N questions
SATISFACTION WITH GENERAL EDUCATIONAL SERVICES AT THE UNIVERSITY	Website Administrative forms Communication channels Virtual classrooms Virtual libraries Email Billing system University wellbeing Research activities	9
SATISFACTION WITH THE TECHNOLOGICAL RESOURCES EMPLOYED	Technological equipment Internet connection	4
SATISFACTION WITH THE ENGAGEMENT AND ATTITUDE OF THE TEACHER	Teacher attitude Teacher knowledge Attention given to students and feedback	6
SATISFACTION WITH ONLINE TEACHING-LEARNING PROCESS	Learning achievements Timetable Usefulness of synchronous and asynchronous activities Teaching strategies and resources Special facilities and virtual laboratories Tasks Evaluation	16

Data processing

Version 25 of SPSS was used to process data. This enabled an objective and comprehensive analysis to be conducted, considering the geographical location of students as an essential element for determining their satisfaction in relation to the four dimensions under evaluation. Pearson chi-squared analysis was used to examine the extent of the association between student satisfaction and geographical context.

Results

In light of the geographical variability of the Peruvian altiplano and as a means to providing an overview of student characteristics, information is presented in Table 3 regarding the geographical location at which students undertook online classes.

Table 3. Geographical area in which students undertake online classes

AREA	f	%
RURAL	1171	49.3
URBAN	1203	50.7
Total	2374	100.0

These data reveal that participating students were fairly evenly distributed between urban and rural areas. According to National Institute of Statistics and Informatics (2020), nationally, approximately 20.7% of homes in rural areas have an internet connection, whilst this figure rises to 59% in urban areas. This is in line with figures reported for "homes with internet connection and low connectivity in Africa and in Latin America and the Caribbean, which are only as high a 17% and 45%, respectively" (UNESCO, 2020, p. 19).

In this regard, in different countries around the world, it has been evident for a number of years that technology has not been brought into rural areas to enable internet access, given that this area comprises a larger proportion of individuals who report only using this type of service occasionally (Yang & Hsieh, 2013). Individuals in such areas tend to consider internet access to be barely necessary. For this reason, a digital gap emerged, which continues to have an impact on the educational system in a number of countries.

Nonetheless, in the present day, this is an alarming situation given that internet connectivity serves as a foundation for the development of online education, emerging as the main disadvantage regarding students who receive this type of education from rural areas.

Previously conducted research has demonstrated that access to technology for its instructional use differs significantly as a function of the geographical location of educational institutions, with those living in rural areas finding themselves at a disadvantage (Habibi et al., 2021).

General satisfaction with online university education

Student satisfaction with online university education is, mostly, indifferent (neither satisfied nor dissatisfied), with an overall tendency towards more satisfactory levels (Table 4). This finding is useful in consideration of the fact that the importance of identifying student satisfaction with educational provision is oriented towards assessing whether the institution adequately meets the material and psychological expectations or demands of users (Surdez et al., 2018).

Table 4. Student satisfaction with online university education

| Level of satisfaction | Geographical area | | | | Total | |
| | RURAL | | URBAN | | | |
	f	%	f	%	f	%
Very dissatisfied	105	4	100	4	205	9
Dissatisfied	203	9	188	8	391	17
Neither satisfied nor dissatisfied	494	21	508	21	1002	42
Satisfied	311	13	337	14	648	27
Very satisfied	58	2	70	3	128	5
Total	1171	49	1203	51	2374	100

In general, these findings (Table 4) are essentially positive, given that the responses of neither satisfied nor dissatisfied (42%), satisfied (27%) and very satisfied (5%) demonstrate that students are accepting of the general educational services, technological resources at hand, engagement and attitude of teachers, and online teaching-learning processes they receive.

Nonetheless, it is important to reflect on the finding that 26% (17% and 9%, respectively) of students are dissatisfied or very dissatisfied with online education services, with 52% of this group living in rural areas. This is unsurprising as such areas are characterised by weak or non-existent internet connectivity, corroborating claims that online education has broken the educational service apart, widening

gaps in inequality due to economic, geographical and technological conditions (Gómez-Arteta & Escobar-Mamani, 2021). In this regard, it was revealed that, whilst differences exist in student satisfaction with online university education provision, as a function of the geographical context in which they find themselves, this association is not statistically significant (Table 5). Indeed, data analysis according to the Pearson chi-squared statistic, with significance set at 95% and a 0.05% margin of error, produced a p-value that was higher than 0.05. Consequently, it is concluded that no statistically significant differences exist in student satisfaction as a function of geographical context when defined as rural or urban.

Table 5. Pearson chi-squared outcomes pertaining to satisfaction with online university education as a function of geographical context

	Value	df	p-value < 0.05
Pearson chi-square	2.630[a]	4	0.621
Maximum likelihood	2.632	4	0.621
N of valid cases	2374		

a. 0 cells (0.0%) have an expected count of less than 5. The minimum expected count is 63.14.

The findings presented above urge further situational analysis. Indeed, responsibility for this situation does not fall entirely on universities but, instead, is shared by other entities that indirectly condition student satisfaction. These include local and regional authorities who have failed to take action to install antennas and satellites in order to enable populations in rural geographical settings to have access to connectivity. In this regard, current legislation must be considered. The Organic Law of Peruvian Municipalities puts the emphasis on regional and district municipalities to "promote, support and execute investment projects and public municipal services that present, objectively, externalities or economies of scale at the provincial level; to the effect of, signing the pertinent agreements with the respective district municipalities" (Law N° 27972, 2003, Art. 73). The aim of this is for these respective municipalities to enact their competencies and functions, including to "support the incorporation and development of new technologies for the betterment of the educational system. The aim of this process is to optimise relationships with other sectors", according to that dictated by Art. 82 inc. 8 of the aforementioned law. Likewise, it is a specific function of regional governments to "formulate, approve, execute, evaluate and administrate regional policies regarding education, culture, science and technology, and sport and recreation in the region" (Law N° 27867, 2002, Art. 47). To this end, government entities are immersed in processes channelled towards quality education.

Satisfaction with the university's general services

The general services provided by UNAP pertain to the channels of information and communication available to students, in addition to aspects that enable them to complete administrative paperwork and gain access to academic services and student wellbeing.

The level of satisfaction reported by students regarding general services provided by UNAP are found to reflect neither satisfaction nor dissatisfaction, with the overall sample tending towards feeling satisfied (Table 6). This is considered to be a positive outcome, as it demonstrates that general services are meeting the expectations of the majority of students. Nevertheless, the 27% of students reporting to be dissatisfied or very dissatisfied with general services at UNAP must not be ignored, with respondents from this group mostly coming from rural areas of Puno

Table 6. Satisfaction with general university services

| Level of satisfaction | Geographical area | | | | Total | |
| | RURAL | | URBAN | | | |
	f	%	f	%	f	%
Very dissatisfied	124	5	108	4	232	9
Dissatisfied	210	9	210	9	420	18
Neither satisfied nor dissatisfied	470	20	504	21	974	41
Satisfied	292	12	301	13	593	25
Very satisfied	75	3	80	3	155	7
Total	1171	49	1203	51	2374	100

These findings are complemented by the information presented in Figure 1, in which it can be clearly noted that the aspect to produce greatest student satisfaction is the good institutional email service and alternative personal email service, followed by satisfaction with the UNAP website, which is kept up-to-date and diversified, and, next, with the virtual classroom system, whose function is directed towards meeting students' learning needs. On the other hand, the aspect to produce greatest dissatisfaction amongst participating students pertained to the digital university wellbeing system, which fails to ensure student physical and emotional wellbeing. This is followed by dissatisfaction with the channels available to communicate with teachers/administrators, which, according to students, are not well defined or easy to access in order to address concerns. This gives rise to the need to establish new channels of communication that enable all students to access required information, regardless of their geographical context.

Figure 1. Satisfaction with general services at UNA
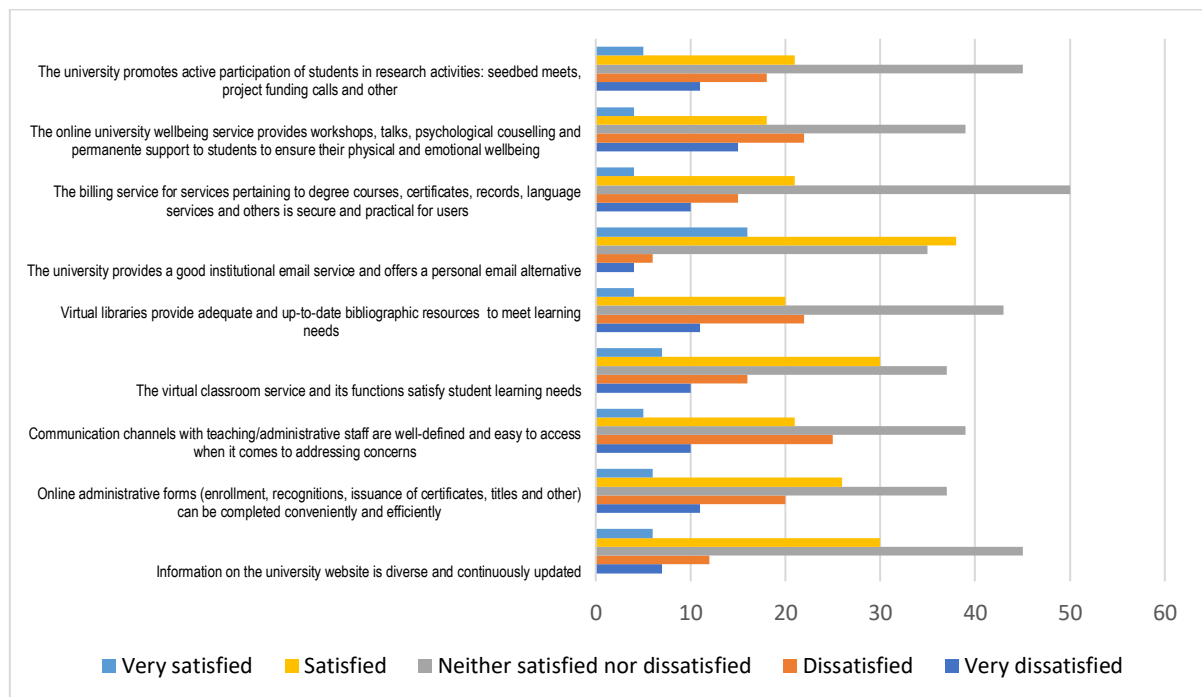
Satisfaction with technological resources

Examination of satisfaction with technological resources comprised the main point of the present research. It can clearly be noted that the geographical context restricts technology and that this struggle leads to dissatisfaction in some students who, due to living in rural areas, cannot access or have extremely restricted access to the online education service provided by the university. This finding corroborates that technology is social in nature and its effect varies enormously as a function of time and space (Warf, 2017). This might be explained by the fact that, at present, a third of humanity remains disconnected and many users benefit from only basic connectivity (ITU, 2022) due to contextual diversity.

Examination of student satisfaction with the technological resources in their reach to access online education revealed neither satisfaction nor dissatisfaction. This being said, in contrast to that seen in relation to other dimensions, tendencies pertaining to this dimension were inclined towards dissatisfaction, highlighting shortcomings and weaknesses in this aspect, which were related with the geographical location of students at the time of undertaking online education (Table 7). This conclusion is based on the dissatisfaction reported by 23% of all respondents living in rural areas with regards to technological resources. Such individuals find themselves in a position of poor connectivity and with scarce financial resources preventing them from accessing a suitable data plan. This finding confirms the existence of challenges to accessing and using technology in educational practice (Iivari et al., 2020). It also provides evidence that students are only able to access online education concomitant with that permitted by their financial and technological resources (Gómez-Arteta & Escobar-Mamani, 2021), giving rise to concern about access to quality education.

Table 7. Satisfaction with technological resources

| | Geographical area | | | | | |
| | RURAL | | URBAN | | Total | |
Level of satisfaction	f	%	f	%	f	%
Very dissatisfied	230	10	159	7	389	16
Dissatisfied	318	13	255	11	572	24
Neither satisfied nor dissatisfied	394	17	475	20	870	37
Satisfied	179	8	238	10	417	18
Very satisfied	51	2	77	3	127	5
Total	1171	49	1203	51	2374	100

Within this dimension, aspects stand out that were reported to be highly dissatisfactory, as shown in Figure 2. The main aspect to produce dissatisfaction is the data plan provided by the university to access online education. Whilst this finding reveals that authorities are positively disposed towards providing students with free internet as a means to them accessing educational services (Paredes-Chacín et al., 2020), students generally consider such provision to be inadequate for them to perform activities effectively. This is because it does not allow them free access to international digital libraries, social networks and other applications considered to be necessary for grounding learning processes. This limits the possibility of making available a broad array of essential technological resources for educational development (Escobar-Mamani & Gómez-Arteta, 2020). Another aspect found to produce student dissatisfaction was the speed and stability of internet connections. Shortcomings regarding this aspect prevents students from gaining access to virtual classrooms and easily completing work tasks. This situation is particularly alarming for students in rural areas (20% of whom report dissatisfaction), who are often faced with insurmountable challenges when attempting to access online education due to the absence of internet connection in their place of residence. This forces them to seek out other locations at which they can access the educational service.

In order to increase the reliability of outcomes and verify the association between satisfaction with technological resources and geographical context, Pearson chi-squared analysis was performed, setting significance at 95% and using a 0.05% margin of error.

Outcomes produced significant p-values for all four indicators (<0.05), as shown in Tables 8a, 8b, 8c and 8d. Consequently, it is concluded that statistically significant differences exist in student satisfaction with technological resources as a function of whether their surrounding geographical context is rural or urban.

Table 8. Pearson chi-square outcomes pertaining to satisfaction with technological resources as a function of geographical context

Table 8a: Satisfaction with available technological equipment as a function of geographical context

	Value	df	p-value < 0.05
Pearson chi-square	79.778[a]	4	0.000
Maximum likelihood	80.544	4	0.000
N of valid cases	2374		

a. 0 cells (0.0%) had an expected count of less than 5. Minimum expected count is 70.54.

Table 8b: Satisfaction with the data plan provided by the university as a function of geographical context

	Value	df	p-value < 0.05
Pearson chi-square	22.988[a]	4	0.000
Maximum likelihood	23.036	4	0.000
N of valid cases	2374		

a. 0 cells (0.0%) had an expected count of less than 5. Minimum expected count is 66.10.

Table 8c: Satisfaction with internet connection as a function of geographical context

	Value	df	p-value < 0.05
Pearson chi-square	96.744[a]	4	.000
Maximum likelihood	97.858	4	.000
N of valid cases	2374		

a. 0 cells (0.0%) had an expected count of less than 5. Minimum expected count is 43.90.

Table 8d: Satisfaction with access to videoconferences as a function of geographical context

	Value	df	p-value < 0.05
Pearson chi-square	47.789[a]	4	0.000
Maximum likelihood	48.097	4	0.000
N of valid cases	2374		

a. 0 cells (0.0%) had an expected count of less than 5. Minimum expected count is 70.04.

In this regard, it is concluded that student dissatisfaction with technological resources is not exclusively the responsibility of university authorities or their management infrastructure, given that they have strived to provide students with the opportunity of accessing online education. Despite this, geographical conditions stand in the way of their good intentions. This is compounded by the inaction of some local, regional and national authorities, who have failed to oversee the implementation of resources that permit access to connectivity, not only for educational purposes but, also, for health and other purposes. In this way, they have fallen short on some of their functions related with the incorporation and development of technology to support educational provision (Law N° 27972, 2003, Art. 82), and execution of various regional policies, amongst which educational and technological policy most stands out (Law N° 27867, 2002, Art. 47). In this sense, it is emphasised that public policies must be targeted towards sustainable development, promoting rational use of resources and respect for the culture underlying all places (Gómez-Arteta & Escobar-Mamani, 2022).

Further, it should be noted that connectivity, via technology, is not only a national concern but, also, an international concern. The International Telecommunication Union of the United Nations is responsible for guaranteeing connectivity in the entire population worldwide, in all places and through whatever means they possess, in this way, protecting and supporting the right of all people to communicate with others (ITU, 2022).

Figure 2. Satisfaction with technological resources
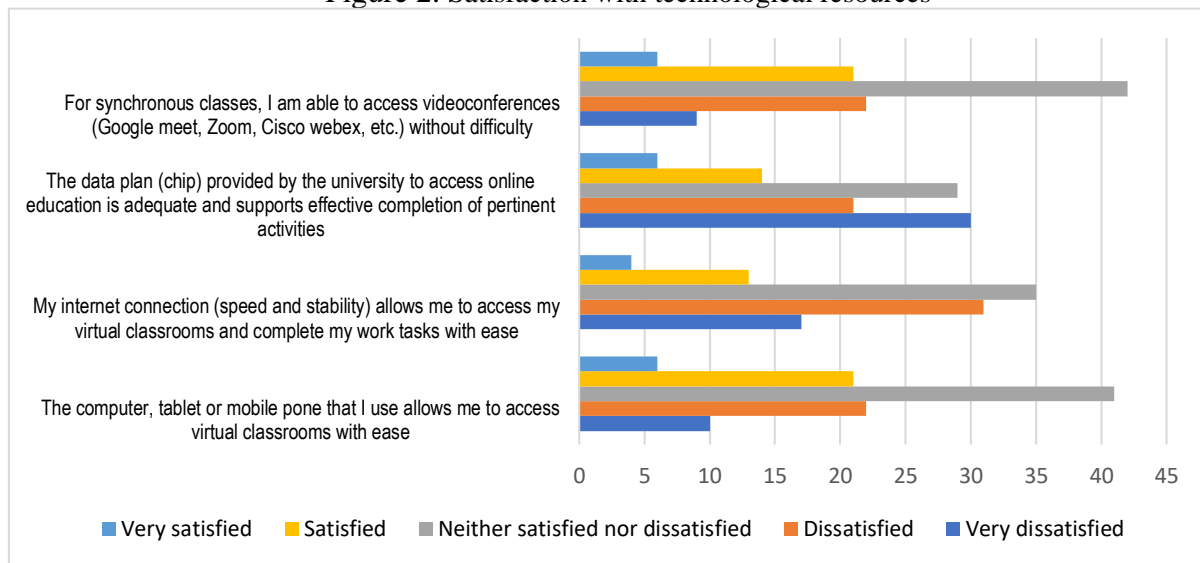
Satisfaction with the engagement and attitude of teachers

With regards to the third dimension, teacher engagement and attitude (Table 9), students mostly reported by neither satisfied nor dissatisfied (40% of respondents), with the following trend being towards satisfaction (29%). This suggests that, alongside other aspects, the teacher's attitude influences student satisfaction (Alonso, 2016). Likewise,

this finding reinforces the idea that students play an important role when it comes to innovating and transforming teaching proposals in order to promote student learning (Tejedor et al., 2020) and meet their learning needs. This makes this dimension a crucial element for overcoming some of barriers to online education, with teachers' experience and knowledge being important for adapting teaching strategies so that they meet student needs in this new setting (Coman et al., 2020).

Table 9. Satisfaction with teacher engagement and attitude

| | Geographical area | | | | Total | |
| | RURAL | | URBAN | | | |
Level of satisfaction	f	%	f	%	f	%
Very dissatisfied	123	5	91	4	213	9
Dissatisfied	184	8	176	7	360	15
Neither satisfied nor dissatisfied	466	20	474	20	940	40
Satisfied	311	13	366	15	677	29
Very satisfied	88	4	97	4	184	8
Total	1171	49	1203	51	2374	100

Figure 3 presents specific aspects pertaining to the teacher engagement and attitude dimension. Within this dimension, it is highlighted that the aspect to produce the greatest satisfaction in students is the knowledge possessed by teachers to respond to questions posed by students. This suggests that teachers are well prepared to deliver their

professional labour. On the other hand, the aspect that produces greatest dissatisfaction in students is the lack of empathy and tolerance of teachers towards internet connectivity problems. This issue poses challenges to students located in rural areas with regards to them being able to hand in work tasks and specify proposed activities.

Figure 3. Satisfaction with teacher engagement and attitude
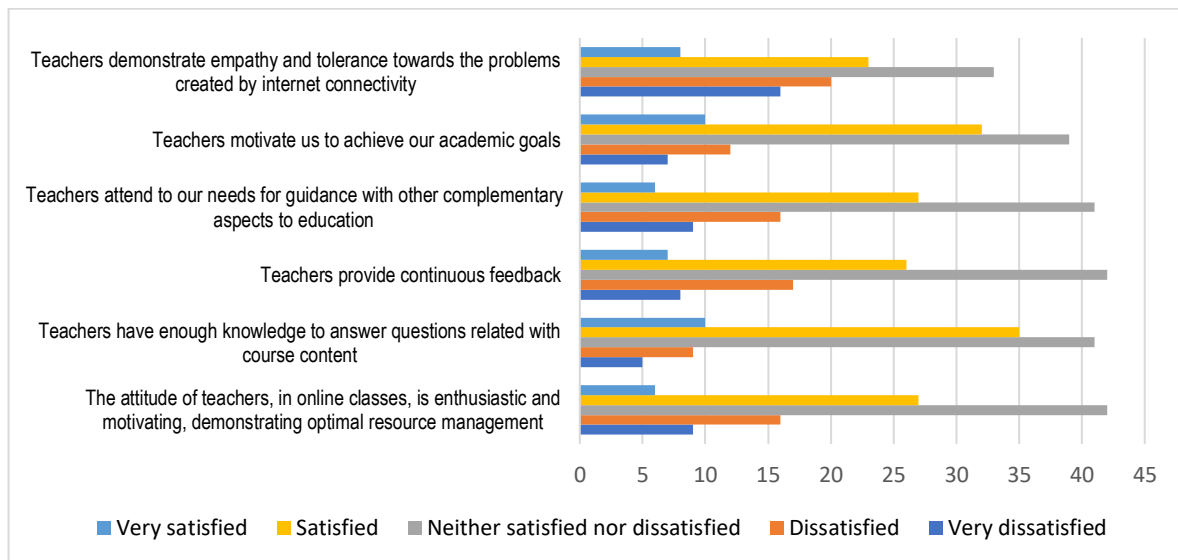
Satisfaction with the teaching-learning process

Finally, the dimension related with the teaching-learning process, produced neither satisfied nor dissatisfied responses in 43% of students, with the next most common response pertaining to satisfaction (25%) (Table 10). Here, little difference was found in responses provided by those living in urban and rural areas, suggesting that the teaching-learning process promoted through online education is oriented towards students from diverse geographic backgrounds.

Table 10. Satisfaction with the online teaching-learning process

| Level of satisfaction | Geographical area | | | | Total | |
| | RURAL | | URBAN | | | |
	f	%	f	%	f	%
Very dissatisfied	114	5	117	5	231	10
Dissatisfied	189	8	188	8	377	16
Neither satisfied nor dissatisfied	499	21	524	22	1023	43
Satisfied	301	13	300	13	601	25
Very satisfied	68	3	75	3	142	6
Total	1171	49	1203	51	2374	100

Within this dimension, positive aspects emerge, alongside others that are in need of improvement (Figure 4). Thus, the aspect to produce greatest student satisfaction is the distribution of synchronous hours to specify teaching-learning processes. This positive finding demonstrates that curricular planning is suitable to student needs, regardless of their geographical context. On the other hand, the aspect to produce greatest dissatisfaction pertains to the fact that neither virtual laboratories nor specialised software is available for students to be able to complete practical aspects of courses. This reflects a huge shortcoming that must be addressed as soon as possible. In accordance with this, Molina et al. (2021) also found low levels of student satisfaction due to system limitations for performing practical sessions.

Figure 4. Satisfaction with the online teaching-learning process
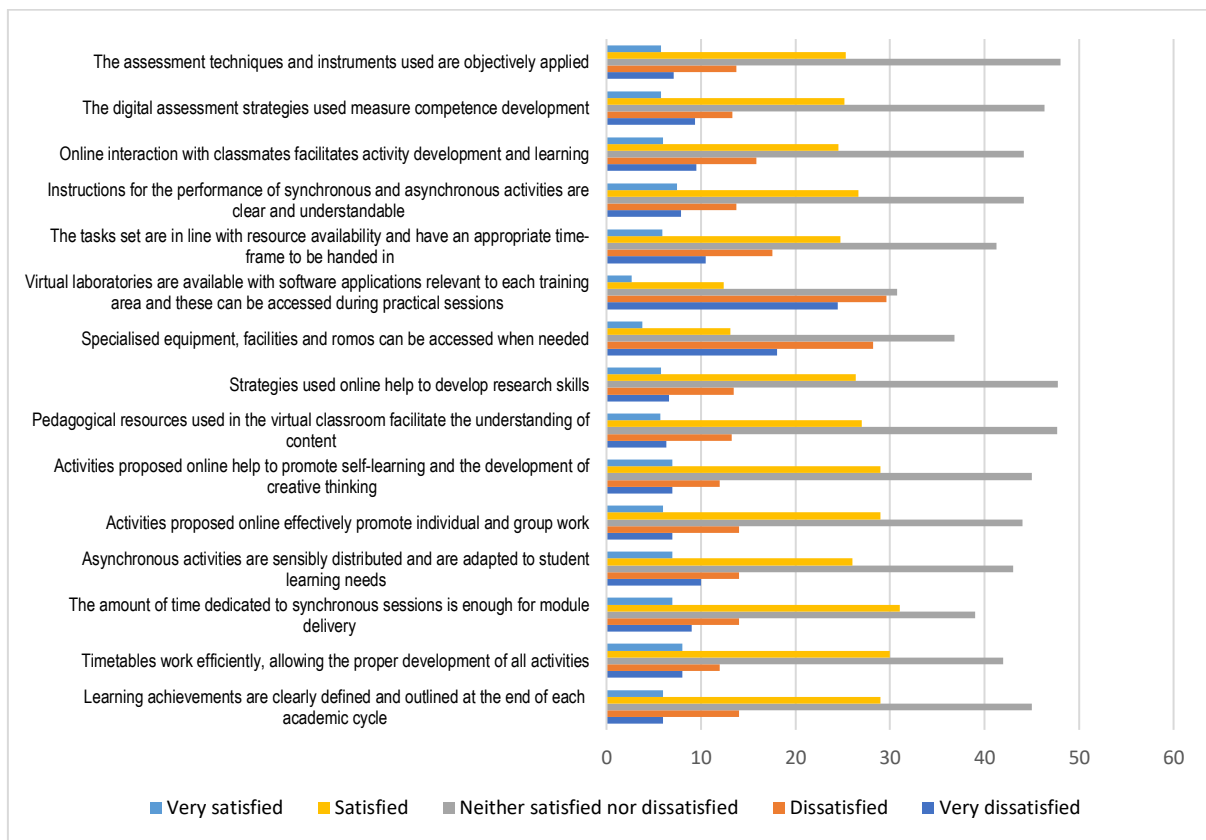
These findings demonstrate a need to open up spaces for the insertion of technology, in general, and digital technology, specifically (Mahony, 2021), above all in inhospitable spaces that are limited by their geographical diversity and in need of urgent attention. This is crucial as current globalisation demands the development of diverse aspects grounded in digital online technology (Buzai & Ruiz, 2012). This is even more important in the educational sector, which must meet the needs of all individuals, given that education is a universal right and, at the time of writing, the United Nations lists it as the fourth objective on agenda 2030 for sustainable development. Specifically, systems must be targeted towards "guaranteeing inclusive, equitable and quality education, and promoting lifelong learning opportunities for all" (Ministry of the Environment, 2016, p. 19).

This need requires decision making from both political and educational authorities at a national, regional and local level, in addition to input from all those involved in quality education provision, with a view towards reorienting proposals to produce greater access to online education. This calls for provision of the financial and logistical resources needed to break down the barriers put in place by the struggle between geographical context and technology.

Discussion and conclusions

The finding that most students are not dissatisfied, with overall trends towards satisfaction, is generally a positive outcome. This finding is framed by the global context surrounding the issue, since, according to previous studies, student satisfaction, globally, with online education is mostly high (Díaz et al., 2021). In this regard, Baber (2020), Durán et al. (2015) and Wolverton et al. (2020) state that online classes are equally as effective as traditional classes at producing satisfaction in students. Specifically, the greatest response percentage pertained to students not feeling

dissatisfied with online education. This coincides with that reported by Caner & Servet (2020), who also found university students to report average levels of satisfaction.

Likewise, it is noteworthy that the general trend revealed by our overall outcomes of being neither satisfied not dissatisfied, followed by a group of satisfied students, was maintained in the dimensions of satisfaction with the university's general services, teacher engagement and attitude and online teaching-learning process.

With regards to satisfaction with the university's general services, present findings are analogous to that proposed by Napitupulu et al. (2018), who indicated that the quality of service facilities was directly related with student satisfaction. Similarly, it can be inferred that student satisfaction is influenced by the quality of technical services, image and perceived value (Teeroovengadum et al., 2019). Additionally, in accordance with Castro (2023), the importance of communication channels regarding student satisfaction is supported, in the sense that social networks and institutional email are considered to be key elements for enabling communication at university. The stance taken by Chen et al. (2020) is also supported in that availability of a platform that is accessible to everyone is considered to be a fundamental aspect for strengthening user satisfaction.

Findings regarding satisfaction with teacher engagement and attitude are similar to those reported by Gavrilis et al. (2020) who found that students held positive perceptions about their communication and collaboration with teachers. Additionally, teachers' attitudes to being faced with a new landscape were evaluated, agreeing that "each and every teacher has had to use their own means, their own personal effort, their own whiles and skills to provide a service that, in many cases, has never been experienced before" (Del Castillo-Olivares & Del Castillo-Olivares, 2021, p. 99)

With regards to the teaching-learning process, one of the aspects to produce the greatest satisfaction in students from both urban and rural areas is the timetabling of synchronous hours. This finding contradicts that seen in other contexts, such as in Romania, in which students report dissatisfaction with synchronous sessions, stating that they do not allow time to rest as they are highly frequent and teachers do not respect scheduled timetables (Coman et al., 2020).

On the other hand, the high levels of student dissatisfaction with technological resources, above all in rural areas, reveals the limitations of technology when faced with a challenging geographical context. This corroborates the existence of barriers to connectivity and technological resource availability, which persist in many different countries (Paredes-Chacín et al., 2020) and impede the provision of good educational services, especially in rural areas. Emergence of greater dissatisfaction in students living in rural areas, who receive limited educational services due to the lack of internet connection and not having a data plan that enables adequate internet connection so that they can engage with educational processes, shows that a digital gap exists in university students, as a function of their geographical setting.

At the same time, present findings reveal that one of the biggest issues faced by students in the context of online education pertains to the technological resources required to study online. This mainly refers to equipment (computer, mobile phone, tablet, etc.) and internet access (Manrique & Sánchez, 2019), producing, in diverse contexts, dissatisfaction with the educational service received by university students.

In comparison with other contexts, student satisfaction outcomes pertaining to technological resources corroborate the complaints of university students in Romania with regards to poor internet connection, loss of signal, lack of computers/laptops and insufficiency of mobile telephone services (Coman et al., 2020). This verifies that technological issues propose a factor that, on many occasions, has stood in the way of

students receiving quality online education provision. Likewise, these findings verify the existence of infrastructural differences in internet access, for example, in Indonesia the majority of rural areas have much slower internet connections than that seen in urban areas (Syahruddin et al., 2021).

Findings pertaining to satisfaction with technological resources confirm that geographical area, whether rural or urban, leads to the emergence of significant differences regarding access to technology and behavioural patterns in students (Habibi et al., 2021; Yang & Hsieh, 2013; Syahruddin et al., 2021). It should also be noted that respondents living in urban areas show more concern about the enjoyment and utility of technology when compared with those living in rural areas (Syahruddin et al., 2021).

In a general sense, it is concluded that student satisfaction with online university education is fairly standard, with similar patterns being shared across many universities across Peru and the wider world, as revealed by the scientific literature reviewed in relation to the present study. Statistically speaking, no significant differences exist in student satisfaction with online education as a function of geographical context. This outcome leads us to question whether desired levels of quality are being achieved in online education. This gives rise to the need to conduct further research in order to find new measurements, considering, as a priority, populations located in rural areas who are more affected by numerous geographical and technological factors. In this respect, it is suggested that considerations regarding student perceptions about their satisfaction with online education always be present as a valuable and informative criterion when evaluating the quality of education.

Likewise, it is concluded that geographical context is a key element for modifying student satisfaction. Often, this context imposes barriers in the sense of technological resources and impedes access to online education, giving rise to greater dissatisfaction in students located in rural areas. In this regard, various statistically significant differences were identified in student satisfaction with technological resources as a function of geographical context. These findings must be taken into consideration by political and educational authorities, at both a national and regional level, in order to urgently respond to student needs and address their poor levels of satisfaction. University education provisions must be rethought, above all, in rural settings, to target continuous improvement in the quality of university education. This will require the breaking down of barriers put up by the struggle between technology and the geographical context, with the aim of promoting the achievement of sustainable development goals by 2030 and proposals outlined by the International Telecommunication Union.

With a view to forming more specific conclusions, present findings support more in-depth analysis of the meaning of satisfaction, which is directly associated with student perceptions about the quality of university services, confirming the importance of considering student opinions when identifying strengths and weaknesses in order to achieve better outcomes (Díaz et al., 2021). This aspect should be considered by university authorities as a part of the research into the educational context that informs the design of university education projects and implementation of curricular designs targeting the promotion of equitable and quality education within the framework of digital change (Sáiz-Manzanares et al., 2022).

Finally, it should be highlighted that the findings produced by the present study are positive, however, they should be considered in light of a number of limitations. Firstly, data was gathered from a single university in Peru and geographical context was the only factor examined as a conditioning factor or satisfaction with online education. Future studies are encouraged to replicate the present study at a number of universities both throughout the country and around the world in order to provide a more complete view of

student satisfaction with university online education. Such research should consider diverse geographical contexts and access to technology. Further, based on present findings, future research should be designed to analyse the conditioning factors of student satisfaction with online education, above all, in countries in which access to technology is limited. Likewise, studies should be conducted to gather more detailed information on the meaning of satisfaction with online education and include potential differences in student perceptions of satisfaction as function of age and gender. The possibility also remains open of measuring the achievement of competencies in students, as an outcome of online education and as a function of geographical context. Student satisfaction should also be measured in relation to their learning outcomes (Murillo & Duk, 2020).

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