Research Article

Online or remote education? Preferences of Colombian higher education students

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ARTICLE INFO	ABSTRACT
	While some students had experience receiving online education prior to the COVID-19 pandemic, the emergency remote modality offered a different experience given that higher education faculty had limited time for planning and, most of them, did not have any experience in online education. This research aims to identify the differences between undergraduate students' perceptions and preferences on emergency remote and online education. Researchers identified a set of online education courses–that pre-existed COVID-19 times–and courses that were transformed into remote education courses–designed as a response of the COVID-19 emergency. Participants of this study are a group of students who, during the same academic semester, participated in both online and (emergency) remote courses. Researchers used a survey to understand students' perceptions and preferences assessing their experiences in different dimensions (e.g., interaction and evaluation). Researchers used the add-on preferential groups model to identify which of the two modalities was preferred by the students for each dimension. The quantitative analysis was complemented using content analysis of responses to open-ended questions, seeking to gain a better understanding of students' perceptions and preferences between online and emergency remote education. The results show that students have a positive view of the online and remote modalities; however, each of these modalities offers students advantages for specific dimensions. For example, the remote modality was preferred for having greater interaction among peers and with the instructor. On the other hand, online education provided more flexibility. Students suggested improving assessments' approaches and instructors' technological skills for both modalities.

Keywords: emergency remote education, preferences, perceptions, online learning, higher education |

INTRODUCTION

Before the COVID-19 pandemic, several modalities for higher education were recognized, with in-person education being more prevalent than distance and online education. With the challenge of providing continuity to the educational system and closing learning gaps, the pandemic required institutions to adopt the educational modality known as *emergency remote education* (ERE). For this new modality, instructors had to quickly design learning experiences based on virtual education and traditional distance education.

ERE emerged as a response to the COVID-19 pandemic, which forced higher education institutions to continue their academic activities online. Hodges et al. (2020) stated that the main objective of ERE was not to "re-create a robust educational ecosystem, but rather to provide temporary access to instruction and instructional support in a manner that is quick to set up and is reliably available during an emergency or crisis" (p. 8), bringing instruction to students' and educators' homes, both online and offline (Fullan et al., 2020). This implies that–even when a lot of work and creativity was invested to support ERE–the redesign process of a course might have not been 100% as effective as desired, given time constraints (Fullan et al., 2020; Head et al., 2002; Hodges et. al, 2020).

Since 2019, Colombia recognizes multiple education modalities like face-to-face, online, distance education, and any combination of these modalities (MEN, 2019). During the COVID-19 pandemic in 2020, new models of education emerged, like ERE, as an alternative to face-to-face education. ERE is based on asynchronous interactions using digital tools as mediation (e.g., chats, discussion forums, video conferencing platforms, and others).

Arias et al. (2021) suggests that ERE increased the visibility and relevance of the role of the instructor in supporting student learning (Castro et al., 2015). This became a challenge for educators while transitioning into emergency remote instruction; this process required extra time and effort to get comfortable with the dynamics and pedagogical practices required for effective online/remote instruction. On average, it takes around three iterations of a course to have educators at a comfortable level for instruction and course delivery (Cano, 2021; García, 2021; Hodges et. al, 2020). However, although educators struggled with their digital literacy skills, they were motivated to keep instruction going and provide the best possible learning environment for their students.

In this study, researchers selected students that were participating in both online education courses (that were designed before the COVID-19 emergency), and courses that were in remote education courses (designed with a limited amount of time given the COVID-19 emergency) in order to understand their perceptions and preferences of both modalities given their learning experiences, and how these preference can provide an insight on how better learning experiences can be designed in post-COVID-19 times.

Thus, this article explores the following research question: *What are students' perceptions and preferences about/between online learning (OL) and ERE?*

BACKGROUND

OL is defined as an educational process made possible by the advances in information and communication technologies (ICT), which intensively incorporates the use of telematic networks, computers, and various web applications in the management of the teaching and learning process, with the intention of favoring the development of competencies in a social context (García-Peñalvo & Seoane-Pardo, 2015; Gros-Salvat; 2018; Ricardo et. al 2020). OL is a flexible modality in terms of time management, space, and learning styles. OL is characterized by the interaction of various participants who share technological spaces, tools, activities, and learning experiences under the mentoring and guidance of instructors.

Conversely, ERE is a concept that resulted from the COVID-19 emergency. ERE is a temporary shift of teaching to an alternative mode due to a circumstance or crisis, involving the use of fully remote teaching solutions that would otherwise be delivered in person or with blended or hybrid courses, and which was expected to return to that format once the crisis or emergency had subsided (Anderson et al., 2020; Bokolo & Selwyn; 2021; Hodges et al., 2020). ERE is a mode of teaching characterized by synchronous interaction, where meaningful collaborations with contextualized learning experiences can foster and promote their self-regulated strategies and behaviors (Hensley et al., 2022; Whittle et al., 2020). Given the limited time and training for instructors to adapt their learning materials to OL, ERE implies that many instructors sought to transform the processes that were carried out in person (e.g., lectures and exams) to the online context.

Characteristics and Experiences of Online and Emergency Remote Education

Taking into consideration that ERE is founded on the characteristics of face to face, online and distance education, the following section will explore the principles and characteristics of quality online education, making emphasis in the quality of interactions and learning assessment.

OL, as a teaching modality that allows blurring the spatiotemporal barriers of learning, has been developing and has gained momentum over the past 20 years. Gros-Salvat (2018) presents six generations of OL that bring it to a networked environment and consider the pedagogical and technological advances:

(1) designing online multimedia resources to transmit knowledge, integrating the Internet and the use of communication tools,

(2) bringing the application of computer games for OL,

(3) implementing learning management platform (LMS), incorporating virtual classrooms that connect the content from generation zero,

(4) using Web 2. 0 and social networks and social interaction between the actors and strengthening the content, and

(5) the fifth and sixth generations are characterized by cloud computing, open content, and massive open online courses (MOOCs).

OL modality is a training option available to students, which, with a previous and pertinent design of the teaching process, can enhance the learning process. However, OL requires at least a basic level of digital competencies of students, instructors, and administrators (Casero & Sanchez, 2022; Sanchez & Prendes, 2021). In turn, given the active role that the learner must assume in this modality (Zambrano et al., 2010), it has been suggested that it strengthens autonomous work, self-determination and self-regulation of student learning, as well as skills for cooperative and collaborative learning (Cano et al., 2016, 2018, 2022; Gros-Salvat, 2018; Ricardo et al., 2020;). This active role also enables the student to network with other peers, and it provides greater access to updated digital educational resources and materials (Area & Adell, 2009; Gros-Salvat, 2018). In addition, OL and ERE modality gives special importance to interaction and exchanges between the instructor and the students, which strengthen the student's autonomous learning (Cardona & Sánchez, 2011; Ricardo et al., 2020).

Interaction and Tutorship Role in OL and ERE

Hence, **interaction** is considered a key aspect of the process of student training (Gros-Salvat, 2018). The frequency of student interactions depends on the control that the instructor exercises over the learning activity, his/her ability to maintain it during the learning process, and the warmth and number of aids s/he provides (Badia et al., 2001; Gros-Salvat, 2018). These interactions are also determined by students' previous experiences and the meaning they make out of them (Ricardo, 2018).

Social **interaction** can be synchronous with immediate feedback, or asynchronous with a much more thoughtful and argued elaboration. OL and ERE may benefit from at least three types of interaction: instructor-student, student-student, and student-content. In the first case, instructors must ensure that their students are able to understand and respond to the different activities, and that they receive the necessary guidance to carry them out. This type of interaction occurs through e-mail, discussion forums, feedback on activities, or communication in general, whether individual or in a group, in the virtual learning space (Area & Adell, 2009; Badia et al., 2001; Casero & Sanchez, 2022; Rasmussen et al., 2007; Ricardo, 2018). The instructor's accompaniment and tutorship role are fundamental for the achievement of the objectives, so a high level of communication and collaboration between instructor and students should be promoted to clarify information related to activities (objectives, conditions, and evaluation), help students self-regulate their learning process, and propose tasks and activities that respond to the autonomy and expectations of the students (Fernández et al., 2013; Gros-Salvat, 2018; Ricardo & Vieira, 2023).

In the case of student-student **interaction**, a high degree of interaction among classmates should be promoted, whether individually, in small groups, or with the whole class, in order to favor the collective construction of knowledge (Area & Adell, 2009; Rasmussen et al., 2007). According to Badia et al. (2001), this is achieved if there is a positive interdependent relationship among students, if there is a real exchange of knowledge and beliefs, and if the learning activities are designed as cooperative tasks. Finally, in the student-content **interaction**, educational materials must be of high quality, presented in different formats (textual, visual, or hypermedia), and should be elaborated in a clear, orderly, and structured manner.

Assessment and Feedback Processes in OL and ERE

Just as interaction is a fundamental aspect, so are the **assessment and feedback processes**. Duart et al. (2020) suggest that ICT-mediated assessment practices should be relevant, coherent, transparent, and aligned with the learning material and with didactic and methodological strategies. Likewise, these can be collaborative, favoring dialogue and continuous interaction among the actors in the process, encouraging self-, and peer-assessment, and should provide timely and clear feedback to encourage learning. These practices empower students to assume responsibility for the processes of self-regulation of learning, examining the understanding of what they have learned, and assuming personal challenges for the achievement of learning outcomes (Duart et al., 2020). Continuous assessment practices also allow instructors to make instructional decisions to improve and adapt their pedagogical practice (Coll, 2007; Ricardo & Vieira, 2023).

However, assessment in OL and ERE is not exempt from important challenges. Casero and Sanchez (2022) found out that instructors were challenged to rethink their assessments strategies and practices during the pandemic given the online modality. While the authors found that students did notice more strategies needed for online modality (e.g., giving more importance to formative assessments than ever before), they suggest that more changes should be done to be more adequate for online modality. Duart et al. (2020) and Gros-Salvat (2018) highlighted that designing and implementing valid assessment strategies is quite complex. Furthermore, instructors often have limited knowledge to design and apply authentic assessments in OL environments that are flexible, integrated and interactive, with timely feedback, participation, and collaboration (UNESCO, 2013). Some of the common approaches for assessment in online education include self-assessment and peer assessment, participation in forums, portfolios, reports/research, collaborative work, synchronous debates, simulation and role-playing, problem-solving and case studies (Conejo & Castillo, 2014; Duart et al., 2020; Martínez 2015; Marín & Salinas, 2014).

Scholars like Audran et al. (2021) and Cano (2021) highlight that ERE also brought challenges for students, related to their digital literacy skills and the required self-regulation skills. A study conducted by Biwer et al. (2021), with 17,182 students (undergraduate and graduate), aimed to understand the way students self-regulated their learning during the COVID-19 remote instruction. Using a mixed method approach, these scholars found that around 34% of the students were able to sustain their academic performance–especially, their self-regulation and time management skills stayed the same–even when they struggled with their attention rate and limited motivation to be engaged during remote instruction. Additionally, the authors stated that 47% of the students struggled with the adaptation process, feeling overwhelmed, and some wanting to quit studying during ERE. Finally, only 19% of the students demonstrated an ability to adapt more effectively to the new learning environment and dynamics. These students expressed to be more motivated, to have better attention, and time regulation than before the transition to remote instruction.

The experiences students had during the emergency transition were influenced by multiple factors, including students' previous experiences; time management skills, self-regulation skills; attention regulation skills; and their ability to adapt to new learning environments (Biwer et al., 2021). Many students struggled to engage during video lecture sessions–which forced them to invest more time in their autonomous studying time–and with keeping their mental health and well-being while navigating such a modality transition. These events caused students a significant drop in their educational experience and performance (Biwer et al., 2021).

Students' personalities and social abilities were crucial in the adaptation process of ERE during the COVID-19 pandemic. Students who considered themselves extroverted struggled with the isolation and lack of interactions and collaboration with other students in a classroom environment; whereas students who considered themselves introverted and shy found, in ERE, a safer environment to participate without feeling the social pressure that hindered them from engaging in classroom activities (Biwer et al., 2021; Dörrenbächer & Perels, 2016; Johnson, 2015). Students' age also played an important role in their adaptation process and their perception of distance education: older students demonstrated more adaptability to the distance/OL environment and its dynamics and form of interactions compared to younger students. According to Biwer et al. (2021) and Dörrenbächer et al. (2016), age and experience in higher education can foster student abilities for self-regulation.

Hernández et al. (2022) conducted a study with 503 undergraduate students to understand students' perception of the transition from the in-person courses to ERE courses. Their results showed that the emergency transition to ERE prioritized preparing educators for a quick transition to the new teaching modality over focusing on student-centered pedagogical approaches.

In general, OL differs from ERE in that it is a process intentionally planned to occur through technological mediation; both instructors and students have clear expectations about the training modality, and often have previous experiences that allow them to recognize the need to follow a self-regulated learning process. Conversely, ERE usually includes synchronous communication spaces through video, and brought significant challenges related to the limited technological resources of the participants, the low levels of digital literacy of instructors and students, and the limited time (and experience) for planning reliable and meaningful evaluation processes. These differences led us to compare Colombian students' preferences and perceptions of higher education students regarding OL and ERE given their learning experiences, and how these preferences can provide an insight on how better learning experiences can be designed in post-COVID-19 times. Thus, this study explores the following research question: *What are students' perceptions and preferences about/between OL and ERE?*

METHODOLOGICAL FRAMEWORK

The methodological framework guiding this research is the add-on preferential groups (APG) (Vieira et al., 2018) model. APG model divides the responses into groups indicating preferences and perceptions about certain pedagogical strategies, as opposed to using statistical methods to identify "general" differences in measures of central tendency. Ones the groups have been defined, APG model uses a permutation test to identify whether the differences between groups are statistically significant or not (Vieira et al., 2018).

APG model has three levels of visualization, as presented in **Figure 1**. The first level provides a quick visualization of preferences between two pedagogical strategies or modalities. A scatter plot is created with the students' rating of activity *x* vs. activity *y*, and the main diagonal (*x*=*y*) is used as an indicator of their preferences. The points below the main diagonal represent students who prefer activity *x*; responses from those above the main diagonal prefer activity *y*. APG model uses different shades of gray according to the percentage of responses in each area of the graph. The second level (bottom right) divides the plane into four quadrants using the middle point of the scale for each axis (e.g., if the scale is 1-10, the lines will be at X=5 and Y=5); and summarizes the number of positive and negative perceptions of both activities. Finally, the third level (bottom center) provides the integration between the visualization of preferences (level 1) and perceptions (level 2). That is, within the group that has favorable perceptions of both modalities, this level allows us to identify which of the two modalities they prefer. Likewise, for the percentage of participants who do not have a favorable view on either modality, it identifies which of the two they prefer (Vieira et al., 2018).

To validate the resulting groups, this model proposes the use of a permutation test to identify whether the differences in the observed percentages of students' preferences are statistically significant (Vieira et al., 2018). The permutation test is particularly useful for educational contexts, where the sample is often small, and the assumptions of parametric tests are not always met. For this analysis, the null hypothesis is that all groups follow the same distribution, while the alternative hypothesis is that at least one of the groups derives from a different distribution.

Methodology

This article presents a case study to understand: *what are students' perceptions and preferences about OL and ERE?* The case study is an appropriate methodology for this process because it allows for the integration of quantitative and qualitative data to provide a detailed description of the phenomenon in a given context. The context, in this case, is a medium-sized private university (approximately 10,000 students) in the Caribbean region of Colombia. This university is an in-person institution, although it had offered some specific online graduate programs and undergraduate courses using OL modality even before the pandemic. When the transition to ERE modality was established, the university suspended activities for two weeks to offer support to its faculty members in adapting materials and activities. Although the institution is private, a high percentage of the enrolled students (more than 70%) have some type of scholarship or financial support,
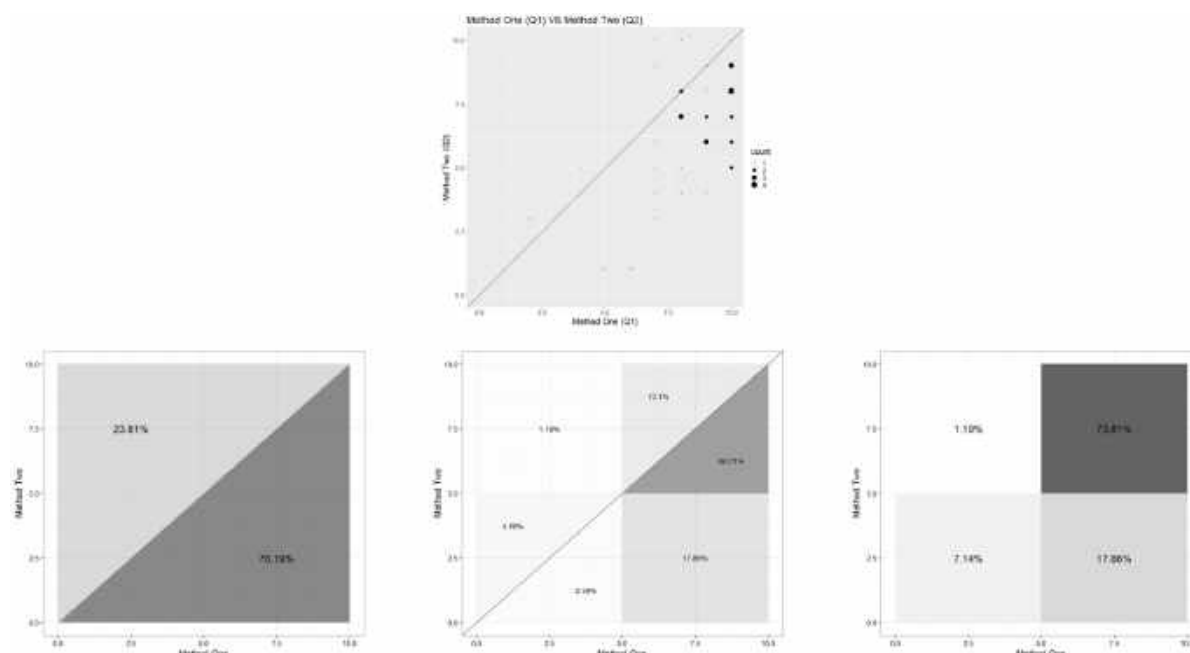
Figure 1. APG analysis levels example (Source: Authors)

which means that a high percentage of the student community did not necessarily have access to an Internet connection or quality devices. For this reason, the university distributed most of the laptops available at the institution among the students who expressed a need for them.

Participants

In total, 88 participants voluntarily decided to complete a survey that was distributed online to students who were enrolled in an undergraduate OL course. Among these students, 53 were female, 33 were male, and two did not report their gender. Regarding their disciplines, 10 students were enrolled in business administration, 19 in psychology, 12 in industrial engineering, 10 in civil engineering, eight in early childhood education, five in architecture, four in electrical engineering, three in social communication and journalism, one in geology, two in systems and computer engineering, two in mechanical engineering, three in medicine, one in music, four in international business, one in international relations, and three students did not specify their program. At the time of completing this survey, the students were enrolled in the following OL modality courses: intercultural education (25), childhood and the world (19), e-learning (25), e-learning (eight), educational technologies (six), and other subjects (five).

Instruments

For this study, we used a survey seeking to investigate perceptions and preferences of students when comparing OL and ERE modalities on what was described by APG model. The survey included an initial section focused on student demographics and asking students about courses that they had taken in OL modality.

The second section contains 14 statements that inquire about different components along the following dimensions: quality of content, interaction, assessment, feedback, time requirements, resources, and technical support. Specifically, participants were asked to evaluate on a scale of 1-10 the usefulness of these components both for OL and for ERE.

Table 1 depicts the items that assessed these dimensions, such as: "time for the development of independent and asynchronous activities" or "educational platforms for the development of asynchronous sessions (Google Drive, Virtual Classroom, Web Catalog)". The last section consisted of four open-ended questions asking about the advantages and disadvantages of the modalities, and which of these they would consider for the future.

Table 1. Questions from the instrument

Item	Statement
P1	Quality and quantity of content
P2	Student-instructor social interaction
P3	Student-student social interaction
P4	Activities and tasks that promote active and collaborative learning
P5	Activities and tasks that respect diverse talents and ways of learning.
P6	Timely instructor feedback (social presence, provided learning aids)
P7	Time for the development of independent and asynchronous activities
P8	Time for the development of synchronous activities
P9	Teaching skills to maintain interaction in synchronous sessions.
P10	Availability and accessibility to educational resources in a variety of formats
P11	Learning assessment strategies
P12	Educational platforms for development of asynchronous sessions (Web Catalog, Virtual Classroom, Google Drive).
P13	Educational platforms for development of synchronous sessions (Blackboard Collaborate, Zoom, Meet, or other).
P14	Timely technical support

Data Analysis

To understand students' preferences and perceptions between and about OL and ERE, we first computed a descriptive statistical analysis to determine the measures of central tendency and variability of students' perceptions of each modality.

Subsequently, we used APG (Vieira et al., 2018). This model aims to make up for the limitations that arise when using measures of central tendency and traditional methods of inferential statistics, by using two-dimensional spatial in combination with statistical techniques. This model describes students' preferences by comparing the values they select between 1 and 10 for both class modalities.

Additionally, we conducted a content analysis of the open-ended questions to identify the advantages and disadvantages OL and ERE for students. The categories were established according to the students' comments using open coding, and we then identified the number of comments referring to each category.

RESULTS

Table 2 presents the descriptive statistics for each item/modality. The results suggest that, in most of the items, the average score for OL modality had a higher average on how effective they are perceived by the students compared to ERE modality. 10 of the items showed statistically significant differences based on the paired t-test results, with a p-value of less than 0.05, in **Table 2**, the mentioned differences can be observed in detail. The items with the greatest difference between modalities have a clear focus on the learning process, the development of activities and the evaluation during the process, while the difference is much smaller when referring to the interaction between the actors and the instructor's feedback.

Unsurprisingly, the results from the first level of APG model show that, in general, students often prefer OL over ERE modality, obtaining a higher percentage above the main diagonal for all items but *interaction among students*. Consistently with the descriptive and inferential statistics results, the largest number of respondents are located in the box on the upper right, suggesting that most students (more than 70% and sometimes up to 90%) have a positive perception of the two modalities.

The percentage of students who prefer OL modality over ERE one was above 57%, in items related to *the time for the development of independent and asynchronous activities* (**P7**; 65.34%), *the learning assessment strategies* (**P11**; 61.39%), *the quality and quantity of content* (**P1**; 60.23%), and *time for the development of synchronous sessions* (**P8**; 58.23%).

Table 2. Descriptive statistics results per item for each modality

Statement	Modality	Average	SSD	Δδ	TT	p-value
Quality and quantity of content	Remote	8.2	22.2	00.6	22.076	0.001
	Online	8.8	1.6			
Student-instructor social interaction	Remote	7.7	2.1	0.30	-1.550	0.120
	Online	8.0	2.1			
Student-student social interaction	Remote	7.8	2.5	0.20	0.000	0.990
	Online	7.6	2.7			
Activities & tasks that promote active & collaborative learning	Remote	8.0	2.3	0.60	3.990	0.001
	Online	8.6	1.8			
Activities & tasks that respect diverse talents & ways of learning	Remote	7.8	2.7	0.70	3.320	0.001
	Online	8.5	2.0			
Timely instructor feedback (social presence & provided learning aids)	Remote	7.8	2.2	0.10	-0.550	0.582
	Online	7.9	2.5			
Time for development of independent & asynchronous activities	Remote	7.5	2.7	1.30	-5.120	0.000
	Online	8.8	1.9			
Time for the development of synchronous activities	Remote	7.7	2.6	0.70	3.090	0.002
	Online	8.4	2.0			
Teaching skills to maintain interaction in synchronous sessions.	Remote	7.6	2.5	0.50	-1.800	0.075
	Online	8.1	2.3			
Availability & accessibility to educational resources in a variety of formats	Remote	8.6	22.0	0.50	-2.760	0.006
	Online	9.1	1.7			
Learning assessment strategies	Remote	7.9	2.4	0.70	-3.080	0.000
	Online	8.6	2.2			
Educational platforms for development of asynchronous sessions (Web Catalog, Online Classroom, & Google Drive).	Remote	8.6	1.9	0.40	-2.480	0.014
	Online	9.0	1.6			
Educational platforms for the development of synchronous sessions (Blackboard Collaborate, Zoom, Meet, or other).	Remote	8.1	2.0	0.30	-2.420	0.017
	Online	8.4	22.0			
Timely technical support	Remote	7.4	22.6	0.07	-3.280	0.001
	Online	8.1	2.1			

Regarding the perceptions and preferences of the surveyed students, when comparing *instructor-student social interaction* for the two modalities, 8.33% of the students perceive OL modality as way more effective than ERE, rating OL among the highest levels of the scale. Among the students who are satisfied with both modalities, 43.56% are more inclined to choose OL classes, while 36.17% choose ERE classes (see **Figure 2**).

A greater difference can also be noted when asked about *the availability and accessibility to resources*. Among the students who consider both modalities to be effective, 52.08% are more inclined to choose OL modality compared to 39.02% who choose ERE classes.

The two components, where the greatest differences are evident are *evaluation strategies* and *independent and asynchronous activities*. For the *evaluation strategies* item, the percentage of students with a positive perception in this component for OL modality and negative for ERE modality is 9.66%. Among those with positive perceptions of both modalities, 49.43% preferred OL modality and 32.95% chose ERE classes. Regarding the *asynchronous and independent activities*, the percentage of positive perception in OL modality and negative for ERE modality is 15.34%. When students found both modalities useful, 47.16% preferred OL, while 31.25% preferred ERE modality.

Among the assessed components, it stands out that, when consulting about *the interaction among students*, the difference in the preferences of the students between the modalities was very small, with the online modality obtaining 50.01%, and the remote modality the remaining 49.99%. Additional differences may be noted in the percentage of students who perceive ERE modality as more effective, obtaining 9.09% compared to 7.39% who rated OL classes as more effective. When comparing the percentages of students who positively perceived both modalities, 38.64% preferred OL modality, and 36.93% preferred ERE classes.

The results from the permutation test suggest that the groups are significantly different when participants' responses in the two modalities were compared with p-values less than 0.01.

To further understand these differences in perceptions and preferences, we conducted content analysis on students' answers to the open-ended questions about the advantages and disadvantages of ERE and OL modalities.
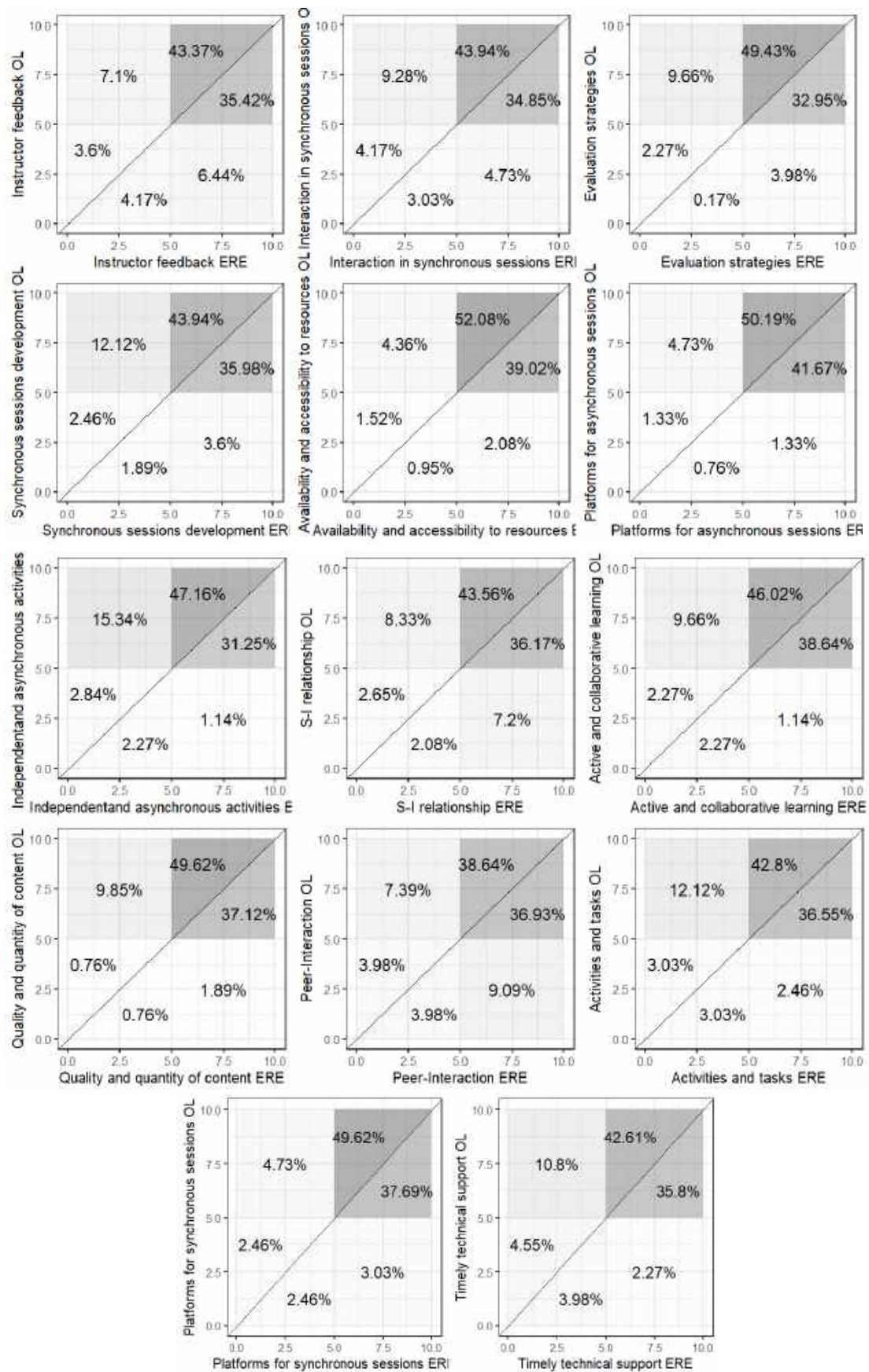
Figure 2. APG results analysis (Source: Authors)

Table 3. Results & categories of content analysis for ERE

ERE category		Description	Example
Positive aspects	COVID (health)	ERE modality made it possible to respond to circumstances caused by COVID-19 pandemic & to continue classes without affecting health of instructors, students, and family members.	"It made it possible to adapt content to a virtual environment in a time of crisis."
	Effective learning	Modality allows for classes to be carried out and for student learning to be as expected in accordance with the proposed learning outcomes.	"Question asking and immediate feedback."
	Comfort	It offers alternatives to develop classes allowing students to manage their time and space.	"It allows students to organize their time for work."
	Economy	This modality provides greater flexibility in space or place from which students attend classes &, thus, possibility of not commuting to the university and incur in expenses on this.	"You do not spend money on the bus."
	ICT use	The implementation of technological resources in the course allowed classes to be more dynamic, in addition to promoting the use of new online tools that allow students to develop activities and/or assignments.	"Learn about new applications to interact virtually."
	Peer interaction	The modality allows for greater/closer interaction with other classmates	"Interaction with the highest level of empathy."
	S-I relationship	Relationship & communication with instructor are more effective by having more contact through synchronous spaces.	"Direct contact with the instructor"
Aspects to improve	Organization/ structure	Lack of organization or clear structure in the sessions	"Better organization from instructors when providing all necessary material with enough time to be able to do things well."
	ICT use	Lack of mastery of the tools implemented for the development of the classes.	"Greater preparation on the part of instructors when teaching the class (knowing how to use technological resources)."
	Interaction with instructor	There was little or no interaction with the instructor.	"For the instructor to be more interactive with students."
	Availability of information	The management and organization of the information did not facilitate access for students, which caused difficulties at the time of having doubts.	"Access to more content and interaction"
	Amount of content	The amount of information and topics addressed is quite high, generating a feeling of dissatisfaction among students.	"Do not saturate students with too many activities just to make a grade and not to teach."
	Teaching	The pedagogical strategies adopted by instructors do not facilitate student learning.	"Train instructors to give better classes. Make it more fluid and not so much like robots."

Table 3 and **Table 4** show the categories for each question/modality. **Table 3** and **Table 4** show the different opinions of the students regarding each modality and the advantages and disadvantages that each one offers. It can be observed that in the categories, opinions were identified regarding the effectiveness of learning, comfort, availability of information, among others.

The results of the content analysis for the question *"do you highlight an advantage of the remote modality?"*, suggested seven categories, six of the responses alluded to COVID-19 and the adaptation that ERE modality allowed for continuing classes during the pandemic. According to the students, the remote modality *"allowed them to adapt the content to a virtual environment during a time of crisis."*

Similarly, 35 students found that this modality allowed them greater comfort and flexibility; one of the students highlighted the possibility of saving or not spending money on transportation; three of the students mentioned the use of ICT, suggesting that they had been able to learn new technological tools and that their

**Table 4.** Results & categories of content analysis for OL

OL category		Description	Example
Positive aspects	Structure	This modality has better planning, structure, and organization, which allows for a more efficient development of the thematic areas.	"It is well planned and allows for a good time frame to complete all activities."
	Comfort	It offers alternatives to develop the classes allowing students to manage their time and space for classes and learning the topics.	"Development of independence in the student's time."
	Learning effectivity	The modality allows student learning to be as expected according to the proposed learning outcomes.	"The student is the main protagonist, so he or she develops more skills."
	Interaction	The modality offers greater interaction with other classmates.	"There is more interaction."
	ICT use	Implementation of technological resources in the course allowed classes to be more dynamic, in addition to promoting the use of new online tools that allow students to develop activities and/or assignments.	"You learn new technological tools."
Aspects to improve	Number of content/activities	The number of activities developed in the independent spaces as well as the number of topics in the course are perceived by the students as too many.	"Don't saturate the student with too many activities just to take notes and not to teach."
	Dynamism	The activities to be developed by the students are usually the same in each of the units and themes, so the resources and tasks to be presented are usually repeated.	" Search for different activities that don't become repetitive."
	Effective learning	Pedagogical strategies adopted by instructors do not facilitate student learning.	" Search for different strategies to implement the topics."
	Assessment logistics	The timing of evaluations often does not consider the students' academic calendar or schedules and may overlap with other subjects or academic commitments.	"Connection, to respect exam time as it would be in person."
	Structure	Lack of programmed synchronous spaces for development of topics, which would facilitate resolution of doubts & achieve a better understanding of topics.	"Set up synchronous classes."
	Interaction	Lack of effective interaction & communication between instructor & students.	"For there to be student-instructor interaction."
	ICT use/platform	Implementation of more didactic and varied educational platforms for the development of activities and work in the subject.	"More didactic platforms."

use facilitated the classes; 15 expressed that they found learning more effective and 12 students highlighted the interaction among students as an advantage of the remote modality.

Finally, 16 students highlighted the contact with the instructor and the possibility of receiving more feedback as positive aspects of ERE modality (see **Figure 3**).
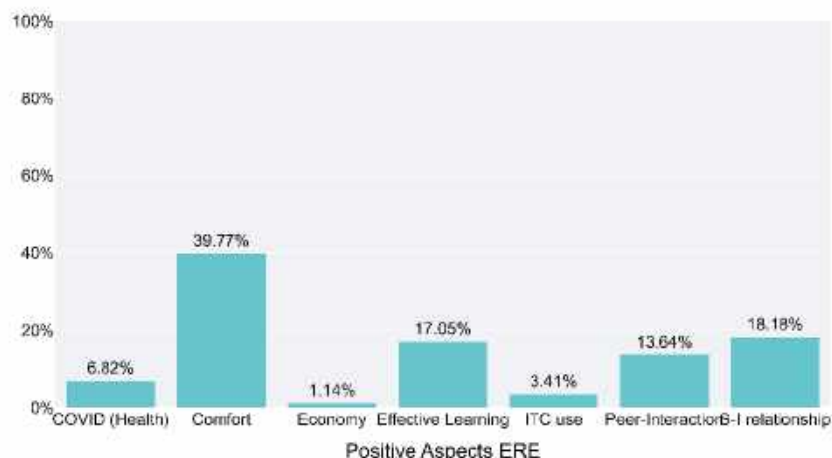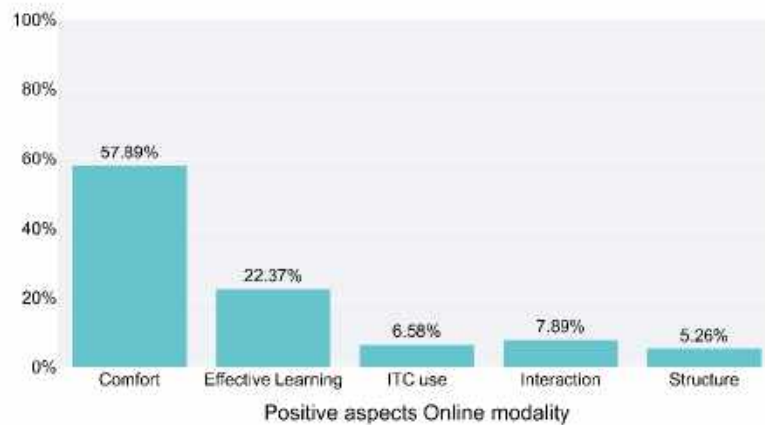
Figure 3. Identified categories advantages of ERE modality (Source: Authors)
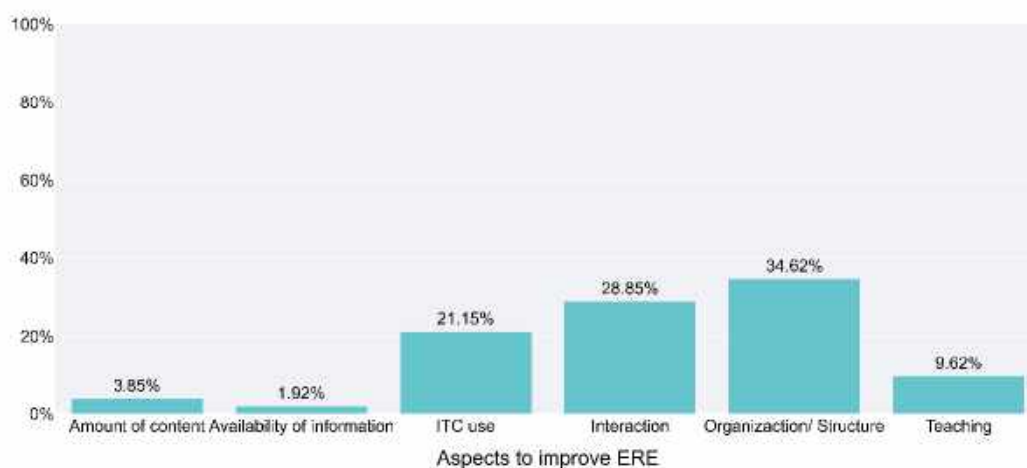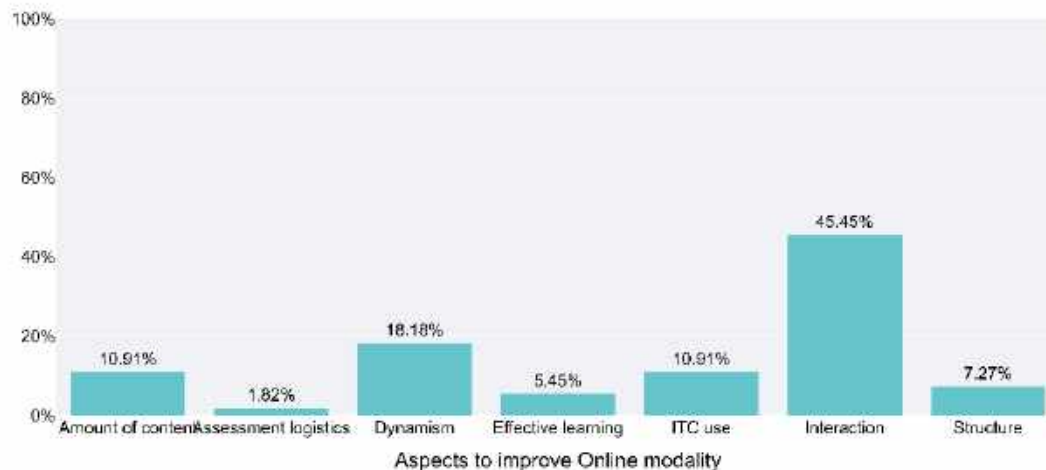

Figure 4. Identified categories disadvantages remote modality (Source: Authors)

Regarding the opportunities for improving ERE modality, most of the students' responses are related to the lack of preparation for implementing this modality. Accordingly, 18 of the comments mentioned that ERE modality requires more structure or organization; among the comments is *"Better organization from instructors when providing all the necessary material with enough time to be able to do things well."*. Similarly, two comments mention the excessive amount of information; five comments highlight the need to strengthen instructor training to address this modality; and 12 of the comments highlight the need for more dynamic and varied technological resources for the development of activities in the subject (see **Figure 4**).

As for the advantages of OL modality, the students' responses were concentrated into five categories (**Figure 5**). Most responses (44, equivalent to 57.89% of the participants) referred to the convenience and flexibility that the online modality allows. In the second place, we find the effectiveness of learning in which 17 responses were related, such as *"students are the main protagonists, so they develop more skills."* Another common response had to do with the structure and organization of the courses in this modality; according to the students, OL modality "*is well planned and allows a good time frame to complete all the activities.*" Six participants also highlighted the interaction with other students as an advantage of the online modality. Finally, five of the comments mentioned the use of ICTs as the possibility of this modality to get to know and learn from new technological tools.

Figure 5. Identified categories advantages online modality (Source: Authors)

Figure 6. Identified categories disadvantages online modality (Source: Authors)

When asked about aspects to be improved in OL modality, seven categories were identified among these comments. Most of the comments (25) mentioned the need for improving interaction between the students and the instructor; 19 of the suggestions were related to a greater dynamism in the activities, with responses such as *"Search for different activities that do not become repetitive"*; six of the comments were associated with the amount of content and activities included in a OL course, which may saturate students; and four students expressed the interest in having a greater number of synchronous meetings (**Figure 6**).

DISCUSSION AND CONCLUSIONS

This study aimed to identify *students' perceptions and preferences about and between OL and ERE* to provide some light on how to design quality learning environments (e.g., content quality, learning activities' design, assessments, social interactions, etc.) that foster students' motivation and satisfaction in post-COVID-19 times. Although many of the higher education institutions in the world had begun to offer OL programs or courses, ERE implied a transition to the use of technology with limited planning in terms of time and resources, led by instructors who had little or no experience with online education modalities. Our results suggest that college students have a generally positive perception of both OL and ERE modalities, although they rate OL modality higher in most of the assessed factors, including statistically significant differences in nine dimensions in favor of OL modality. These results are in line with the findings of scholars like Casero and Sánchez (2022), Gros-Salvat (2018), Hensley et al. (2022), and Ricardo et al., (2020), especially in areas related

to implemented learning strategies, content quality, collaborative and active learning (through meaningful collaborations), development of independent activities, and learning assessment provide contextualized learning experiences that foster and promote self-regulated learning. From the students' point of view, OL modality is a training option that they can access because they have the digital competencies to assume the learning process (Casero & Sanchez, 2022; Sanchez & Prendes, 2021). They highlight the advantages of flexibility in time management given the option of asynchrony, autonomy and self-regulation of learning, and collaborative work and interaction made possible by the use of technological tools and platforms, these practices should be kept in a post-pandemic era. Students positively value the support of instructors and consider the need for timely feedback to promote learning.

The participants, however, considered that interaction among students is more effective in the remote modality than in the online modality. This may indicate a student preference for participating in synchronous interaction spaces, where the instructor mediates each moment of the class using synchronous tools, rather than participating in asynchronous virtual spaces (e.g., discussion forums, e-mails, and feedback tools of the institutional LMS, for example). These asynchronous spaces are more impersonal and demand the development of skills such as self-determination, autonomous work, self-regulation of learning, and cooperative and collaborative learning, which are necessary for effective interaction in an OL environment (Cardona & Sánchez, 2011; Cano et al., 2016, 2018; Gros-Salvat, 2018; Hensley et al., 2022; Ricardo et al., 2020).

Regarding students' perceptions about the quality of the student/content interaction, the students expressed a preference for the online modality because it has better planning, structure, and organization, which enables the development of the topics to be more efficient. This structure and organization can be presented through the integration of various tools and updated digital resources of high quality and in different formats, which favors the development of the learning outcomes of the course (Casero & Sanchez, 2022; Cano et al., 2016, 2022; Cardona & Sanchez, 2011; Gross-Salvat, 2018; Rasmussen et al.,2007; Ricardo et al., 2020).

However, it is important to highlight the **implications**, for better learning experiences can be designed in post-COVID-19 times, based on students´ suggestions about aspects to be improved in both modalities, including:

(1) instructors' preparation to use digital tools/resources and to design innovative and motivating learning experiences that are relevant to the context, the learning modality (Ricardo & Vieira, 2023) and

(2) reducing the required time for students to complete the learning activities (Badia et al., 2001; Cano et al., 2018; Hernández et al., 2022; Ricardo, 2018).

This highlights, in agreement with Audran et al. (2021), Cano (2021), Conejo and Castillo (2014), and Duart et al. (2020), the need for instructor training and professional development for the strengthening of pedagogical and technological competencies.

Regarding the quality of assessment in OL and ERE modalities, students suggested that this process should be improved, so that students are not overloaded with evaluations that do not promote meaningful learning articulated with real contexts; rather, they suggest that authentic and comprehensive assessment strategies should be designed and implemented, including characteristics such as flexibility, motivating and interactive, and favoring participatory and collaborative processes (Conejo & Castillo, 2014; Duart et al., 2020; Gros-Salvat, 2018; Martínez 2015; Marín & Salinas, 2014; Ricardo & Vieira, 2023; UNESCO, 2013). The design and implementation of effective pedagogical strategies were probably one of the most challenging elements experienced by instructors during ERE.

According to the above, it can be highlighted that both educational modalities have a positive perception by students, however, the results show that teachers should continue to receive ongoing training in teaching and the use of tools and platforms to facilitate the learning process of students. Additionally, participants highlight the value of peer-to-peer learning, therefore in OL and ERE modalities should promote the design of spaces that allow interaction among participants, as well as consider tools that promote it. Finally, this study provides possibilities for evidence based research in other modalities using technologies and in different disciplines and higher education contexts.

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