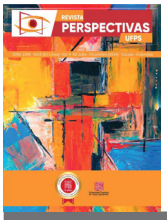

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Sentiment analysis on the perception of remote classes at Uniagustiniana.

Análisis de sentimientos sobre la percepción de las clases remotas en la Uniagustiniana

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Palabras clave:

Text analysis, sentiment analysis, remote classes, higher education.

ABSTRACT

A one-day day of remote classes was held at the Uniagustiniana, in order to prepare the academic community in case it is necessary to carry out academic activities in this modality due to force majeure. To know the perception of students who are studying basic science subjects, in the various programs offered by the institution, a brief survey was conducted using a mixed methodology, composed of several closed questions on a Likert scale, mainly to know if students have the appropriate conditions to take classes in remote mode. and with an open question in which students can give their opinion regarding the day. To determine if the day was successful, the results of the survey are analyzed and a sentiment analysis is implemented on the students' comments using Python software, since it has libraries for natural language processing in which it incorporates specific tools and dictionaries for this type of analysis.

Keywords:

Análisis de texto, análisis de sentimientos, clases remotas, educación superior.

RESUMEN

En la Uniagustiniana se llevó a cabo una jornada de un día de clases remotas, con el fin de preparar a la comunidad académica en caso de que, por motivos de fuerza mayor, sea necesario realizar las actividades académicas en dicha modalidad. Para conocer la percepción de los estudiantes que se encuentran cursando asignaturas de ciencias básicas, en los diversos programas que ofrece la institución, se realizó una breve encuesta con metodología mixta, compuesta por varias preguntas cerradas para una escala de Likert, principalmente para saber si los estudiantes cuentan con las condiciones adecuadas para tomar clases en modalidad remota, y con una pregunta abierta en la que los estudiantes pueden dar su opinión respecto a la jornada. Para determinar si la jornada fue exitosa, se analizan los resultados de la encuesta y se implementa un análisis de sentimientos sobre los comentarios de los estudiantes mediante el software Python, ya que cuenta con librerías para el procesamiento del lenguaje natural en las que incorpora herramientas y diccionarios específicos para este tipo de análisis.

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Introduction

The COVID-19 pandemic brought with it learnings, challenges and opportunities in various sectors; in the case of the education sector, it was necessary to adapt several processes to ICT-mediated contexts, in which remote classes and the use of virtual education tools took on special relevance (Photopoulos et al., 2023), which led to pedagogical innovation for the development of academic activities (Bashir et al., 2021).

Diverse studies have analyzed the advantages offered by remote synchronous teaching for both teachers and students, highlighting the use of available virtual resources, the development of technological skills, among other aspects (Cerdas et al., 2022). As part of an institutional strategy, Uniagustiniana held a day of remote classes in May 2023 for students in the face-to-face modality, both day and night shift classes, in order to prepare the academic community in case of difficulties in carrying out academic activities in person due to limited mobility force majeure situations.

From the Department of Basic Sciences, we had 26 ICT-mediated classes. At the end of each class, a voluntary and anonymous survey was conducted, designed with closed questions and a space to collect the students' comments, on which a sentiment analysis is applied, also called opinion mining (Saberi & Saad, 2017), which is a field of natural language processing that focuses on understanding and extracting subjective information from texts. such as opinions, evaluations, emotions, and comments provided by users (Razali et al., 2021).

The survey was completed 247 times by students enrolled in several Basic Sciences subjects offered in the academic programs of the institution, covering students from different academic semesters and faculties.

The following section presents the methodology of the study, as well as a description of the methods and tools used for the sentiment analysis of the students' comments. In the Results and Discussion section, we present a descriptive analysis of the survey, followed by a word frequency analysis and sentiment analysis of the comments. Finally, we provide the conclusions of this paper.

Materials and methods

In this descriptive cross-sectional study, a methodology based on three phases was considered:

Figure 1. Correspondence between the project and the SDG.

In the first phase, a survey administered through Google Forms is used as a data collection mechanism through which the students were consulted about the subject they are studying, the academic program they were studying and the means to connect to the class. Subsequently, 3 Likert scale questions are asked, from 1 to 5, in which: 1 is completely disagree, 2 is disagree, 3 neither agree nor disagree, 4 is agree and 5 is completely agree; with which it seeks to investigate whether students have adequate conditions for the development of remote academic activities and the perception of the teacher's performance. Finally, through an open question, the student is asked to give their opinion regarding the remote class.

In the second phase, the designed instrument is applied to the students. This process was carried out at the end of each remote class; To avoid delays in the student's entry into the next class, the survey was designed with few questions. Since the last question is open-ended, the answers present high variability in length and depth; however, this type of question tends to enrich quantitative analyses, as Rincón (2014) concludes.

In the third phase, the analysis of the results is carried out, where the analysis of sentiments takes on special relevance, given the potential that this strategy can have when used on data from the education sector (Ligthart et al., 2021). For this analysis, Python software is used as it offers varied tools for data analysis and word processing; in particular, the nltk library (short for Natural Language Toolkit) is used, in which the Sentiment analysis on the perception of remote classes at Uniagustiniana.

In this work, dictionary-based sentiment analysis is used (Okango & Mwambi, 2022). To determine polarity in comments, an established dictionary is considered in which lexical units are used, which can be words or phrases, and their sentimental orientation, or polarity, is estimated, assigning values between -1 and 1 for possible polarities, which in this case are positive, negative, and neutral (Shaik et. al, 2022). Taking these values into account, a definitive value called compound is generated.

The Vader dictionary (Valence Aware Dictionary and Sentiment Reasoner) is used as it can be accessed through the nltk library. The polarity calculation is done using the polarity_scores function (found in the SentimentIntensityAnalyzer module), and it is established that if compound takes a value greater than or equal to 0.05 the comment is positive, if the value is less than -0.05 the comment is negative, and it is said neutral in another case.

It is worth noting that sentiment analysis is an area that is constantly growing, in which several methods have been developed that can be applied through various software tools (Atteveld et al., 2021), even reaching the development of methods for the analysis of sets of comments that can involve several languages (Mercha & Benbrahim, 2023).

Results and Discussion

When asked about the type of technological device used to connect to the remote class, it is observed that almost two-thirds of the respondents use a computer while just over a third of the respondents use a cell phone; on the other hand, 1.6% of respondents connect through a tablet.

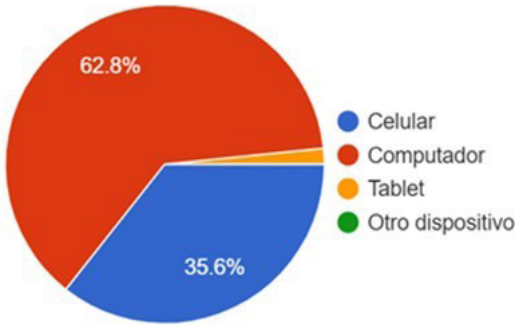

Figure 2. Technological devices used by students to access remote classes. Source: Author.

To facilitate the analysis of the results, in the following questions a Likert scale between 1 and 5 was used, the student is asked if he or she has the conditions for a correct development of remote classes, taking into account two variables: quality of internet connection and adequate environment for learning, since these affect the teaching and learning process of students in ICT-mediated contexts (Pillaca et al., 2022).

Below are the answers to the question: *I have an optimal internet connection for remote classes.*

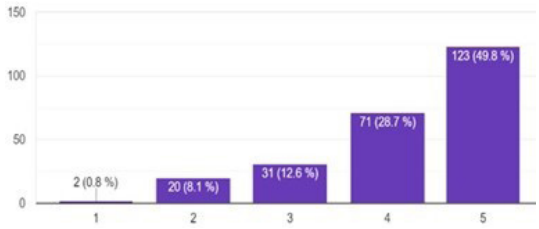

Figure 3. Student responses. Source: Author.

The following graph shows the results corresponding to the question: I have an adequate space in my home for the development of remote classes.

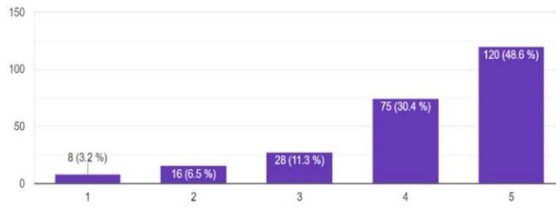

Figure 4. Student responses. Source: Author.

In the answers to the two previous questions, it can be seen that more than 75% of students agree or strongly agree with having the right conditions for the development of remote classes, while less than 10% say they disagree or completely disagree with having a good internet connection or an adequate space to attend the remote class.

Regarding students' perception of the teacher's performance in the development of remote classes, considered another factor that can affect the teaching and learning process of students in ICT-mediated contexts (Pillaca et al., 2022), the following question was asked: *The development of the class, by the teacher, in remote mode was adequate; obtaining the following results.*

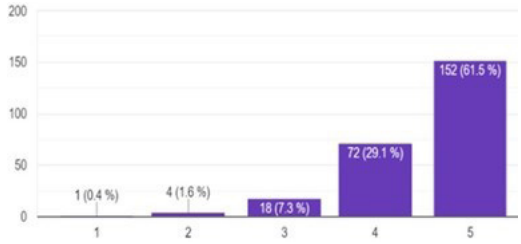

Figure 5. Student responses. Source: Author.

The responses suggest that the students felt comfortable with the strategies adopted by the teaching team, since more than 90% of the students indicated that they agreed or totally agreed that the teacher's development of the class was adequate. When reviewing in detail the comments of the students, they highlight the effort of the teachers in the use of tools and diverse strategies to carry out the teaching-learning process.

In particular, in the case of physics courses, the Phet simulator (Haryadi & Pujiastuti, 2020), developed by the University of Colorado, was used, while in mathematics and statistics courses, several specialized software tools were used, including: R for statistics courses (Tucker et al., 2022), Matlab for linear algebra, and various calculations mainly with matrices (Majid et al., 2012), and Geogebra as a visualization tool (Ferro et al., 2020).

The survey ends with the question: *Please indicate your opinion regarding the remote class.* In general, the feedback can be perceived as positive.

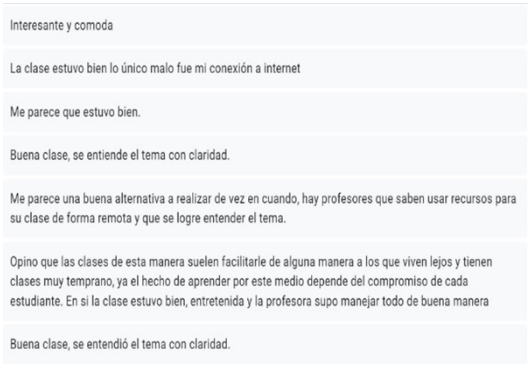

Figure 6. Some comments from the students about the day. Source: Author.

Among the comments collected, there were also negative comments from students who prefer interaction in the classroom, mainly due to the sources of distraction offered by the domestic environment, which is in line with what Núñez (2022) observed when analyzing the experience of students from 4 public universities in Bogotá under the remote education model. Sentiment analysis establishes three categories: positive, negative, and neutral; As a result, 194 comments were classified as neutral, 49 as negative and 4 as positive. We can see that comments initially classified as negative can be seen by a reader as neutral and even positive.

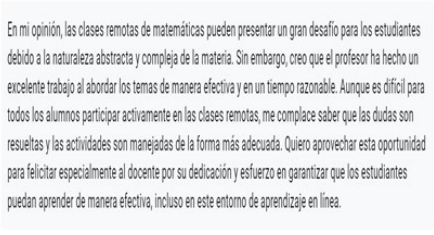

Figure 7. Comment rated negative. Source: author.

In order for the results to be more in line with what has been observed, only two categories will be considered: negative comments and non-negative comments, defined as those with negative and positive compound values respectively, with which negative comments are 49 and non-negative comments are 198. Sentiment analysis is sensitive to the dictionary used, since if other dictionaries are considered, the results may vary (Widmann & Wich, 2022); however, building and validating a personalized dictionary is in itself a research problem (Ahmed et al., 2020).

Although there are other alternatives to the dictionary approach, such as strategies based on machine learning methods, these can also present cases such as those observed in the Figure above; therefore, some authors have chosen to combine these methods to seek an improvement in the results of the analysis (Dhaoui et al., 2017). However, dictionary-based sentiment analysis is usually more widely used because it is easier to implement computationally (Khoo & Johnkhan, 2018).

When performing a frequency analysis on the words used in the comments, removing stopwords or stop words, it is found that the words "class" and "classes" have 69 and 50 occurrences, while "buena" and "buena" have 68 and 43 occurrences respectively, thus we get 111 ocurrences of "good". When reviewing the bigrams, it is found that "good class" and "a very good class" cover between them 18 occurrences, being the second most frequent bigram after remote class(s), it is also observed that "good alternative" has 4 occurrences. By not removing empty words, the most common 4-grams are "from time to time" and "very good class" with 9 and 5 occurrences, respectively. In several comments, it is observed that the students felt satisfied with the remote class; however, this does not allow us to conclude that they are attracted to this modality for a prolonged number of classes or for an entire semester.

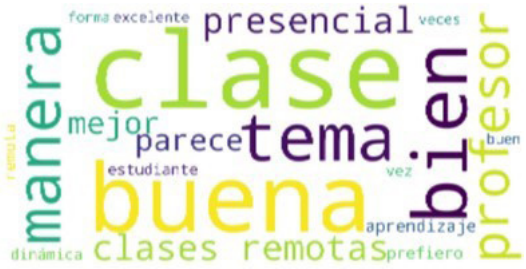

Figure 8. Word cloud of the comments made by the students. Source: author.

In the case of frequency analysis, removing stop words prevents the appearance of prepositions or conjunctions between the most common words, as this would affect the analysis. It is worth clarifying that when removing empty words, the text may lose meaning due to the lack of elements that facilitate the union of ideas, which can affect the results obtained in various methods for sentiment analysis (Saif et al., 2014), but on the other hand it can reduce the computational cost (Ho et al., 2022). In particular, for the data of this work, when removing the empty words and subsequently applying the sentiment analysis, 18 comments were recognized as negative and 229 as non-negative.

Conclusions

In general, the students were satisfied with the development of the classes in remote mode, which, according to the text analysis of the comments, is mainly due to the use of software tools in their development; In addition, the students valued the effort, both institutional and teaching, for pedagogical innovation to offer variety in the development of classes, reasons why they would be willing to repeat the day of remote classes.

In the event that it is necessary to resort to the remote modality for a long time, it is recommended to put into practice didactic strategies that favor participation and dialogue through open questions and the problematization of the topics of the class, giving a more protagonist role to the students (Villaroel et al., 2021); in this regard, for academic activities in remote mode, the strategy known as

flipped classroom has recently taken on special relevance (Al-Said et al., 2023).

Sentiment analysis is a tool for assessing attitudes, emotions, and opinions, which can be used to determine students' reactions to various contexts. However, it may be limited by the classification method implemented in the library under consideration, or by the dictionary of words used for the categorization of positive, neutral or negative; Therefore, if you opt for a dictionary-based strategy, it is recommended to develop a specific dictionary for comments on academic activities.

In future work, other strategies for performing sentiment analysis, such as machine learning methods, can be considered. The performance of several methods could also be compared to determine which one might be the most suitable for analyzing comments from academic activities.

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