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Análisis cualitativo de la comprensión del lenguaje emocional en niños de primaria utilizando un enfoque de procesamiento del lenguaje natural

Tesis para obtener el Grado Académico de Maestra en Educación con Mención en Psicología Educativa

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DECLARACIÓN JURADA DE AUTORÍA DE TESIS

Donald Jaimes Zubieta de la Escuela de Posgrado, Unidad de Posgrado de Educación, de la Universidad Peruana Unión.

DECLARO:

Que la presente investigación titulada: **"Análisis cualitativo de la comprensión del lenguaje emocional en niños de primaria utilizando un enfoque de procesamiento del lenguaje natural"** constituye la memoria que presenta la Licenciada Flor Ysolda Lastrera Tocto para aspirar al Grado Académico de Maestra en Educación con Mención en Psicología Educativa cuya tesis ha sido realizada en la Universidad Peruana Unión bajo mi dirección.

Y estando de acuerdo, firmo la presente declaración en la ciudad de Lima, a los 29 días del mes de marzo del año 2022

Dr. Donald Jaimes Zubieta

ACTA DE SUSTENTACIÓN DE TESIS DE MAESTRO(A)

En Lima, Ñaña, Villa Unión, a 29 días del mes de marzo del año 2022, siendo las 04:00 p.m, se reunieron en la modalidad online sincrónica, bajo la dirección del Señor Presidente del Jurado: Dr. Jorge Platón Maquera Sosa, el secretario: Mg. Sara Esther Richard Pérez, los demás miembros: Dra. Ethel Altez Ortiz y el asesor: Dr. Donald Dámazo Jaimes Zubieta, con el propósito de administrar el acto académico de sustentación de Tesis de Maestro(a) titulada: Análisis cualitativo de la comprensión del lenguaje emocional en niños de primaria utilizando un enfoque de procesamiento del lenguaje natural. del Bachiller/Licenciado(a) Flor Ysolda Lastrera Tocto Conducente a la obtención del Grado Académico de Maestro(a) en: Educación

(Nomenclatura del Grado Académico)

con Mención en Psicología Educativa El Presidente inició el acto académico de sustentación invitando al candidato hacer uso del tiempo determinado para su exposición. Concluida la exposición, el Presidente invitó a los demás miembros del Jurado a efectuar las preguntas, cuestionamientos y aclaraciones pertinentes, los cuales fueron absueltos por el candidato. Luego se produjo un receso para las deliberaciones y la emisión del dictamen del Jurado.

Posteriormente, el Jurado procedió a dejar constancia escrita sobre la evaluación en la presente acta, con el dictamen siguiente:

Bachiller/Licenciado (a): Flor Ysolda Lastrera Tocto

CALIFICACIÓN	ESCALAS			Mérito
	Vigesimal	Literal	Cualitativa	
Aprobado	17	+B	Con nominación de Muy Bueno	Sobresaliente

(*) Ver parte posterior

Finalmente, el Presidente del Jurado invitó al candidato a ponerse de pie, para recibir la evaluación final. Además, el Presidente del Jurado concluyó el acto académico de sustentación, procediéndose a registrar las firmas respectivas.

Presidente

Secretario

Asesor

Miembro

Miembro

Bachiller/Licenciado(a)

Qualitative analysis of emotional language comprehension in elementary school children using a natural language processing approach

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ABSTRACT

Holistic education consists of integrating teaching, knowledge learning, and expressing feelings and emotions, which allows a better interaction of the teacher in class with his students giving importance to relevant aspects such as emotional and social states necessary to achieve a better academic formation. Therefore, qualitative research of phenomenological study was conducted, and Colaizzi's method was applied, which was adapted to 5 steps to achieve an interpretation of the relevant factors found in the responses of the interviewees. These factors were categorized through the emotions and the sum of the number of emotions found in the responses, with anger having a value of 16, sadness of 14, pleasure of 13, fear of 8, love of 5, shame 4, and disgust of 3. This is corroborated by the generation of text and the Sankey diagrams that show that the emotions that stood out most were: anger, sadness, and fear. Feelings were quantified; using sentiment analysis algorithms. Most of the interviewee's answers had negative expressions, but as the value was close to zero, therefore, it means that such expressions had messages of hope to improve such situations from which they could get many learnings. The good practice of conducting interviews with students and parents using guides such as the ones explained in this article has made it possible to identify emotions mostly present in the answers, to observe how the level of maturity when facing difficult situations and to describe how these experiences affected or added positively to the child. This becomes an opportunity for the teacher or school managers to provide support, timely support in classes, and finally, integrate these emotional capacities into the teaching-learning process.

Keywords: COVID-19, emotions, feelings, phenomenology, experiences, vocabulary, language, text

1 INTRODUCTION

The social quarantine resulting from COVID-19 forced the educational system to implement new ways of learning by using virtual online teaching tools and added to the academic demands; it affected teachers and students emotionally due to the inability to adapt and cope with this new normality of teaching and learning. Emotional intelligence has been a relevant factor in facing these adaptation processes to virtual classes, the learning system, and new forms of interaction. In this process of change, the role of the teacher is described not only as a transmitter of knowledge but also as a facilitator in the teaching and learning process. In this sense, this research will understand how emotional capacities are fundamental when reaching the cognitive competencies, complementing a more integral education. Chura Luna (2020) confirms it by emphasizing that the purpose of the holistic model of education is to redirect the traditional cognitive learning, undertaking and innovating this process with a new qualitative dimension which is the emotional intelligence of the child. Similarly, Goleman (2010) emphasizes that in a social context with high rates of problems of violence, stress, bulimia, among others; the formation of the learner should be not only cognitive but also include other aspects such as interpersonal and intrapersonal intelligence, which ultimately achieves: an integral being. Therefore, the idea of integrating the promotion of emotional intelligence consists of teaching children to identify their emotions and use the appropriate language to express their emotions assertively. In this sense, the research was based on the studies carried out and described in the Table 1.

The previous research allows defining the motivations of the present study: to analyze the meanings and differences attributed to emotions through vocabulary and emotional language, to analyze how the management of emotions is carried out; all of the above in virtual learning. In this sense, the research intends to analyze qualitative semi-structured interviews with open-ended questions ranging from a general perception to the specific. The qualitative processing of the information will be developed with specialized software, which allows observing the hermeneutic organization (identification of the categories and subcategories of the problem to be addressed); obtaining relevant emotional intelligence factors during this process for the interpretation of the results and recommendations of the cases. To deepen this analysis, we intend to use artificial intelligence algorithms through the analysis of natural language such as word cloud to report the most frequent words given in the interviews, the analysis of feelings that allowed categorizing the emotions expressed in the answers through how personal they were and how positive or negative the answer was, the generation of text where patterns were found in phrases and texts of the answers.

The number of times the interviewees mentioned the categories of the hermeneutic tables were analyzed with Sankey diagrams; the width of the arrows describes this number. The color of these diagrams differentiates each category per respondent and highlights these occurrences by respondent and category.

2 MATERIALS AND METHODS

2.1 Qualitative data

Data is a term used in quantitative approaches but coined in qualitative approaches and describes the iterations that the interviewee and researcher have; this means that the formats and contexts are very different from the quantitative approach. Polkinghorne 2005 prefers to call it a narrative. For the IPA method (Interpretative Phenomenological Analysis), each research participant is represented in a case, which must be very well analyzed; this process takes time and major effort. Therefore the samples are usually small; so that this purpose can be fulfilled (Pietkiewicz and Smith, 2014).

Table 1. List of representative publications that directed the study of this research from different perspectives

Proposal	Techniques	Results	Reference
It is to know about emotional intelligence, expressed in the competencies involved in self-management of emotions.	Literature review	Made a classification of emotions in terms of the specific responses that occur based on the specific responses that occur in the organism.	Goleman (2010).
Analysis and regulation of emotions when delivering bad news to patients with terrible health problems; applied to 4 medical students	Qualitative case study approach, intrinsic and extrinsic regulation of emotions	Multiple channels expressing emotion and demonstrating emotion regulation responses should be used for emotion analysis	Kazemitabar et al. (2021).
Prevalence of Damasio's three categories and analysis of interview paragraphs in codes and their meanings	Damasio's theory, qualitative study, inductive content analysis.	271 positive emotions and 266 negative emotions recognized in the interviews	Santo et al. (2020).
Exploring emotions and coping skills among emergency technicians and nurses and determining key factors	Qualitative approach, interview saturation, inductive content analysis	After a failed emergency patient resuscitation experience, short- and long-term emotional reactions appear, many of them being harmful to health professionals	Fernández-Aedo et al. (2017).
A qualitative study to explore the views of patients and oncologists to determine how best to address emotions during consultations	Semi-structured interviews, content analysis of responses, use of qualitative software	Identified factors that may make it difficult for oncologists to address patients' emotions.	Visser et al. (2018).
Doing an ideographic analysis which consisted of teachers describing the most relevant event and nomothetic where qualitatively reported events were quantified by external coders	Interviews, idiographic and nomothetic approach	Teachers described more socio-emotional and relational behaviors of students. The most predictive factors were hostility and aggression toward the teacher, anger, and anxiety.	de Ruiter et al. (2019).
To make a comparison in emotional reactivity in child maltreatment of maltreating and non-maltreating parents	Systematic review, use of Prism method	There is negative affect, depression, verbal aggression and anger of children on maltreating parents and that maltreating parents report low levels of emotional control, regulation of their emotions and coping strategies	Lavi et al. (2019).
Determine strategies used by teachers to regulate emotions in students by avoiding negative ones that teachers say prevent effective teaching and learning	Survey and coding of responses from finding regulation strategies	Teachers use a variety of strategies to regulate such as hedonics, modulation, and suppression of student responses. strategy.	Taxer and Gross (2018).
Analysis of English teachers' identities through the exploration of emotions that arise due to socio-cultural challenges	Qualitative approach, interviews, and narrative story writing	The importance of holistic education, where not only is cognitive professional, but also teaching how to manage their emotional pressure being that they belong to an unequal society in terms of power and culture.	Hayik and Weiner-Levy (2019).
Analyzes the role of emotions, beliefs, and conceptions in teaching and curricular and instructional decision making	Qualitative descriptive, semi-structured interviews	The priority of guaranteeing classrooms with safe spaces for learning, this expressed in the identity of students and the control of the teacher and student emotions	Sheppard and Levy (2019).
Analysis of nurse-patient communication to identify patterns of response to positive palliative communication in recorded patients	Analysis of recordings and coding of responses, clustering	Humor was most frequent in communication which allowed for positive emotions in patients.	Terrill et al. (2018).
To explore the lived experience of parents with children with cystic fibrosis disease the difficulties and challenges they face.	Qualitative phenomenological with interpretative analysis of Scribber.	It was determined how important it is to have an excellent perspective of the future, thanks to optimism about the future, focus on problems, social and economic factors giving a solution, and how important spirituality is.	AlAdaileh et al. (2021).

2.2 Sentiment analysis

Alamoodi et al. (2021) emphasize that sentiment analysis in respondents' answers is fundamental in the study of emotions because it allows categorizing opinions related to a state of mind. Goleman (2010) mentions that feelings are the expressions of emotions through conscious appraisal of emotion and subjective experience in general. Therefore feelings are expressed as a function of polarity and subjectivity; the former describes whether a response is positive, negative, or neutral, and the latter describes personal feelings, views, beliefs, opinions, allegations, desires, beliefs, suspicions, and speculations. Sánchez-Garcés et al. (2021) agree that to determine sentiment analysis, one should look at the relationships of words in the text and the frequency of each word in the responses. Hatzivassiloglou and McKeown (1997) explain that in order to determine the grouping of polarities, groups are identified according to patterns as described in Eq. 1, where the function Φ identifies each possible polarity group (P) in two subgroups C_1 and C_2.

$$\Phi(P) = \sum_{i=1} \left(\frac{1}{|C_i|} \sum_{x,y \in C_i, x \neq y} d(x, y) \right), \tag{1}$$

Where $\Phi(P)$ is the function that scores each group of adjectives (positive and negative) represented by C_i and represents the cardinality of the group i; $d(x, y)$ is the distinction or differences identified for a word to be placed in some group (positive or negative). Thus, Sánchez-Garcés et al. (2021) emphasize that the procedure for determining polarity consists of constructing a first random partitioning of words to adjectives; then, in a second, third, and n-th iteration, the word is placed in the corresponding adjective. The n-th iteration is given until no move can improve the objective function and the adjectives are well organized.

2.3 Text Generation

Bhowmik et al. (2022) mention that part of natural text processing (NLP) is text generation. This consists of learning a text by subdividing the text. The text is processed, and close words are found thanks to calculating the conditional probabilities of the vocabulary elements. To achieve this, recurrent neural networks are used, which form a repetition chain, making the information persist. In such architectures, there are LSTM (Long Short Term Memory) networks; designed to remember information over long periods, which are described by LSTM cells.

From the authors Bhowmik et al. (2022), Özcanlı and Baysal (2022) and Xu et al. (2022) we obtained the following description of the cell architecture detailed in Figure 1; it allows adjusting the information by filtering and selecting it in such a way that learning is more efficient and selective. The figure illustrates three states (forgetting gate, input gate, output gate). The input gate with the activation function `tanh` generates a tokenization vector of possible values, and this is activated by the `sigmoid` function and produces a new state of the LSTM system. The input gate decides which part of the information should be updated or ignored. The forgetting gate decides which part of the information should be removed from the previous cell state of the previously hidden layer. The output gate concatenates the input with the `sigmoid` layer and decides which part will be kept from the current cell state through a function `tanh` and multiplies it. In this sense, Figure 1 is considered an excellent reference of how such neural networks work.

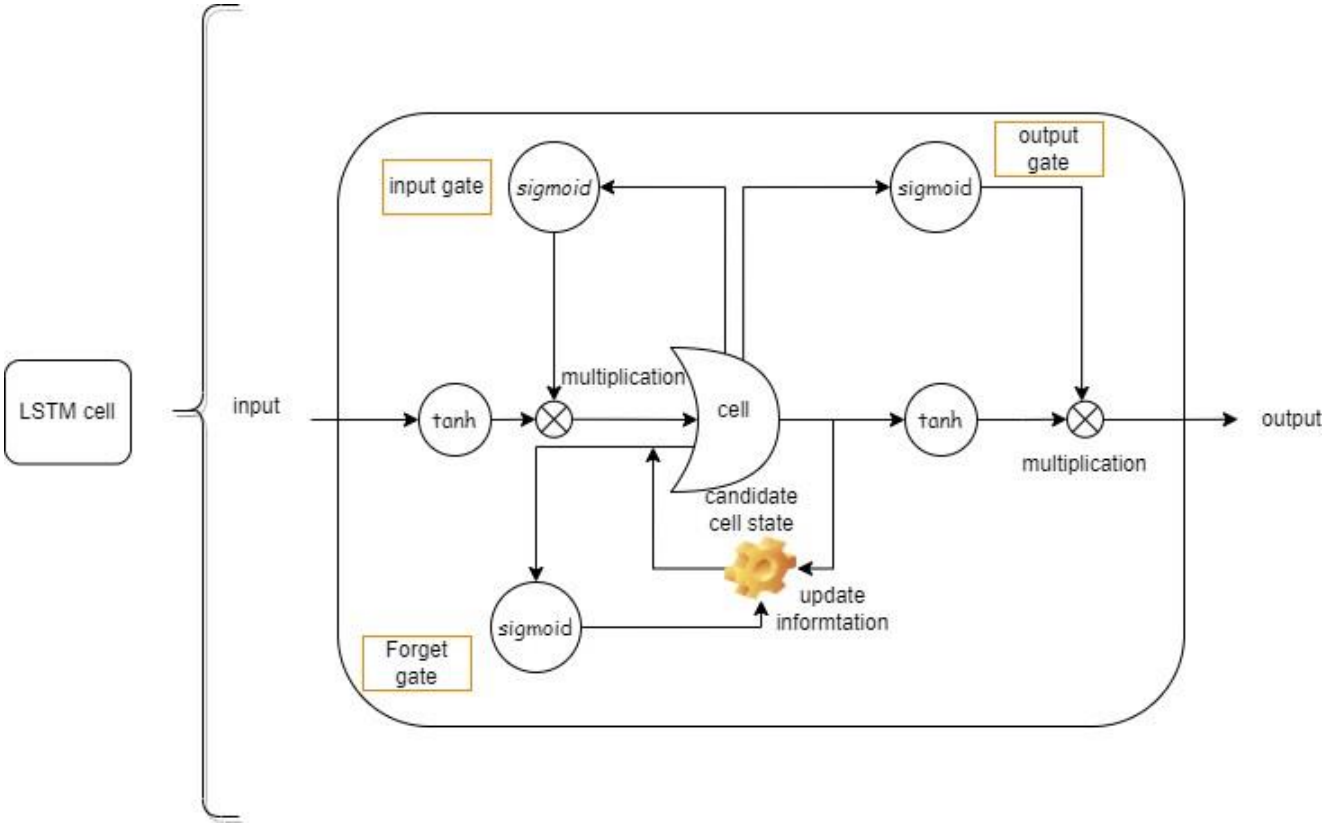

Figure 1. LSTM cell

2.4 Hermeneutic analysis

Mart´ınez (2004) mentions the word hermeneutics comes from the Greek *hermeneuein*, meaning to interpret, which is the end of this process. One of the processes that support interpretation is exploring the object of study through phrases or words that catch the researcher's attention that is key to the answer to the research problem. The principle of the hermeneutic study consists of deciphering: First the parts of the object of study and then its meaning through the context (interviews).

Radnitzky and Giorgi (1973) postulate the follow rules of the hermeneutic process. Rule 1: The first thing the researcher does is develop questions as a preliminary phase called the exploratory phase and thereby achieve an excellent interpretation. Rule 2: The hermeneutic procedure goes from the global meaning to the meaning by its parts; this process consists of decomposing the categories into subcategories or vice versa (interpretative stage). This procedure produces a richness in the interpretation and significance of the object of study. Rule 03: Contrast the interpretation with other authors and related texts to consolidate the analysis and interpretation. Rule 04: The principle of innovation; analyze from other points of view (interpretation); it allows enriching the description and understanding of what is mentioned by the authors.

2.5 Iterative process

Polkinghorne (2005) emphasizes iteration in the analysis, i.e., re-emphasizing a question to the interviewee or some section of the answers by re-analyzing them allows concepts to be considered significant because they are repeatedly present and can expand on important aspects mentioned by the interviewees. Iteration in data collection and data analysis achieves saturation of responses in people's lived experiences. Also, Nayar (2012) mentions that it allows to interpret and generate meaning or understanding

of the interviewees, which is the basis on which you can reflect and therefore modify your actions, interactions or meanings.

2.6 Sample

Polkinghorne (2005) states that the unit of analysis in qualitative research is the experience, not individuals or groups. Therefore, selecting a qualitative sample is based on the representativeness, description, completeness, and saturated understanding of the experience under investigation. In this sense, the experience collected goes beyond the number of participants, and under this, the research sample is proposed, which was non-probabilistic and selected for the convenience of the researchers. These were seven children who attended fifth grade in 2021 and belonged to the Titicaca Adventist School.

- Inclusion criteria: Students who have difficulty discriminating between one emotion and another when faced with a situation in their environment. For this criterion, the classroom teacher was asked to make a selection from among all those who had emotional problems, and, based on this, the parents' support was requested to participate in the study. In the end, seven parents agreed and authorized their children to participate.
- Exclusion criteria: Students who did not present any atypical emotional circumstances in the classroom, as well as children who were in a face-to-face teaching system were excluded.

2.7 Phenomenological Analysis: Colaizzi's Method

For the methodology, the descriptive phenomenological method proposed by Colaizzi was used, which consists of 7 steps described below (Zhou et al., 2021):

- Step 01: Perform the transcription of the interviews, analyze them and understand the object of study through the objectives of the work.
- Step 02: Extract the significant statements from each description; expressed in the relevant code factors in the interviewees' answers. Gibbs (2013) emphasizes that coding is a way of categorizing the text to summarize it into key phrases or words that describe the idea of the text.
- Step 03: Identify meanings to interpret the interviewees' behavior.
- Step 04: Organize the codes and summarize them into common concepts, forming groups of codes (called categories).
- Step 05: Describe the phenomenon across all categories, explaining how respondents experience and understand their world.
- Step 06: Describing the essential aspects of the phenomenon resulting from the brief and summarized formulation of all the information gathered from the interviews.
- Step 07: The researcher returns to the information gathered to validate the explanation of the phenomenon.

2.8 Research Methodology: Adapting Colaizzi's Method

The research of Sánchez-Garcés et al. (2021) was used to adapt Colaizzi's Method.

1. **Step 1. Organization of the information** In this step, the interview guide was developed under two professionals specializing in psychology and qualitative studies.

   In order to ensure the richness of the experiences of the children interviewed, semi-structured interviews were used, which allow the researcher to iterate a number of times with the interviewee, to

observe reactions and expressions, to unexpected questions and situations that expand the narrative of the response. However, this does not detract from the usefulness of preparing a plan beforehand; and for this purpose in the present research, a plan of questions has been elaborated, which is shown below:

This instrument consists of two levels of interpretation that describe the purpose of the study, which is the analysis of the emotional language and emotional vocabulary of children in a classroom whose context is virtuality during the period 2021; being the first the expression and management of basic emotions presented in the classroom and the second the identification of emotions and their differentiation concerning the rest of the emotions. This instrument uses the 5 components of emotional intelligence proposed by Goleman; Mitrofan and Cioricaru (2014) detail these components: Knowledge of personal emotions (Emotional vocabulary), emotion management (Emotional language), self-motivation, recognition of others' emotions, and relationship management (these last three related by emotional language.

After the interviews were taken in 4 iterations on average per interviewee, the transcription of the recorded videos of the interviews was carried out. Then the analysis of the information was carried out, reviewing the answers several times until their meaning was understood.

2. Step 2. Synthesis of the interviews Key phrases were identified in the answers of each of the seven interviewees; the information was consolidated in a spreadsheet; whose columns were: Code of the interviewee (names were avoided) key phrases of the interviewees. According to Gibbs (2013), this phrase is the way to categorize the text to summarize it and describe the idea of the text.
3. Step 3. Coding The key phrases identified in the previous step are called codes; they summarize text paragraphs into key ideas.
4. Step 4. Categorization Once the codes have been identified, they will be conceptualized in order to identify the purpose of each one of them and according to this conceptualization they will be grouped taking as a criterion, common concepts to form themes of the object of study).

Steps 2, 3 and 4 were also supported by Sandelowski and Barroso (2002) and state that the process for the content analysis of the responses consists of three steps: (1) All response accounts were read carefully and repeatedly for familiarization. (2) Each response transcript was summarized into units of meaning called codes. (3) Each meaning unit was given a concept to describe the meaning of the responses.

5. Step 5. Process of interpretation of the object of study. This interpretation consists of:
   - Describing the occurrences that the codes had in the interviewees; that is, the number of times the codes were cited by each of the interviewees; such occurrences were illustrated by Sankey diagrams.
   - Interpreting the semantic relationships between codes forming common concepts called categories and explaining the child's vocabulary and emotional interaction.
   - The data were interpreted using Natural Language Process (NLP) algorithms; which allowed to expand the meaning and cross-reference the information in such a way that consolidates the analysis.

     For this purpose, we used (1) Frequency of words in the interviews; through the word cloud graph. (2) Sentiment analysis where the responses were categorized through the polarity and subjectivity of the answers.(3) Text generation: Where patterns were found in the set of words coming from the interviewees' answers; and a predicted text was defined based on the answers.

3 RESULTS

3.1 Polarity analysis

According to Sánchez-Garcés et al. (2021), the key aspect of sentiment analysis is to understand the opinion being expressed; this is achieved through polarity and subjectivity. Polarity describes the relevance of respondents' answers through trends of those answers where this trend is quantified as positive, negative, and neutral in values within the interval [-1,0, 1,0]. Subjectivity is a quantitative value where 0 is very objective, and 1 is very subjective. A subjective response is expressed with many personal feelings, views, beliefs, opinions, desires, and speculations.

In this study, polarities were analyzed for each respondent. The interviewees who obtained a positive value were interviewee 01 (E001) and interviewee 07 (E007), the former obtaining a value of 0.0590 and the latter 0.005 of polarity, which describes a positive, but low sentiment. This means that in the great majority of their answers, they express negative emotions through their experiences and memories, but the positive aspect of these experiences is the control of these emotions or the change in these negative emotions through the child's emotional maturity. At the same time, the atypical e-learning experience has brought some negative emotions but experiences that they consider positive. The respondents who obtained negative value were respondent 02 (E002) with value of -0.0772, respondent 03 (E003) with value of -0.0808, respondent 04 (E004) with value of -0.0909, respondent 05 (E005) with value of -0.2036, respondent 06 (E006) with value of -0. 0722, which describes a negative feeling, but low; this means that the great majority of their answers express negative emotions together with experiences and memories that bring them such emotions, but there is hope to improve such situations from which they can obtain many learnings; in the same way with this new atypical experience of virtual learning. As for subjectivity, it was also analyzed per respondent, obtaining E001 a value of 0.2798, E002 a value of 0.2734, E003 a value of 0.2035, E004 a value of 0.1049, E005 a value of 0.1393, E006 a value of 0.3716, E007 a value of 0.1896. This describes that all seven have a very low subjectivity in their, but it is positive, which means that their beliefs are present in their answers that there are speculations and desires on the part of the children. Interviewee E006 has the highest subjectivity in his responses, and his opinions are very personal about his experiences and memories. Respondent E004's answers are objective; he denotes interesting ideas of controlling his emotions, always taking the positive side of everything. Below is a description of some of the relevant comments from each interviewee, getting an idea of those that were positive and negative, see Table 2.

Figure 2 describes the frequency of the words that were present in the responses of the seven interviewees; the figure shows that the most cited words were: anger, emotion, control, sadness, fear, expressions, death, scale. Most of the children expressed experiences, memories where they felt emotions such as anger, sadness, fear, shame, and many of them had to do with the death of pets they loved and considered as friends, in many situations when they experienced certain degrees and scales of guilt. Similarly, expressions were observed in the interviews when they told their stories. From these interviews, many of them, in the end, felt very reassured to have interacted with the interviewer.

3.2 Interview coding

To describe the emotions expressed by the interviewees; different tables have been elaborated where the key phrases found in the answers of the interviewees are called codes, these are grouped by categories according to the nature of the phrases, and in each phrase, the described emotion was identified using as

Table 2. Describes the polarity of each interviewee

Interviewee	Positive Factor	Negative Factor
01	The virtual classes have been an opportunity to be with my family on an ongoing basis.	I can't tolerate being wrong, last time. I made a mistake in a simple multiplication.
02	I feel satisfied that I have improved in controlling my anger and rage.	I dislike remembering that when I was little; if my mom didn't buy me something, I would get angry quickly (5 years old).
03	I take time intervals not to hurt others and be cordial when I am furious.	I felt guilty that I opened the door, and my little dog got out and got run over. I felt guilty that I opened the door, and my puppy got out and got run over.
04	I am happy to be together with my family during virtual classes.	I feel frustrated that I am being bullied about my physical appearance, precisely my height.
05	My mom made me feel safe, and I felt that the spiders would no longer hurt me.	They laughed at me because of my old sneakers, and that made me not want to go to school anymore. And that made me not want to go to school anymore; I was too embarrassed.
06	I forget about everything bad, and I calm down when I play with my cat Gabi.	I was very sad to see the scene of my little dog run over in the run over on the track.
07	When I play soccer, it makes me feel happy because soccer is my passion.	I have a lot of nightmares, I feel terrible, and I wake up at 4 am.

Figure 2. Word Cloud from interviews

a basis the authors of Goleman (2010) and Sastoque et al. (2020). This analysis is performed using the interpretative logic provided by hermeneutics.

3.2.1 Emotions of students

This section explains the emotions present during the virtual classes, which are organized in the tables in the annexes section. For example, Table 4 explains how the interviewees assumed the atypical situation that COVID-19 brought with the virtual teaching system and describes the emotions that such experience caused in the children, the complications they faced, the benefits and challenges caused. In this sense,

this describes that many of the children felt frustration because of the change in the learning system; they mentioned that it was because they did not know how to manipulate the computer equipment needed for the class; others mentioned that they did not have the economic means to buy such computer equipment, or they bought equipment that was almost obsolete because of its low price. Similarly, the levels of frustration and anger were high because they had to assume roles and responsibilities in house chores and attend to their classes and homework at the same time; they also felt unfortunate not having face-to-face contact with their classmates and enjoying breaks with games that they missed during the class period.

Table 5 made it possible to analyze how the interviewees manage their own emotions, to see the assertiveness of their actions in situations. These experiences caused the emotion of anger, the methods to control this emotion, taking care not to upset feelings, and the relationships with people with whom they were very close. This meant that there were no traits of violence despite their emotion of anger. This leads to the conclusion that the plasticity of the child's brain to its capacity for change and situational stress helped him cope with and manage this emotion.

Table 6 allowed us to analyze how the interviewees manage their own emotions, to see the assertiveness of their actions in situations. These experiences caused the emotion of sadness, methods of controlling this emotion. One of the answers of one of the interviewees was: "Sadness is an opportunity of life to learn to live"; and the context of this interviewee was the loss of his beloved pet; what he learned to live with such memories making it possible to evoke joys and be assertive in handling such emotion-evoking the positive of his experience; which was the love of his pet and the games with it; in the same way a second interviewee mentions how important it is to practice his favorite sport; becoming a channel to vent his emotions.

With respect to the emotion of shame, many explained in detail an aspect closely linked to this emotion, and that was bullying. When they were at school, for example, one of the children told how terrible his experience was when a group of his classmates laughed at his sneakers that were bought secondhand by his mother because of the economic situation. Therefore, what stands out from this section is how relevant it is to talk to children and promote support campaigns and support for similar actions where bullying is a social problem. Table 7 allowed us to analyze how the interviewees managed to manage the emotion of shame; they were assertive in channeling this emotion and avoiding harming themselves.

Finally, the emotion where the interviewees described that they felt significant physiological changes; was fear. One of the interviewees mentioned nightmares caused by series or movies watched hours before resting; this explains the need for parental control in every action of the child; lack of this presence is caused because the child has only one parent who works late and grandparents educate them; caused that frequently such nightmares took away to sleep at 4 am. Therefore, the insecurity in their formation and education cause children with tendencies to fear, anxieties, and emotional disorders; Table 8 shows some of the situations that caused the emotion of fear and the methods to control this emotion.

The explanation of the meanings of emotions (emotional vocabulary) was expressed through experiences and memories; where they related each one of these with each emotion, managing to analyze these meanings during the interviews. The answers allowed:

- Recognize differences in emotions through their experiences and memories; for example, they explain the emotion of fear through the imaginary monsters that their mind creates when it is nighttime and how they experience this emotion with feelings such as anxiety, among others.
- the meaning of emotions to the expressions and moods experienced by the interviewee.

- There is a fear of showing their expressions and concepts due to self-esteem problems.
- He expresses his meanings based on episodes and memories; for example, he tells of the embarrassment he experienced at school because of a mockery by his classmates.

3.2.2 Emotions of teacher

Students describe how the teacher handles or expresses their emotions during classes. In this regard, many of the interviewees mentioned:

- The teacher seldom expresses his emotions and feelings to us.
- The teacher rarely expresses the reasons for his or her moods or feelings expressed in class.
- The teacher pays attention to our emotional expressions during virtual classes; if someone, for example, shows a sad mood, then the teacher stops the class and pays attention to the child.
- There are few time slots during the classes; where teacher and student interaction takes place; where the emotions of the class participants can be attended.

3.3 Text Generation

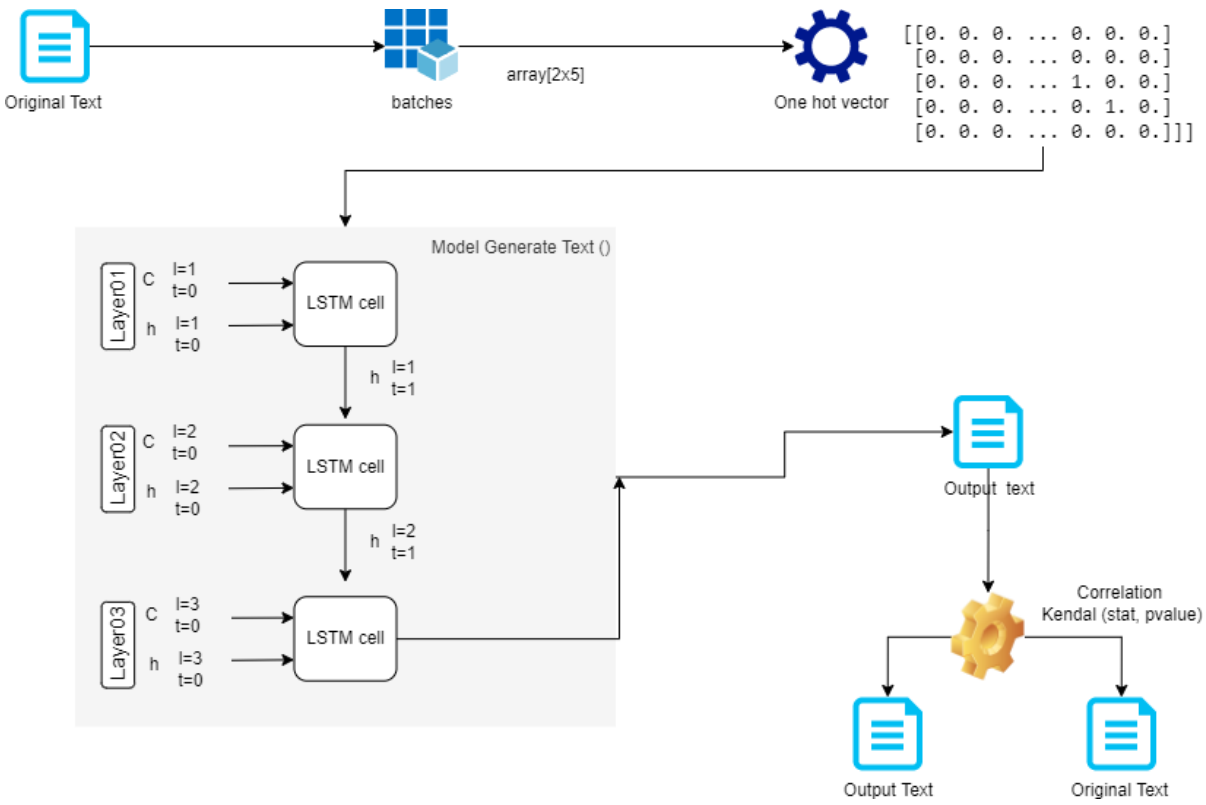

Figure 3. Framework for calculating text generation

Figure 3 describes the text generation over the total of the interview responses to the seven children, being this the original text used to predict the text generation. Then the texts were encoded by generating 2 by 5 arrays to apply the one-hot-encoder method to each letter then; the strategy was to create a column for each distinct value that exists in the feature we are encoding and, for each record, then the tokenization of the sequences of words encoded in those 2 by 5 arrays was performed. The text generation model used a sampling technique for learning, i.e., recognizing letters, words, phrases close to each other (patterns);

the next word was randomly chosen according to its conditional probability distribution. The algorithm carefully decided which letter, words, phrases would be closest to each other and learned the conditional probability distribution of the next token for a given sequence of tokens from the corpus. For this purpose, the technique called Top-K sampling was used, where a simple but very powerful sampling scheme, called Top-K sampling, is introduced. The next K most probable words are filtered out in Top-K sampling, and the probability mass is redistributed among only those next K words. For this research, a k=3 was used. To define the architecture of the LSTM recurrent neural network-based learning model, Kendal's t-test correspondence statistic was employed. Kendal's test was used to test the most similar text predicted by the neural network concerning the original text; likewise, it was used in this research for the statistical hypothesis test to establish whether the two texts can be considered as statistically dependent or similar; for this, the point estimate of the statistic (stat) and the p-value for the hypothesis test were calculated. In this sense, Table 3 describes the tests performed to reach a p-value less than 0.05 and the highest stat, achieving the acceptance of the researcher's hypothesis (H1).

Table 3.

run	num hidden	num layers	epoch	Hypothesis	Kendal's statistic
1	120	1	100	H0	-0.0303
2	120	1	500	H0	0.1327
3	120	1	1000	H0	0.1327
4	120	5	100	H0	-0.140473245
5	120	5	500	H0	0.007691533
6	60	2	200	H0	-0.01259647
7	200	2	300	H0	-0.018256825
8	200	2	500	H0	-0.104426812
9	120	3	100	H1	0.222527676
10	120	3	500	H0	0.04136308
11	200	3	100	H0	0.044176561
12	512	3	100	H0	0.07880714
13	120	4	100	H0	0.035396985
14	200	4	100	H0	-0.065555178
15	512	4	100	H0	0.006190079
16	120	5	100	H0	0.091536642
17	200	5	100	H0	0.045472155
18	512	5	100	H0	0.03552124
19	120	6	100	H0	0.086537352
20	200	6	100	H0	0.09775445

Therefore, it is observed that run 09 obtained the value of hypothesis H1, which stipulates that the predicted text and the original text entered into the prediction model were similar with an estimate of 0.2225; the value of the p-value was 0.0023; accepting the null hypothesis that mentions that there is an average positive correlation between the original text and the text predicted by the LSTM model. The architecture of the model was left with 3 layers, 1 LSTM cell for each layer and 120 neurons in the hidden layer of each of the LSTM cells, as shown in Figure 3.

After the prediction process, the output text was generated, and the Kendal test mentioned above was applied to compare the original with the output text. Below are essential fragments of the text predicted by the model that was considered to be highlighted:

- "I felt afraid, from my classmates of being wrong in answering the question asked by the teacher in the virtual class."
- "I felt sad about being guilty."
- "I felt very angry not being able to go to school and play with my friends that I just met; I felt sad with the virtual classes."

It is observed that the expressions obtained from the sentences predicted by the model highlight many times the emotions of anger, fear, and sadness. This allows us to understand that they were the most prominent in the experiences explained during the interviews; in the same way the word guilty is predicted, which is the one that is the most important in the experiences explained during the interviews; in the same way, the word guilty is predicted.

3.4 Code diagrams of occurrences, respondent

The Sankey diagram is used by the Atlas Ti software to show how the groups of codes called categories, which are detailed in the section 3.2, relate to the responses of the interviewees. These diagrams describe the frequency of these categories in the responses of each of the interviewees. It can be seen that some of the relationships are coarser than others, meaning that some categories or groups of codes are more predominant than others.

Figure 4 shows that interviewee 01 had a higher frequency with emotional vocabulary and e-learning with a value of 5 in each. This interviewee mentions: "I feel sorry for not being able to play with my classmates," which means that he emphasizes the difference with the face-to-face learning system; this aspect is essential for the children; he is also the interviewee who puts more emphasis on the explanation of the meanings and differences of emotions, relating these meanings to his experiences and memories.

Interviewee 02 had a higher frequency with the Emotional language: anger situation with a value of 5. This interviewee puts much emphasis on the control of this emotion, making differences when he was 5 years old and now that he is 11 years old; he highlights the situations that generate anger or rage, his reactions when he was 5 years old, and his reactions at present; this makes him happy to see an emotional maturity.

Figure 5 details that respondent 03 has the highest frequency of emotional language: the angry situation with a value of 4, and in second place emotional language: sad situation, which is also important to highlight because of what was found in the answers and expressions shown in the video conference of the interview. Regarding the first category, he repeatedly shows a large scale of anger due to the frustration of assuming responsibilities from his parents in the education and care of the younger sister, being that this interviewee stays at home. His frustration consists of the fact that the younger sister often does not consider the orders given, and according to what the interviewee mentions, "I have frustration for not having the authority of my mom but the role of mom in the care of my younger sister." Similarly, this interviewee shows high levels of sadness due to a feeling of guilt due to considering herself responsible for the death of her puppy. When she went to open the door, her pet got out and was run over; during the interview, she was supported with a psychological support conversation, achieving that the interviewee could unburden herself and reach the conclusion that she was not responsible for this loss.

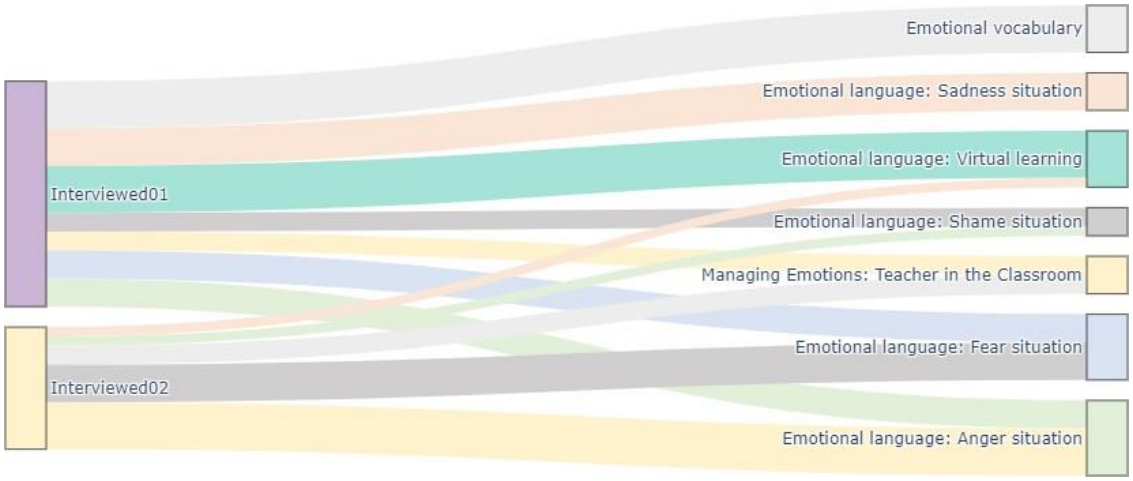

Figure 4. Sankey diagram - Occurrences Code groups with respondents: 01,02

Interviewee 04 with the highest frequency value in the category was the emotional language: angry situation. What stands out about this interviewee is that his levels of anger grow too much when he receives nicknames because of his height; it bothers him a lot that his friends and relatives tell him that he is small, reaching the point of impotence about his physical appearance.

Figure 6 shows interviewee 05 with a higher value category which is emotional language: the angry situation with a value of 02; although the value is not much, it was higher among all since the rest had a value of 01. This interviewee is the one who had the minor interaction in the videoconference. He was very distracted in concentrating and showed high levels of nervousness and complications to formulate his answers; but it was observed that in his stories and answers, he showed mockery and bullying from his classmates and friends about his appearance and for example, he told about some sneakers that were bought second hand, which was a reason for mockery. With this, he showed the emotion of anger and rage for such situations.

Interviewee 06 showed two categories with higher values of 02, and it was emotional language: anger situation and emotional language: sadness situation; What is rescued from this interviewee is his perseverance in terms of anger control, supported with his pets with whom he is distracted and lowers his anger levels; as well as in terms of sadness the feeling of guilt he feels as a result of the loss of his pet, which like interviewee 03 opened the door and the pet went out aimlessly being run over, which impacted on the interviewee the scene on the track.

Figure 7 shows respondent 07, whose major category was emotional language: a fear situation where he explains in his answers that he constantly has nightmares, which wake him up at 4 am; despite being a child, he has fears that he identifies. After analyzing his answers, it was mentioned to the child that these nightmares were caused by the series and movies he watched minutes before resting, which led to a recommendation to the father about this situation.

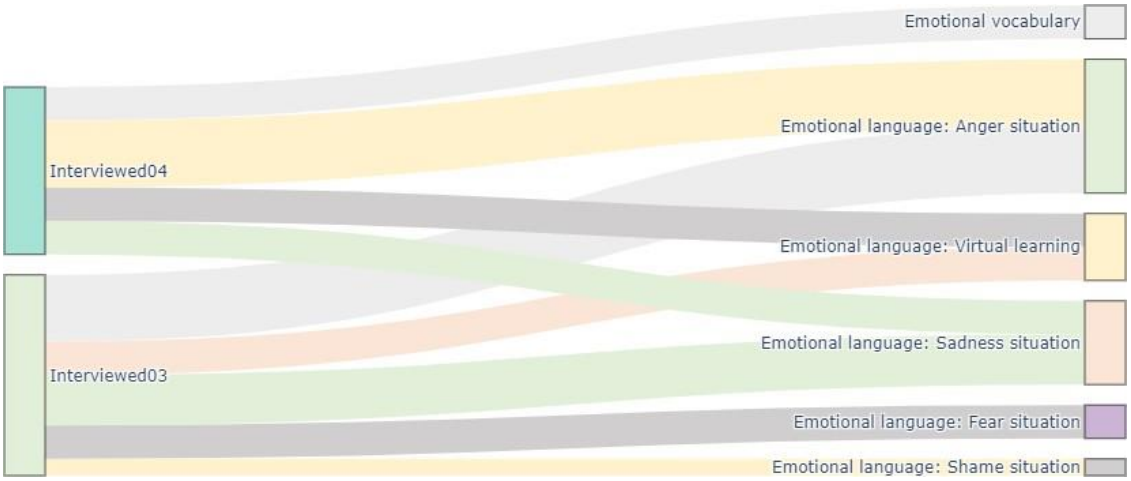

Figure 5. Sankey diagram - Occurrences Code groups with respondents: 03,04

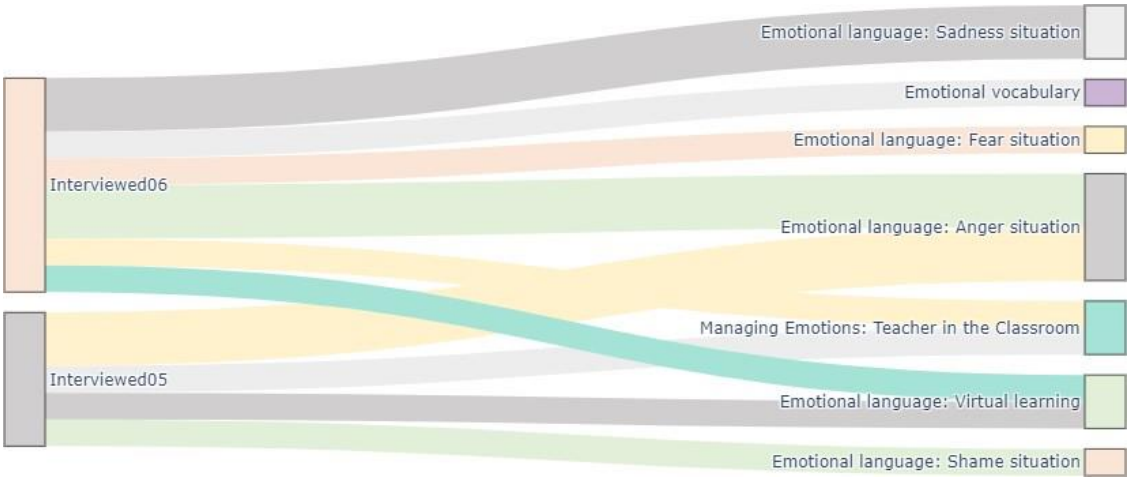

Figure 6. Sankey diagram - Occurrences Code groups with respondents: 05,06

4 DISCUSSION

Sastoque et al. (2020) indicate that the valuation of the person is based on experiences and social interactions, conditioning a psychological balance. These perceptions are mostly formed in childhood. In this sense, the

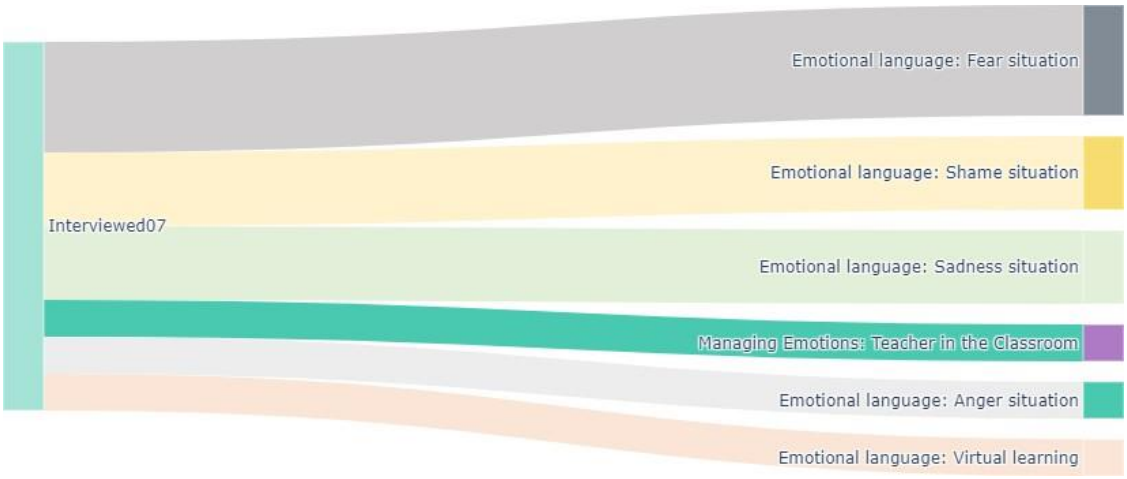

Figure 7. Sankey diagram - Occurrences Code groups with respondents: 07

reason why the ages of 10 and 11 years were chosen to formulate the study. Analyzing the perceptions of these students about them; therefore, emotions and self-concept is fixed by the emotional language in situations or experiences of shame, fear, sadness, anger; which are the primary emotions in the formation of the person according to Goleman (2010).

In the emotional language, in situations of anger, is closely related to situations where there was bullying or verbal aggression regarding his physical appearance or frustrations of not being able to achieve something or not having some skill that he needed; for example, in the period of virtuality not having computer skills or handling of technological tools, lack of understanding of the courses in the period of virtual learning, in this section the interviewee E001 clearly demonstrates such situations. Herrero-Fernández et al. (2021) mention that one of the most relevant factors that leads a driver to anger is the verbal aggression expressed in the insult to the appearance or some ability; therefore, it is important to mention these authors of methods of control of such anger.

In the emotional language in situations of fear: his brain makes him think in function to what he believes, the relatives are vital in the process of emotional control, fear is the emotion in which more physiological changes are identified, the new generates much anxiety. Likewise, fear alerts the body, which generates a series of physiological reactions; therefore, this emotion is one of the most complicated to deal with. Ghaemi Kerahrodi and Michal (2020) affirm that many of the fears are activated depending on what you can believe or think, for that reason, it is valuable to generate mechanisms of self-defense that identify what activates the sensors of fear and self-defense and to understand through therapy the control of these thoughts or beliefs, determining that many of these do not exist.

In the emotional language in situations of sadness, one of its conditioning elements according to Rebollo Catalán et al. (2008) is guilt; in the interviews, three children were found with this feeling E003, E004, and E006. This was a conditioning factor for states of sadness, but one of the interviewees, after

interacting for more than 40 minutes with the interviewer, concluded that guilt had become a lifetime opportunity to learn to live and gain experience. Taking the feeling of supposedly negative emotions positively is one of the values that is learned and is a person's motivation to excel in problems and challenges; Herter et al. (2021) used sadness and shame as motivations to have a healthy life of exercise and leaving vices that destroy the body. For this reason, beliefs are vital in managing emotions. This was demonstrated by the interviewee E003, that due to the lack of parental presence in love responsibility as a student, in his daily care of himself and his younger sister; his levels of depression were high. In the same way, Boucher et al. (2013) explain that the lack of parental attention and high parental control has been systematically related to depression; that is to say, speaking of the first case, the loneliness makes the child prone to depression; and many of these children take refuge in their pets to fill such emptiness. Therefore, the importance of parental authority, love, care, and support is complicated when both parents work all day, or there are cases of single parents in which care is delegated to grandparents or aunts and uncles.

According to Herter et al. (2021), situations of shame are very close to what others will say or opinion about the person in emotional language. For example, interviewee E007 felt embarrassed when he was the only one who did not have a blue pencil; such embarrassment was combined with nerves when the rest saw him of his classmates as irresponsible in class. During the interviews, it was observed that the presence of a friend in embarrassing situations is vital to handle this emotion and complicated situation.

Finally, it is interesting that in this research, the children have come to understand the emotional vocabulary, expressing its meanings through experiences and memories, have scaled such experiences, and obtained lessons for learning about life. The interviewee who talked the most about the meaning and differences of emotions was E001, who highlighted two situations, the first being respect for people, showing them mostly positive emotions and discarding, according to the emotional vocabulary, negative ones and controlling them in order not to hurt other people's feelings and susceptibilities. Bujor and Turliuc (2020) conclude that a person who identifies his emotions and knows how to differentiate them has many possibilities to manage them in complex situations and to develop very assertive control techniques.

5 CONCLUSIONS

The practice of conducting these interviews with the children addressing these questions becomes a means of venting their emotions, as many of them do not have the presence of their parents at home. This has been exacerbated by the online learning system, where they feel the lack of this presence since many of them only have one parent, and during the day, the children are left alone and assume the roles of the parents because of their absence. In this sense, it has been shown that these situations that lead to feelings of sadness and anger can trigger episodes of depression. The advantage identified during the interviews is that these children can take the adverse reality of their homes with optimism, knowing how to understand and absorb their reality in the best way. Nevertheless, it does not detract from the fact of giving the necessary importance to the child and making him feel the emotional support and support. It has been concluded how important it is to promote in people the meaning of emotions and their differences in order to be able to develop methods of control of these emotions and counteract those that can cause harm to the person and their environment with whom they relate.

Anger has been the emotion mostly present in the answers. This is confirmed by the code tables and text generation patterns and described the maturity level of many of the children and the techniques they used for the control of this emotion; they related this emotion with feelings of discomfort; because of the loss of control in such situation, verbal aggression against them; then they demonstrated how negative

this emotion was for them. In this sense, it is concluded that addressing questions related to children's emotional state should be an urgent activity to do in schools, parents where they need to talk about their emotions. Education should prioritize the academic aspect, but teachers should promote interaction in class with their students where they encourage experimentation and expression of feelings and emotions during the inquiry and integration of knowledge, giving special importance to a holistic education that integrates the academic and social part.

6 ANNEXES

Table 4. Emotional language category virtual learning

Interviewed	Code	Emotions
E001	He feels happy because his grades are fine despite the change he feels.	Pleasure
E001	Feels sorry for not being able to play with her classmates.	Sadness
E001	Irritated that he/she cannot use virtual computer tools.	Anger
E001	Feels angry at not understanding their classes in the same way as the face-to-face system.	Anger
E001	Increases his frustration levels when he compares himself to his sibling who has been able to adapt to the virtual learning system.	Anger
E002	Feels angry because he does not have a laptop in good condition for the conditions necessary for his virtual classes.	Anger
E003	Feeling sorry for not being able to play with classmates.	Sadness
E003	Dislikes that virtual classes are boring.	Disgust
E003	You feel angry that you do not understand your classes in the same way as in the face-to-face system.	Anger
E004	You feel joy at being with your family.	Pleasure
E004	Experiences anger because there is sometimes conflict between attending classes and problems at home.	Anger
E005	Anger because there is sometimes conflict between attending classes and problems at home.	Anger
E006	Anger because he/she does not have the computer skills required for virtual classes.	Anger
E006	She is sad that she cannot play with her classmates.	Sadness
E007	Felt nervous about participating in virtual classes.	Fear

CONFLICT OF INTEREST STATEMENT

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

AUTHOR CONTRIBUTIONS

Investigación, JSG, FLT y HAG; Supervisión, DJZ, JSG y HAG; Redacción-borrador original, FLT, JSG; Redacción-revisión y edición, HAG y DJZ.

Table 5. Emotional language category anger situation

Interviewed	Code	Emotions
E001	Expresses his frustration at not being smart like his brother.	Anger
E001	Does not tolerate being wrong - self-esteem.	Disgust
E001	Feels satisfied with learning to control anger.	Pleasure
E002	Dislikes not having the toy he wants when he was little, he would get angry quickly (age 5).	Dislike
E002	Joy at having emotional maturity after age 6.	Pleasure
E002	Confidence for the independence in managing their emotions generated by the absence of the mother.	Love
E002	Level of anger when he was little was high and now that he is 11 years old the level is low.	Pleasure
E002	Aunt's presence in supporting his education in the absence of his mother.	Sadness
E003	Frustration at not having the authority of the mother, but mom's role is over her younger sister.	Anger
E003	Takes time intervals so as not to hurt others: Cordiality.	Love
E003	Doesn't trust her parents: Uneasiness.	Anger
E004	Angered by name-calling about her physical appearance.	Anger
E004	Takes time intervals to avoid hurting others: Cordiality.	Love
E004	Externalizes emotions in facial expressions.	Anger
E006	The importance of a loved one in anger management: Trust.	Love
E007	Has thoughts of hitting when insulted with his size but doesn't: Anger. but doesn't: Anger.	Anger
E007	Animals help with emotional control: Affinity.	Love

Table 6. Emotional language category sadness situation

Interviewed	Code	Emotions
E001	Sadness has been the most complicated feeling that he has not handled.	Anger
E001	Sadness has had the most significant effect on his studies.	Sadness
E001	Death is evidence of a major breakdown in his emotions that he no longer controls.	Sadness
E002	His sadness is heightened when he brings up memories.	Sadness
E002	He express his sadness with anger and frustration.	Anger
E003	Loneliness make him very sad.	Sadness
E003	Death is an expression of loneliness. Death of his little dog.	Sadness
E003	Sadness is a lifetime opportunity to learn how to live.	Sadness
E003	Sadness is related to guilt (death of his puppy).	Sadness
E004	Guilt has been a conditioning factor in the child's experience of sadness.	Sadness
E006	Sadness is related to guilt.	Sadness
E006	Religious beliefs were vital in achieving the goal of emotion management.	Pleasure
E007	Sport is a means of controlling emotions (soccer).	Pleasure

Table 7. Emotional language category shameful situation

Interviewed	Code	Emotions
E001	Her friend's presence is vital when she has an episode that she feels embarrassed.	Pleasure
E002	There is shame management through forgetting.	Pleasure
E003	Shame and anxiety give him the need to eat.	Shame
E005	There is buying about the child from other children.	Shame
E007	What will they say about me in class. Everyone had a blue pen, I was the only one who did not.	Shame
E007	Embarrassment combined with nerves.	Shame

Table 8. Emotional language category fearful situation

Interviewed	Code	Emotions
E001	Fear is controlled by a religious belief.	Pleasure
E001	Fear is the emotion where physiological changes are most identified.	Fear
E002	His brain makes him think according to what he believes.	Fear
E002	Family members are vital grandparents in the emotional process.	Pleasure
E002	At age 10 there is still a level of innocence about negative emotions despite dysfunctional family contexts.	Pleasure
E003	Constant presence of cold hands and nervousness during the interview due to the stress generated by this new experience of being interviewed.	Fear
E003	The new thing makes him very anxious.	Fear
E005	He is very nervous about responding to the interviewer.	Fear
E006	The plasticity of the child's brain allows him/her to handle fears, sadness, or episodes by quickly forgetting everything (forgetting everything quickly).	Pleasure
E007	The movies he/she has seen have turned into nightmares.	Fear
E007	Identifies that many of his fears are nonexistent.	Fear

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