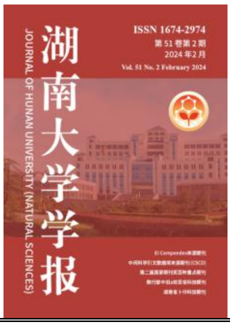

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Influence of Emotions on Understanding of Mathematical Concepts

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Abstract: This article describes the importance of emotional factors in the mathematics learning process. The research was conducted with first-semester engineering students from the Technological University of Pereira, and the topic addressed was complex numbers. This study aims to reveal the dynamics between cognition and emotion for an improvement in the mathematics learning process. Regarding the methodology, the guidelines provided by qualitative research were considered. With the support of grounded theory (TF), it contributes to the generation of new theories that arise due to observations that explain a social phenomenon in a natural and everyday context. The phenomenon that was observed and analyzed is the emotions that are generated in students when faced with the study of complex numbers. The sample was made up of 24 students, to whom collection instruments were applied to understand the emotional and conceptual aspects of the students. The results and conclusions describe the importance of the emotion– cognition relationship and the influence of didactic activities that generate positive emotions for the generation of lasting and significant learning. In addition, the relationship that the student can establish with the teacher is important in the sense that it gives them confidence to express what they feel and not feel embarrassed. How the teacher expresses himself toward the student and the invitation made to participate in class activities are considered a point of reference so that the student has confidence and tranquility during class and can develop the work with greater ease and security.

Keywords: emotion, learning, mathematics, student, teacher, didactics.

情绪对数学概念理解的影响

摘要：本文阐述了情感因素在数学学习过程中的重要性。这项研究是由佩雷拉理工大学第一学期工程专业的学生进行的，研究的主题是复数。本研究旨在揭示认知和情感之间的动态关系，以改善数学学习过程。关于方法，考虑了定性研究提供的指南。在扎根理论（TF）的支持下，它有助于产生新的理论，这些理论是由于在自然和日常背景下解释社会现象的观察而产生的。观察和分析的现象是学生在面对复数学习时产生的情绪。样本由24名学生组成，我们使用收集工具来了解学生的情感和概念方面。结果和结论描述了情绪-认知关系的重要性以及产生积极情绪以产生持久和有意义的学习的教学活动的影响。此外，学生与老师建立的关系很重要，因为这让他们有信心表达自己的感受，而不感到尴尬。老师如何向学生表达自己以及邀请学生参加课堂活动都被视为一个参考点，以便学生在课堂上有信心和平静，可以更轻松和安全地开展工作。

关键词：情感、学习、数学、学生、老师、教学法.

1. Introduction

The birth of emotions in an individual begins from early childhood through initial contact with people, objects, and experiences that generate situations that awaken feelings. Human emotions, which are expressed in adulthood, begin to form from an early age, but due to stimuli and provocations in childhood, they only emerge in adulthood.

Emotions are a determining factor in achieving learning objectives; if a student feels comfortable and understands the material, his or her motivation and desire to participate will increase, and interesting and supportive material can increase a student's self-esteem, confidence, and understanding of the subject. In the absence of such an environment, students may experience sadness and frustration, significantly impairing their academic performance.

When feeling negative emotions, student performance may not be satisfactory, but such experiences can serve as an impetus for students to change their attitude toward the situation being experienced. Therefore, there are different moments in class when the dissemination of mathematical knowledge requires well-developed mechanisms and adjustments that lead to the achievement of class objectives.

As such, exchanging ideas and listening to and observing students' approaches contribute to the construction of mathematical knowledge because the process of learning mathematics is supported by an inherited cultural tradition that manifests when students express their thoughts.

2. Theoretical Foundation

Goleman [1] affirms that from an early age, children in educational institutions should be stimulated with spaces and moments that awaken creativity and ingenuity to solve problems. Such an approach models a curious adult with the ability to be amazed and face a situation, understanding that the best way is to seek solutions to problems and participate in problem solving.

Wallon [2] focused on the development of children from four general perspectives: language, thinking, motor skills, and perceptions. He proposed that emotions should be analyzed in a manner similar to other dimensions connected with the initial development of a child. According to Guill states, as cited by Wallon [2], "emotions, in addition to an adaptive value, have a genetic value because they generate new structures of knowledge" (p. 4). The consolidation of mental structures in a child is generated through interactions with the environment and manifests when the child communicates a desire or makes requests through language. Thus, language is key in Wallon's theory because its enrichment contributes to the expression of emotions.

Aristotle addresses the subject of emotions in different works. He proposed that emotions or passions are valued from the viewpoint of rationality, but they cannot be qualified as something true or false. For example, in book II ("On Virtue in General") of *Nicomachean Ethics*, Aristotle [3] stated: "I call desire, anger, fear, audacity, envy, joy and friendly feelings, hatred, longing, emulation, piety, and in general all the affections to which pleasure and pain are concomitant" (p. 28).

Stoicism is a philosophical school that revolves around the premise that phenomena have a cause and an effect. Stoicism teaches that human beings cannot control what happens around them, but they can control what they feel when a phenomenon occurs. This school of thought affirmed that a human being is responsible for his or her own misery and frustration because by being a participant in an event, he or she decides through a value judgment how much the event will affect him or her, feeling grief or satisfaction.

Regarding learning mathematics, anxiety is a common feeling. As noted in [4], mathematical anxiety can greatly affect the success of a child during his or her school life because he or she must relate to the environment, forcing him or her to perform practices that involve mathematical knowledge. In addition, for children who lack this knowledge, their self-esteem may decline. Therefore, teachers and educators must work with students from an early age regarding their beliefs about learning mathematics to provide a motivating and safe environment for the teaching process [4].

Another important aspect in the formation of human beings is the development of logical thinking and the capacity for abstraction. These two aspects interact, allowing human beings to solve the challenges of daily life and professional and work challenges. The capacity for abstraction promotes the formulation of solutions to problems, making solutions more effective and with more solid logical support [5].

Companies use a high level of skills as a criterion to select staff. Among the competencies they require are the ability to understand problems, propose solutions, model, and even evaluate possible designs of materials that are needed for a particular purpose. Logical thinking is the source of these competencies and thus must be promoted from an early age.

The exchange of ideas between family members motivates children to be attentive and to learn about phenomena they observe in their environment [6]-[7].

The importance given to family interactions places the family context as a privileged setting for strengthening cognitive structures. Serrano [7] examined the mother-child relationship and the process of attribution of intentionality (meaning) of crying after reaching one year of age.

Among Dunn's ideas (Dunn and Dunn model, s.f.), observational studies are highlighted. Such studies provide descriptions of behaviors of children and parents that occur in the family environment and have a direct influence on future adults.

3. Methodology

This was a qualitative study. Such studies are characterized by developing questions and hypotheses before, during, or after data collection and analysis. This dynamic contributes to discovering the most important research questions and subsequently refining and answering them. Investigative actions move dynamically in both directions, i.e., between the facts and their interpretation, and circular process results, where the sequence is not always the same, varying according to each particular study [8].

Grounded theory offers the possibility of permanently controlling a study environment without losing any detail, for example, the participation of students in activities related to complex numbers, as it was essential to prepare the scene and materials used to collect information before the study. This research comprises theory generation and an inductive approach, theoretical sampling and saturation, the constant comparative method, and theoretical memos and sensitivity [9].

As affirmed in [8], a theory emerges on the basis of data. Theory generation is a nonlinear process (although it has to be represented in some way to be fully understood); it is highly iterative (back and forth), and sometimes, it is necessary to return to the field for more data (interviews, documents, work sessions, etc.).

Going back and forth is a characteristic of grounded theory. This process is repeated when analyzing descriptions in an observation grid, and a second intervention is necessary to clarify attitudes. Thus, through multiple interventions, clarification of initial judgments is achieved.

The object of the study of TF is social phenomena that occur in a specific social circle. The educational system is involved in several phenomena that merit the observation and analysis of events that occur in educational interactions, seeking to achieve study objectives. Reading stories about complex numbers, games, exercises in class, trips to the board, and manipulation of materials were some of the activities proposed as interventions to obtain data for analyses, providing different experiences where students participated and interacted with educational agents.

In this case, the social phenomenon that occurs is the influence of emotions on the process of learning complex numbers by students who are engineering majors at the Technological University of Pereira. Notably, emotions and cognition cannot be separated when learning processes are performed because they are connected. This connection determines, depending on the events that happen in class, whether a memory is retained or, on the contrary, easily forgotten.

TF offers an adequate data collection method to understand the phenomenon under study and achieve a deeper analysis of observations. This can be achieved by theoretical sampling and saturation. After choosing what information to consider and where to find it, theoretical sampling was selected for this study.

For data collection, the work of the students related to the subject of study was collected, observations of their attitudes toward learning about complex numbers were recorded, and questionnaire surveys and interviews were conducted. These four approaches guarantee obtaining relevant information that is then used to answer the research question.

3.1. Sample

Students between 16 and 20 years of age enrolled in the Engineering program (Mathematics I) at the Technological University of Pereira were included in this study. Mathematics I is the basis for understanding all other mathematics courses because it provides the theoretical bases to use mathematical concepts, techniques, and results in the understanding, interpretation, and analysis of and solutions to problems in everyday contexts that strengthen the development of mathematical thinking.

Referencing previous qualitative methodology, to achieve a reliable compilation of information, the ideal sample size was between 10 and 20 participants. In general, most of the students were from the city of Pereira, but some students were from cities in the neighboring Coffee Region, such as Santa Rosa de Cabal, Dosquebradas, Popayán, Ibagué, el Valle, Ipiales, and Florencia-Caquetá, and Spain. The sample comprised 24 students.

Regarding the selection criteria, several approaches have been employed in previous qualitative studies. In this study, convenience sampling was used. Hernández et al. As stated in [8], specific cases with direct access to the entire population allow the collection of valuable information. The selected population corresponds to a group of students in the first semester of an engineering program. The group comprises 30 students in different engineering programs (industrial and mechanical). The intent was for all students to participate.

Table 1 provides the characteristics of the population that participated in the study.

3.2. Information Gathering Process

The collection of information focused on identifying and understanding the emotions that students present when learning about complex numbers. The following instruments were used in this study:

1. *Students' work:* A questionnaire related to

cognitive and emotional dimensions was administered.

2. *Nonparticipant observation:* Behaviors, attitudes, or comments that occurred in class when students completed the complex number questionnaire were recorded on an observation grid.

3. *Personal interviews:* Interviews were conducted with students who had difficulty completing the questionnaire. Through interviews, it was possible to delve deeper into the observations and avoid subjectivity.

4. *Didactic activities:* Activities were implemented to enhance positive emotions toward the learning of complex numbers during class. The following activities were proposed:

a. *Reading:* “Origin of Complex Numbers”;

b. *Fun facts:* “A Walk through History: The Birth of Imaginary Numbers”;

c. *Game:* “Tingo, bingo, power!”

Table 1 Characteristics of the participants (Developed by the author)

Student	Place of residence	Place of Birth	Gender	Age	Previous school	Program
1	Pereira	Pereira	Female	20	Baquía City (public)	Industrial engineering
2	Dosquebradas	Pereira	Male	17	Francisco José de Caldas (public)	Industrial engineering
3		Santa Rosa de Cabal	Male	21	Francisco José de Caldas (public)	Industrial engineering
4	Pereira	Pereira	Female	18	Sanctuary Institute (public)	Industrial engineering
5	Pereira	Santa Rosa de Cabal	Male	17	Francisco José de Caldas	Industrial engineer
6	Pereira	Florence, Caquetá		20	Amazonian Agroecological Educational Institution, Camilo Torres (public)	Industrial engineering
7	Pereira	Pereira	Female	17	Immaculate (public)	Industrial engineering
8	Dosquebradas	La Victoria, Valley	Male	18	Magdalena, Ortega (public)	Mechanical engineering
9	Pereira	Pereira	Female	19	Kennedy (Public)	Mechanical engineering
10	Dosquebradas	Pereira	Male	19	New Granada (public)	Industrial engineering
11	Pereira	Pereira	Male	18	Salesian (private)	Industrial engineering
12	Pereira	Carthage	Male	18	Juan Hurtado (public)	Industrial engineering
13	Pereira	Popayan, Cauca	Female	18	Mixed Sintra (private)	Industrial engineering
14	Dosquebradas	Pereira	Male	18	Bernardo López Pérez Megacollege (public)	Industrial engineering
15	Pereira	Pereira	Male	18	San Joaquin (public)	Industrial engineering
16	Pereira	Ibague, Tolima	Female	19	San Isidro Educational Institution (public)	Industrial engineering
17	Pereira	Dosquebradas	Female	18	Augusto Zuluaga Patiño (public)	Mechanical engineering
18	Dosquebradas	Pereira	Female	17	La Boyacá (public)	Industrial engineering
19	Dosquebradas	Dosquebradas	Male	18	Diocesan (public)	Industrial engineering
20	Pereira	Ipiales, Nariño	Male	19	Educational institution city of Ipiales (private)	Industrial engineering
21	Dosquebradas	Canary Islands, Spain	Male	19	Pablo sixth (public)	Industrial engineering
22	Santa Rosa de Cabal	Ibague, Tolima	Female		Francisco José de Caldas (public)	Industrial engineering
23	Dosquebradas	Pereira	Male	20	Pablo Sexto (male)	Industrial engineering
24	Dosquebradas	Pereira	Female	19	El Socorro educational institution (public)	Industrial engineering

The collection of information focused on identifying and understanding the emotions that students present when they are learning about complex numbers. Therefore, each instrument was designed to facilitate answering the research question.

3.3. Reliability of Data Collection Instruments

External reliability was analyzed by sending the data collection instruments to ten evaluators, who provided comments. Each evaluator assigned a score to each question. To ensure the reliability of the instruments, a final format was designed for each instrument based on the comments of the evaluators. Each instrument was again rated by the evaluators, yielding a final average.

Reliability represents the safety of using an information-gathering instrument. Taking into account that this study had a qualitative approach, the instruments designed were an observation grid, interviews, and emotional and cognitive questionnaires.

The compiled material was sent to ten experts in mathematics education, among whom were mathematics teachers and coordinators of educational institutions (some with doctoral studies) in the Coffee region. Of the ten experts chosen, seven agreed to evaluate the information gathering instruments.

Each expert made contributions that improved the instruments. Table 2 presents the final evaluation of the cognitive questionnaire by the experts. A compilation of the general evaluations by each expert for the items on the questionnaires is provided, together with the averages and validation (yes/no) of questions.

Table 2 Final evaluation of the cognitive questionnaire by experts (Developed by the author)

Observation format validation											
Question		**Expert score**									**Validation Question (Yes/No)**
No.	**Evaluation**	**1 DM**	**2 CF**	**3 CM**	**4 CG**	**5 AM**	**6 RME**	**7**	**Sum**	**Average score**	
1.		5	5	5	5	5	5	5	34	4.8	Yes
2.		5	5	5	5	5	5	5	34	4.8	Yes
3.		5	5	5	5	5	5	5	34	4.8	Yes
4.		5	5	5	5	5	5	5	35	5	Yes
5.		5	5	5	5	5	5	5	34	4.8	Yes
6.		5	5	5	5	5	5	4.7	34.7	4.9	Yes
7.		5	5	5	5	5	5	5	35	5	Yes
8.		5	5	5	5	5	5	5	35	5	Yes
9.		5	5	5	5	5	5	5	35	5	Yes
10.		5	5	5	5	5	5	5	35	5	Yes
Suggestions		4.7. The order should be changed, with this coming before the third, and from this on, continue in the same order. 4. The question is inappropriate for a sequence that relates to the feelings of the student's capabilities.									

3.4. Information Gathering and Analysis Process

The information gathering process was carried out during the Mathematics I classes, totaling six hours per week for two weeks. The application sequence was as follows: diagnostic cognitive questionnaire, emotional questionnaire, observations (completion of the observation grid), didactic activities, and repeated cognitive and emotional questionnaires to contrast and analyze cognitive and emotional components after students participated in didactic activities that increased motivation and positive emotions.

Regarding the observation grid, the entire grid had to be filled. Thus, it was necessary to use all senses to observe the environment and the information provided by the population. Lofland and Lofland, cited in [8], suggest being attentive to the artifacts that participants use, the social and human environment, activities, the physical environment, and relevant facts. Once each of these details were available, the observation grid was complete. This instrument is designed to collect information with an emphasis on units of analysis that have been selected on the basis of the objectives or research question.

As seen in the pretest graph (Figure 1a), the results were not ideal because incorrect answers and responses indicating a lack of knowledge to answer the question were predominant. As seen in the posttest graph (Figure 1b), correct answers (blue bar) are much more frequent than incorrect answers (red bar) and responses of “I do not know” (green bar). It is evident that there is a greater understanding of the subject, potentially because of the influence of emotional aspects on understanding the subject.

Beginning with the second question, the students had to perform algebraic procedures to arrive at an answer, and the first two questions and the fourth questions allowed students to select from multiple answers. Thus, a high percentage of questions 1, 2, and 4 were answered correctly. However, the results were unfavorable when the students were asked to provide their own answers to the algebraic procedures.

It is evident in the pretest that there was a lack of knowledge on the part of the student about algebraic procedures. If a student does not answer a question correctly, it is likely because he or she has conceptual gaps that do not allow him or her to design a plan and develop procedures to find an answer. Then, the student either does not answer the question or, with the little knowledge he or she has, provides his or her best guess.

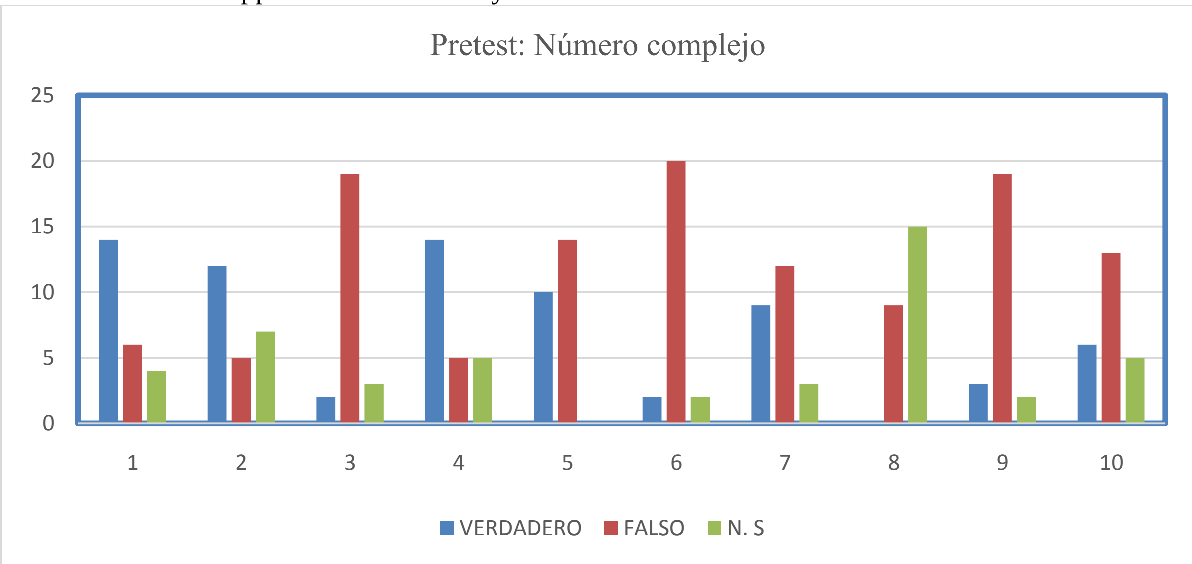
Here is an example of emotional manifestations recorded during the observations.

The data analysis (Atlas.ti software) is presented below. The results identify the emotions generated during the learning of complex numbers before implementing the didactic activities designed to increase positive emotions. Comments related to negative emotions prevail; students expressed indifference, apathy, insecurity, boredom, and despair in class, i.e., more negative emotions than positive emotions.

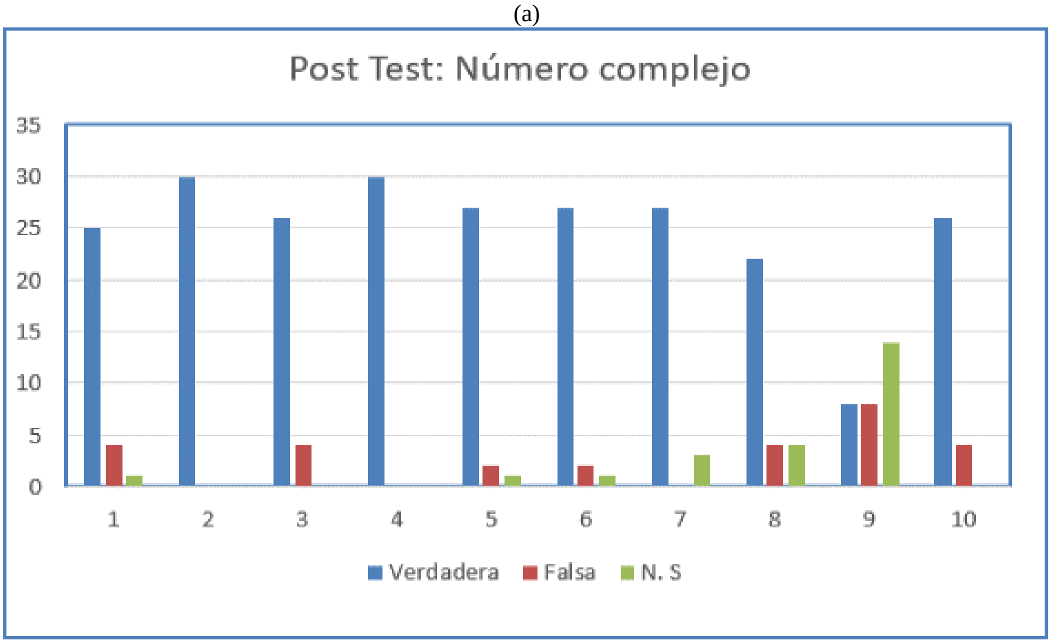
The interviews conducted with the students were transcribed and analyzed through content analysis to reveal concepts related to categories, always considering that coincidences can occur. For the questionnaire on complex numbers, the analysis of correct and incorrect questions was considered. The procedures that the students applied were also analyzed to detect shortcomings in each subtopic.

Figure 1 provides an example of the mistakes that students made when solving the problems.

Fewer mistakes were made on the posttest after the students implemented didactic activities designed to awaken positive emotions in them when learning about complex numbers.



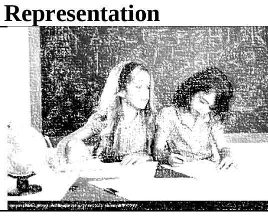
(a)



(b)

Fig. 1 Pretest and posttest bar charts (Developed by the author)

Table 4 Observation forms (Developed by the author)

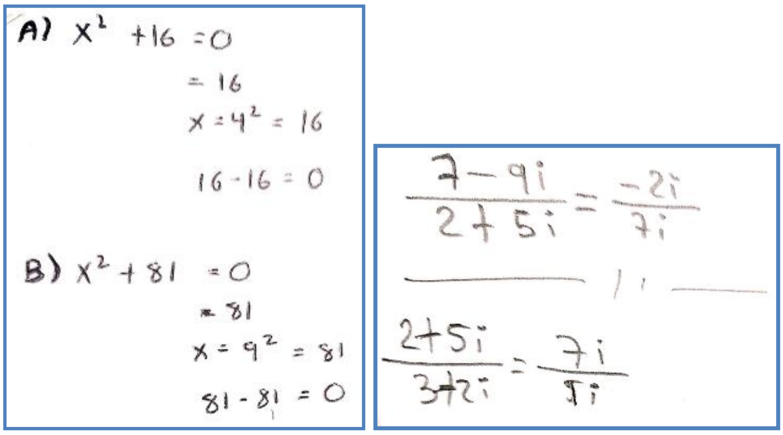
Observation grid **Emotional behaviors**				
Emotions	**Student #**	**Time/date**	**Emotional manifestation**	**Representation**
Insecurity	1	8:00-9:00 a. m. Monday, February 7, 2022	The student constantly raises his head and looks sideways	

Remarks:
As much as the student tries to look at the work of the rest of his classmates, it is difficult for him because they are far away. The student does not delay in turning in the question sheet. The student, through an interview, stated that he feels insecure, which is why he goes to look at the work of his classmates.

Continuation of Table 4

Boredom	2	8:00-9:00 a. m. Monday, February 7, 2022	The student yawns constantly	

Remarks:
Through an interview, the student stated that he feels lazy, bored, and hungry because the day before he went to bed very late, and in the morning, when he came to class, he had just woken up. Therefore, the activity produces these sensations.
The yawning began when the questionnaire began; before, when we were in the class, this attitude was not observed.



a) b)

Fig. 2 Evidence of class activity

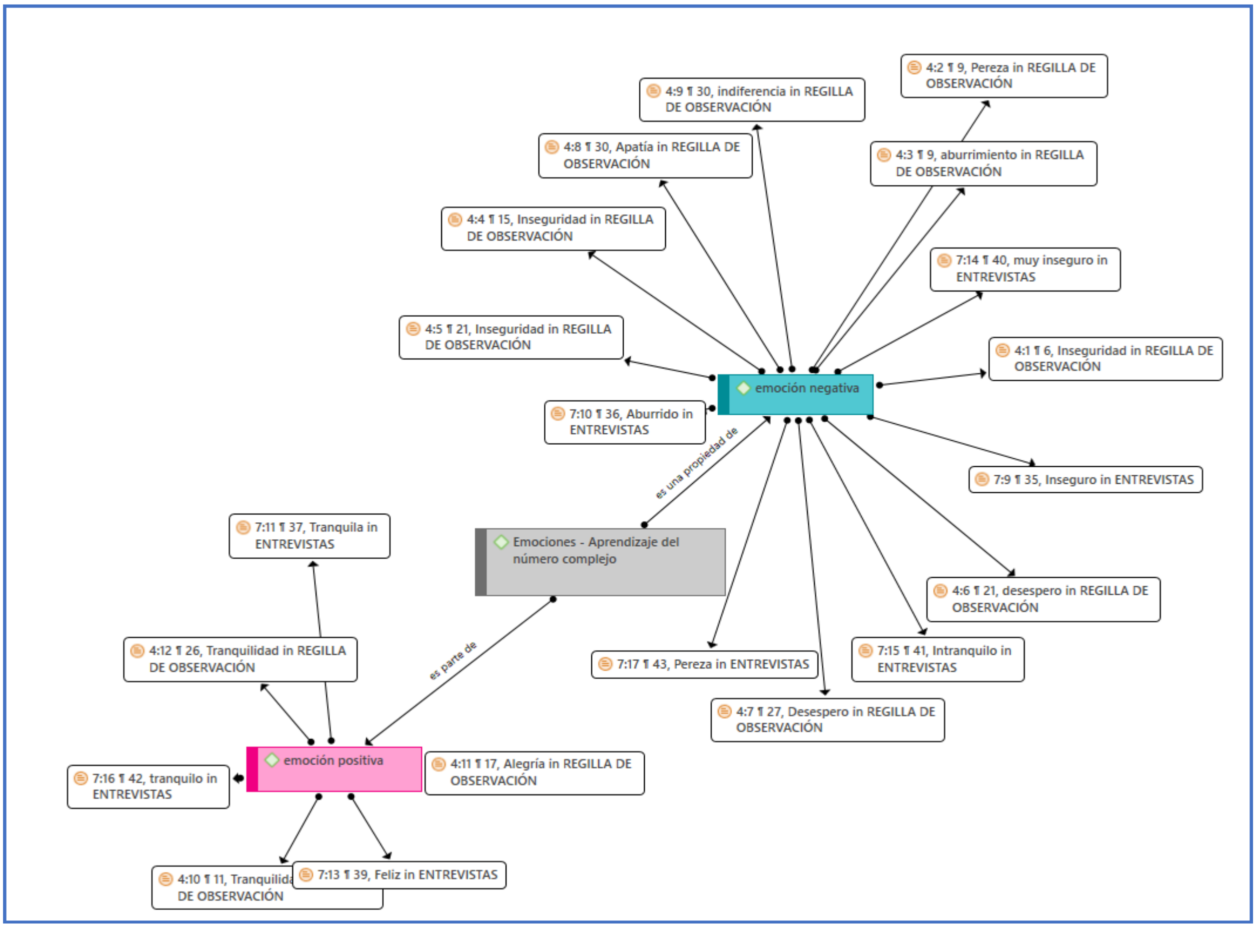


Fig. 3 Emotions in learning complex numbers (Developed by the author)

4. Results

According to [10], teachers consider fear, shame, anger, and frustration in students to be the product of immaturity and a lack of opportunities to vent and express their emotions and feelings. This situation triggers a cognitive blockage; therefore, academic results are not ideal.

Three instruments were used to collect information: the complex numbers questionnaire to identify concepts familiar to students; nonparticipant observation to observe behaviors while completing the questionnaire; and a structured interview conducted with students who stood out for notable behaviors during the completion of the questionnaire to deepen our understanding of their attitude.

Regarding the complex number questionnaire, negative results were obtained because the highest percentage of responses corresponded to ignorance of the subject, either because the student was not taught or did not remember the content taught at school. The MEN [11] affirms within its learning objectives that this topic should be addressed in the ninth grade.

During the completion of the questionnaire, all students were observed, but emphasis was placed on nine because they presented behaviors that expressed a particular emotion. Among these gestures were constant movements of the head in the form of denial, trying to look at the answers of their classmates, singing while completing the questionnaire, and thumb sucking. These manifestations were considered when completing an observation grid and scheduling an interview after the questionnaire had been completed.

During the structured interview, the students predominantly manifested the affective domain because in their answers, they expressed the desire for an environment of patience, understanding, and tranquility in mathematics classes. However, they also expressed feeling lost when answering the questionnaire, that is, not knowing what to do when faced with challenging questions.

After this initial phase, a posttest was applied to investigate the activities that involve high emotional states and are related to learning about complex numbers. Likewise, the emotional questionnaire was used. These instruments contributed to verify that the emotional state is highly related to learning.

Regarding the cognitive component, most students assigned grades of five and four points, with few assigning grades of three, two, and one point. Their answers highlight their confidence in their cognitive abilities, as they consider themselves capable of solving problems, understanding difficult subjects, and solving exercises that involve complex numbers.

Regarding the affective component, the high marks correspond to the questions related to the fact that the students are aware that the study of mathematics is necessary for their personal life and that they have fun and feel safe when studying complex numbers. However, a group of students indicated that they felt uneasy when studying mathematics; they indicated that it was a general feeling and not specifically related to the subject of complex numbers.

Finally, regarding attitudes toward the learning of complex numbers, many students presented a positive attitude, as they expressed feeling motivated in their study. However, there was also a group of eleven students who expressed a feeling of boredom with complex numbers, especially when graphing in a complex plane. However, the average score for this statement was three points, suggesting that they did not dislike it.

5. Discussion

Emotions represent the different physiological states that a person experiences at a given time. These emotions are the result of interactions with an event, an object, or an agent. In the analysis of the emotional factors that affect the learning of complex numbers, it is necessary to consider these aspects because each one directly or indirectly influences the consolidation of neural connections, generating lasting knowledge in the student.

Among the factors that can alter the emotional state of people are beliefs, which from an early age influence the personality of students, until the impact of events or material objects, which at a certain moment alter individuals, either due to the event or alteration caused by an object.

Among the emotional factors identified are the teacher-student relationship, didactics in teaching, experiences previously lived by students, and the beliefs that a student has toward learning mathematics. Each of the above factors influences the learning process.

The teacher-student relationship constitutes a permanent and constant bond that is generated from the moment an interaction begins in the classroom. Not only will the knowledge of complex numbers be an aspect that establishes a relationship, but the verbal and gestural expressions and materials used in class will also generate bonds that unite a teacher and student in a dynamic relationship. Therefore, the way a teacher expresses his or her ideas either gesturally or verbally or through the materials used in class, the dynamics are decisive for students to develop confidence and motivation regarding learning mathematics.

The experiences that a student has had, either with family or a group of friends, are factors in generating a disposition or predisposition toward the class. Content and moments will be retained, with students recalling their time in math class and possibly rejecting the work done.

The academic contribution of this research lies in recognizing the influence that emotions have on the learning process, given that when emotions are connected to other organs of the body, cognitive structures that promote interaction with the environment are constructed. This situation could be evidenced in class when, upon inviting the student to participate in the activities, he did not express inhibition, fear, or embarrassment, but appeared calm and happy about participating in the proposed activities. The reason for this good disposition and performance comes from the positive emotions that predominated in the class experience, managing to infect the rest of the classmates.

Among other aspects to consider, emotions lead to the formation of immediate value judgments as instant behavioral manifestations in the face of a stimulus, person, or object. Therefore, the moment of reflection cannot be eliminated during the application of the activity, since it will complement and reinforce the topics that were worked on during the meeting, making the students remember the most important and outstanding aspects of the day. Reflection is not only carried out by the teacher but is a joint effort, where the student has the opportunity to participate and express their ideas about the knowledge that the day left them.

6. Conclusions

For students, the relationship that they establish with teachers is important in the sense that it provides them with confidence to express their feelings and not feel ashamed. The way in which teachers express themselves toward students and encourage participation in classroom activities are considered points of reference so that students have confidence and tranquility during class and can develop knowledge with greater security.

During class, there are moments when teachers must interrelate with students and invite them to participate actively without embarrassing them. Rather, teachers should motivate students.

Identifying when students are substantially affected by different strategies used by teachers during class lends itself to reflecting on the role of preparation in mathematics class. No matter how many times a topic is addressed in class, teachers must recognize that each individual is different; therefore, they must be knowledgeable about the resources, needs, and materials for a particular topic.

Experiences lived by students determine beliefs that affect the teaching-learning process because students consider their beliefs as facts. This can motivate students or, on the contrary, lead to unpleasant feelings and disinterest.

Teachers must be alert to nonverbal messages in the classroom, messages that are transmitted through looks, actions, or materials. Therefore, the dynamics that are interwoven during class serve to better understand different social phenomena and allow teachers to make immediate decisions that contribute to strengthening positive emotions in students.

Social phenomena are events, reactions, and ways of understanding a situation and reacting to said event, considering individual beliefs. Subjectivity also plays a leading role in social phenomena because they are the perceptions or conceptions of each person before the phenomenon.

Among the limitations that arose for developing the work not had an academic download to dedicate more time to the research process. I had to guide several courses during the semester, in addition to the hours of consulting and other teaching activities. For this reason, time was a great enemy. In addition, there is a limitation that not all teachers in the Mathematics Department accept the importance of emotions within the learning process; rather, traditional and rote education takes precedence.

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