

COMMUNICATION SKILLS, NEUROSCIENCE AND THE PROFESSIONAL INTERACTIONS OF PRIMARY EDUCATION SCHOOL MANAGERS

Capacidades comunicacionais, neurociência e as interações profissionais de gestores de escolas de Educação Básica

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Resumo: Este estudo teve como objetivo analisar a percepção dos gestores de educação básica da rede pública, com relação a melhoria de suas capacidades comunicacionais em suas interações profissionais, após a realização de uma formação customizada com base em neurociências e orientada ao desenvolvimento de capacidades comunicacionais. Este estudo possui uma abordagem qualitativa, de caráter descritivo e exploratório, realizado por meio de uma pesquisa-ação, viabilizada através de um curso de formação a 87 gestores das escolas públicas de educação básica, da cidade de Indaiatuba, interior do estado de São Paulo, Brasil. Os resultados mostraram que os gestores perceberam um aprimoramento em suas capacidades comunicacionais, resultando na melhora das interações com pais de alunos e colaboradores da escola, bem como na mediação de conflitos. A formação capacitou os gestores para lidarem de forma mais efetiva com a comunidade escolar, pois aprenderam a interagir de forma mais assertiva e atentos aos estados emocionais, conseguindo, como resultado, melhorar suas interações profissionais.

Palavras-chave: Gestores escolares. Treinamento de gestores. Neurociência. Comunicação.

Abstract: This study aimed to analyze public primary education managers' perception regarding improving their communicational skills in their professional interactions after taking customized training based on neuroscience and oriented to developing communicational skills. This study has a qualitative, descriptive, and exploratory approach, carried out through action research enabled by a training course for 87 managers of public primary education schools in the city of Indaiatuba, in the interior of the state of São Paulo, Brazil. The results showed that managers perceived an improvement in their communication skills, resulting in improved interactions with parents of students and school employees, as well as conflict mediation. The study used neuroscience as a knowledge base in training focused on improving professional

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interactions through developing communication skills. The training enabled the managers to deal more effectively with the school community, as they learned to interact more assertively and pay attention to emotional states, improving their professional interactions. School managers are responsible for leading the environments that promote the early development of future Brazilian citizens. They would have more resources to provide further effective school environment when trained for that. The study's originality is in using neuroscience for training primary education managers focused on developing communication skills.

Keywords: School managers. Managers training. Neuroscience. Communication.

1 Introduction

The increasingly complex contemporary context requires developing more complex capacities. To be effective, the productive behaviors in such complex environments need to be systematically organized. Moreover, the human being should be considered in its totality of aspects, from biological to social issues (MATURANA; D'ÁVILA, 2015).

The way human beings behave is directly connected to their communication skills structure, which belongs to the behavioral development scope and is associated with verbal and non-verbal communication (GUIMARÃES; FILIPKOWSKI, 2021). In verbal communication, elements such as speech and tone of voice are considered, whereas in non-verbal communication, factors such as body posture and emotional expressions (NAVARRO, 2011; COSENZA; GUERRA, 2011; NAVARRO, 2021; WEIL; TOMPAKOW, 2015; PEASE; PEASE, 2005; CHUN, 2000; LIN; MAKEDON, 2010).

People interact through a configuration of expressions formed by verbal and non-verbal communication, which informs the interlocutors of the sender's characteristics (NAVARRO, 2011). Therefore, the set of symbols, sounds, and gestures formed during a communication process are determinants for interactions to have good results. For example, if the way a person expresses generates distancing between the interlocutors, the results will probably fall short of what they could be (STIPP, 2019; GUIMARÃES; FILIPKOWSKI, 2021; KNAPIK, 2011).

The literature addresses human interactions and communicative capabilities in specific studies. Weil and Tampakow (2015) stated that when interacting, a person's physiology is continuously on the lookout to identify indications in the interlocutors that there will be closeness or distancing in the course of the interaction. Knapik (2011) proposed that relationships and emotions should be considered in management development processes because they will determine the orientation the professional interaction will follow, whether favorable or not.

Studies pointed to managers' need to develop communication skills to improve interactions (OGAWA; FILIPAK, 2013; VERMA; PANDE, 2016). Regarding training for school managers, none was identified focusing on developing communication skills to generate a positive impact on professional interactions.

One possible way to improve the results in the professional interactions of managers is to develop their communication skills through training composed of neuroscience knowledge. Neuroscience knowledge allows an understanding of the functioning of the human being and its impact on human interactions (COSENZA; GUERRA, 2011). In the literature, no studies use neuroscience as a knowledge base in training focused on improving professional interactions through developing communication skills. However, some have identified this need for research (SALA; ANDERSON, 2012; COCH, 2018; CAMPOS; ÁLVAREZ, 2019).

Managers are essential in building an effective educational environment (GUIMARÃES; FILIPKOWSKI, 2021). These professionals are increasingly invited to expand their training concerning behavioral skills, in addition to technical ones. Managers' performance with the school community, students' parents, and school professionals must provide as much effectiveness as possible to contribute to the social development for which the school is responsible (KNAPIK, 2011).

In Brazil, the structure for training school managers, both from the undergraduate and graduate perspectives, emphasizes developing technical and administrative skills rather than behavioral ones (GATTI, 2010). This type of training structure implies that managers may be unprepared to deal with situations with students' parents and school employees in which there is a negative emotional impact, conflict, and the need to convey complex information (PERRENOUD, 2000).

School managers must improve their communication skills and professional interactions (GUIMARÃES; FILIPKOWSKI, 2021). By refining these elements, they may communicate in a way that generates more openness, attention, and greater understanding among those involved in professional interaction, ensuring the smooth functioning of the school (GUIMARÃES; FILIPKOWSKI, 2021). As a result, this study aimed to analyze the perception of public primary education managers regarding improving their professional interactions after taking customized training based on neuroscience and oriented to developing communication skills.

2. Theoretical background

2.1 Human interactions and communication skills

During the human development process as an animal species, communication has always played an important role (NAVARRO, 2011). Gestural communication has accompanied the human species' development since its beginning, and for a long time, this was the way homo sapiens communicated. Still, all this non-verbal expression has a genetic and hereditary basis, and non-verbal communication arises from muscle groups mobilized through emotions (NAVARRO, 2011).

Understanding how non-verbal expressions work is vital because they convey information about who is communicating, such as identifying their intentions and feelings during the interaction (NAVARRO, 2011). From the perspective of human interactions, Weil and Tampakow (2015) ensured that human beings could perceive whether an interaction is harmonious or not without the need for words. According to the authors, in interpersonal interactions, the physiological systems of those involved are continuously mobilized to avoid the anxiety of being denied as an individual in that relationship. Many behaviors are recorded in the nervous system, which carries the characteristic of discernment and comes from the entire evolutionary process of the human species.

Considering the management aspect, Knapik (2011) emphasized it is essential to consider emotions in the processes involving professional interactions, generating the body's expressions. If the first impression is unfavorable in an interaction, the whole process may be at risk and have a greater tendency to develop conflicts. Therefore, it is up to the management professional to develop skills to manage the possible conflicts that may arise in day-to-day interactions. Thus, this professional must develop relational skills capable of mobilizing people to build more collaborative environments.

Specifically on the aspect of better dealing with conflicts, Knapik (2011) stated that these arise from the states of estrangement that can be created in moments of interaction. When people have feelings of closeness to each other, the acceptance of the other and what they are suggesting tend to be considered. Additionally, a group's psychological climate and personal interactions directly influence the work environment and achievements.

2.2 The school manager, the need for more complex skills, and a neuroscience perspective

The way a school is managed directly guides the interactions of its professionals, parents, and students. It is the actions of all that allow the purpose of an educational institution to be realized. The manager must perform all necessary actions to build a healthy school structure (TAROUCO, 2016).

Education has an important role and needs to contribute for people to assume their condition of learning and teaching to live together in society (MORIN, 2011). Accordingly, Maturana (1996) stated that human beings are only able to express their humanity when they use their condition of communicating through a language that can organize everyday actions among those involved in the communication process.

In the conversation, language and emotions are organized to coordinate themselves to guide mutual actions for the continuous creation of human beings and better spaces for coexistence (MATURANA, 1996). Through the biological-cultural approach, Maturana and D'Ávila (2015) presented the human being as an autopoietic molecular living capable of creating itself and differentiating itself from other living beings through the condition of talking. The conversation is a particular way of living together (MATURANA, 1996).

On human functioning and from the perspective of neuroscience, there are neurobiological bases to understand that human development, through learning, is directly related to emotions. These mobilize the human system both for the advance and the retreat in continuous learning and healthy doing. Emotions are implicit aspects of human physiology and directly influence how we communicate (COSENZA; GUERRA, 2011).

Cosenza and Guerra (2011) also evidenced that brain activity goes through variations and that attention and memory are impaired at certain times, such as in situations of anxiety. Therefore, emotions serve as signals because, through physiology, human beings demonstrate what they are feeling when facing a situation.

Learning and behavioral change have a biological correlate and reinforce that new neural connections are incited in the interaction with the environment, which is directly related to the learning process, the acquisition of new skills, and the new behaviors that arise from this process (COSENZA; GUERRA, 2011). Adding to this perspective, the process of storing memories and learning is directly connected to a person's emotional processes, and the stronger the memory, the greater the myelination of the neural network involved. It becomes easy to learn when the emotional state is good, and difficult when the emotional state is one of fatigue, depression, or stress (IZQUIERDO, 2011).

Human beings learn to avoid what makes them uncomfortable and tend to approach what makes them safer, which directly impacts the exchanges between the interlocutors on the issues and actions that need to be performed by those involved (IZQUIERDO, 2011). Given the above, the development of school managers must consider understanding the functioning of the human being in its biopsychosocial implication (PERRENOUD, 2002). Including this

issue in training and developing the manager's administrative and technical skills shows a promising possibility when analyzed from the research perspective (VERMA; PANDE, 2016).

Corroborating this orientation to the professional development of the school manager, Ogawa and Filipak (2013) ensured that the manager is the professional responsible for organizing the formative processes in school consistently with social needs. Therefore, this professional needs to have, in addition to technical training, the ability to dialogue with their peers and a clear conception of the social context and the innovations required for the school. School managers must be prepared beyond formal training. Being a school manager is taking care of financial and administrative resources and leading and mobilizing the school's professionals to promote the best learning environment for society.

Adding to the relevance of the role of the school manager, it needs special attention since these managers are responsible for the success, wear, and problems of interpersonal relationships. The management professional is an articulator of the evolution of the school environment to improve all collective work. The manager gets the team's collaboration when they can communicate, mobilizing stimuli for the contribution and development of those involved, and creating a collaborative climate in the school is directly related to how much they can make healthy personal interactions. By employing a well-established communication process, it is possible to resolve conflicts, reduce wear and tear, and enhance good capacities. School management presents itself as the element capable of consciously mobilizing all the individuals who represent a school structure (GUIMARÃES; FILIPKOWSKI, 2021).

Specifically, about the process of interacting with students' parents, Perrenoud (2000) stated that more extensive knowledge of professional interactions may not be able to fully control moments of significant difficulties. However, it helps to understand and deal with them in the best possible way.

3. Method

3.1 Study Context

This study was conducted in Brazil, with managers of public primary schools from a city in the interior of São Paulo. The training framework for these managers is organized at the national, state, and municipal levels and its main emphasis is on developing technical skills for organizational performance (GATTI, 2010; FRANCO, 2014). Before applying the research, it was submitted to the Ethical Committee of the Federal University of Viçosa, Brazil, and approved under the number 44997521.5.0000.5153.

To become a manager, the teacher must graduate in Pedagogy or other Bachelor's courses. Being the Pedagogy course, the manager teacher starts with initial training for developing the technical capacities of management (FRANCO, 2014). Postgraduate courses in school management are provided by institutions authorized by the Brazilian government, also focusing on developing technical skills (FRANCO, 2014).

In Brazil, in 2005, the National School of Public Education Managers Program emerged as support for continued training for primary education public school managers. The MEC portal - School of Managers (Education Ministry) (BRASIL, 2021) reports that two courses are offered: the specialization course in school management and the improvement course in school management, both focusing on the technical development of the position.

Brazilian states can also offer training programs for managers, and the state of São Paulo provides training courses for entry-level professionals. The courses offered are Specific Training Course for Incoming School Directors; Learning Paths; School Director: Designing Tomorrow; Learning Focus - School Director; Learning Focus - School Director Early Years of Primary Education; and Educational Evaluation (SÃO PAULO, 2021). At the municipal level, public school networks can structure training centers for continuous training, which are chosen by the Secretariat of Education of each city according to the guidelines on indicators and results that need improvement (INDAIATUBA, 2021). This structure allowed the customized training and intervention of this study.

3.2 Research design

This study has a qualitative approach of an applied, exploratory, and descriptive nature, carried out through action research (GIL, 2009), enabled by a training course for managers of public primary education schools in the city of Indaiatuba, in the interior of the state of São Paulo, Brazil. The action concerns the application of customized training with elements from neuroscience oriented to developing communication skills, carried out with 87 primary education managers from the municipality.

The training was structured with 38 hours, distributed in five joint meetings, four individual tutorial meetings, the performance of the class activities, and the completion of questionnaires and forms for the manager self-monitoring. The training was designed using the Metasystemic Behavioral Technology methodology, developed by a Global and Organizational Human Development Institution in Campinas, São Paulo. According to Coden (2022), this technology is structured considering how the human being develops through the biopsychosocial aspects.

The proposed program contents of the training were: 1) Meeting 1: the importance of talking and knowing how to talk, how a new ability and competence is formed, the common ground that arises in every interaction, the importance of information being clear; 2) Meeting 2: emotions in communication, human physiology, biopsychosocial beings: memories, closed nervous system, mental systems, the brain condition of conscious choice; 3) Meeting 3: Value Systems - Integral Spiral Dynamics Study; 4) Meeting 4: subject and operational domains, conflicts, needs, goals, and orientation in communication, the validation and deconstruction; 5) Meeting 5: action plan, effective meetings, task organizer, academy of good communication.

Moodle, Google Meet, and Google Forms platforms were used to carry out the training activities. Data collection took place through Google Forms, with an open questionnaire for the 87 participants, which served to capture information about the changes that occurred after the training, and a form to capture general data on the profile of the participants. At the end of data collection, 57 participants answered the questionnaire.

Regarding the 57 participants' profiles, most are between 41 and 50 years old, have a degree in education, have specializations other than management, and have been working in the position for up to 15 years. The details are presented in Table 1.

Table 1 - Research participants' profile

Participants profile		n	%
Age range	From 31 to 40	4	7.02
	From 41 to 50	37	64.91
	From 51 to 60	16	28.07
Time as manager	Up to 1 year	10	17.54
	From 1 to 5 years	20	35.09
	From 5 to 10 years	9	15.79
	From 10 to 15 years	10	17.54
	From 15 to 20 years	5	8.77
	Over 20 years	3	5.26
Graduation	Pedagogy	52	91.23
	Bachelor's degree	5	8.77
Post-graduation	School Management	24	42.11
	Other specializations	28	49.12
	No specialization	5	8.77

Source: Data from research (2022).

Data analysis was performed using the content analysis method (BARDIN, 2011), developed in three phases: in the first phase, the material was prepared, called pre-analysis; in the second phase, the material was explored to identify key points; in the third phase, the data treatment and interpretation were performed, based on the interviewees' statements. The research content was structured through categorizations that seek to classify similar elements grouped by their common characteristics.

4 Results

The study presented 40 categories identified through data collection with the open-ended questionnaire, which was structured with six questions and answered by 57 of the 87 managers participating in the research. The criteria used to identify the categories are related to the proposed contents in the training and the research objectives. The complete data is shown in Table 2.

Table 2 - Questions and categories identified

Questions	Analysis Categories
Question 1: What did you think of the customized behavioral training course based on neuroscience and focused on communication that you attended? What contributions do you think it brought to your personal and professional life?	A1: Training evaluation A2: Indication for learning application A3: Practical application of learning A4: Direct reference to the training content A5: Noticeable outcome
Question 2 - What behaviors do you think have changed in your professional interactions from what you learned in this course?	B1: Way of organizing communication B2: Way of communicating B3: Body posture B4: Facial expression B5: Speech B6: Voice B7: Emotions B8: Attention B9: Direct reference to the training content



Question 3 - Have there been changes in your daily life and interpersonal relationships? Can you describe any of them?	C1: Occurance of changes C2: General changes C3: Interpersonal changes C4: Direct reference to the training content
Question 4 - Do you think that the customized behavioral training course, based on neuroscience and focused on communication, brought subsidies to make yourself understood more clearly to the parents of school students? If yes, please justify.	D1: Yes D2: Justification D3: Evidence of connection to the training content D4: Without D1, with justification D5: Without D1, without justification D6: With D1, without justification D7: Indication of new result
Question 5 - Do you think that the customized behavioral training course, based on neuroscience and focused on communication, brought subsidies to transmit information about procedures and processes to your employees, resulting in more effectiveness? If yes, please justify.	E1: Yes E2: Justification E3: Evidence of connection to the training content E4: Without E1, with justification E5: Without E1, without justification E6: With E1, without justification E7: Indication of new result
Question 6 - Do you think that the customized behavioral training course, based on neuroscience and focused on communication, brought subsidies to prepare you better to deal with conflicts with and among your subordinates in a more agile way? If yes, please justify.	F1: Yes F2: No F3: Justification F4: Evidence of connection to the training content F5: Without F1, with justification F6: Without F1, without justification F7: With F1, without justification F8: Indication of new result

Source: Data from research (2022).

Among the categories identified, 19 indicated that there were changes or indications of changes, as follows: A2, A3, A5, B1, B2, B3, B4, B5, B6, B7, B8, C2, C3, D2, D7, E2, E7, F3, and F8. On question 1, designed to verify what the participant thought about the training and its contributions to personal and professional life (Table 3), the analysis observed 78 citations in category A2, indicating that the learning could be applied. Category A3 presented 27 citations, meaning there was a practical application of the learning, and in category A5, there were 49 citations, showing visible results in the participant's daily life after the training.

Table 3 - Categories of question 1 and participants' quotations

Categories indicative of a change	Total quotations from participants
A2: Indication for learning application	78
A3: Practical application of learning	27
A5: Noticeable outcome	49

Source: Data from research (2022).

Practical examples of these categories were identified from the participants' statements when answering the questionnaire, showing the transformations that occurred after the training. For instance, regarding the indication of the application of learning in their daily lives (A2), participant P4 highlighted that the training made him reflect on his personal and professional life, broadening his view on communication and stance towards it when he expressed: "The

course provided me with reflections on my personal and professional life, broadened my view about communication and my stance towards it." This perspective was reinforced by participant P8, who stated that the concepts used in training allowed him to clarify the way of looking at his interlocutor during the communication process when he wrote: "I believe that the concepts of neuroscience were the most interesting contents of the course because they clarified my look at the other, especially those with whom I will verse."

About the practical application of learning (A3), evidence could be observed in the speech of participant P15, who claimed to have improved his way of designing strategies for interactions: "The course contributed a lot to my professional performance [...] and creation of interaction strategies for the smooth running of coexistence in the groups." Participant P23 assured that he is listening and talking more with others when he stated: "I have learned to give more opportunities to those who live together with me, try to listen to them more, dialogue and talk more too."

Concerning direct reference to noticeable outcomes (A5), participant P25 stated that he has improved his communication, mentioning: "The course has brought me much learning, it has significantly improved my communication with the people around me." This evidence was corroborated by participant P34, who stated that he enjoyed the training and that it helped him with people management: "I liked it a lot; it helped me in several people management issues."

About question 2, designed to verify the participants' perception of which behaviors they considered had changed in their professional interactions, the following notes indicated behavioral change: the way to organize communication, in category B1, with 45 citations; the change in the way to communicate, in category B2, with 91 citations; emotions, in category B7, with 39 citations; and the change related to attention, with 39 citations in category B8. The complete data are in Table 4.

Table 4 - Categories of question 2 and participants' quotations

Categories indicative of a change	Total quotations from participants
B1: Way of organizing communication	45
B2: Way of communicating	91
B3: Body posture	11
B4: Facial expression	9
B5: Speech	11
B6: Voice	10
B7: Emotions	39
B8: Attention	39

Source: Data from research (2022).

About the way of organizing communication (B1), participant P8 noticed that his interactions changed in behavioral aspects related to him planning more for his interactions and thinking more before communicating: "The main thing was thinking before communicating. Not doing things automatically, but planning, preparing myself for an interaction, always taking into account the biopsychosocial being." Corroborating this evidence, participant P32 reported that he is better at organizing his time, the organization of meetings, and priorities: "I believe that I improved my communication with the group of collaborators because the course helped me in the organization of my time, in the identification and organization of meetings and priorities, besides guiding me about the personal characteristics and of my work team."

Regarding the way of communicating (B2), participant P29 mentioned that it is possible to evidence the behavioral change after the training because now he seeks to interpret the reality of what is happening in an interaction. As he observed: "What I felt the most changes were regarding the expectations related to the others because I seek the real interpretation, real feedback, and implementation of the team to bring them together to the common goals."

About body posture (B3), observed changes occurred when finding evidence such as that written by participant P49, who reported changes concerning his physiology: "I believe the behavior that changed the most was communicating more consciously, including my body posture, my tone of voice, and my facial expression."

Concerning facial expression (B4), statements such as that of participant P43 expressed the change observed in his body posture: "The issue of my physiology: tone of voice, facial expression, and body posture." About speech (B5), participant P14 noticed a change in how he pronounced himself when he stated: "I reviewed concepts, reformulated thoughts, speech, and actions. I remade myself in many moments." Regarding voice (B6), participant P36 assured that he has changed the way he uses his tone of voice and body expression after taking the training.

In relation to emotions (B7), participant P18 evidenced that there was a change in this aspect of interactions when writing that he started to pay more attention to his emotions and that of his interlocutors, citing that he changed in the element: "Paying more attention to the emotions of others and my own."

About attention (B8), there were changes in interactions after the training, from statements such as that of participant P35, who wrote about having started to pay more attention to people and their placements during interactions with him. He said, "From the course on, I started paying more attention in interactions with the people who work with me, trying to be more attentive and listening to complaints or ideas so that I could formulate a response."

Question 3 aimed to verify with the participants if there were changes in their daily lives and interpersonal relationships and to ask them to describe the changes if they occurred (Table 5). The results evidenced that category C2 indicated general changes, with 28 citations, and category C3, which showed the change that occurred in interpersonal relationships, had the highest number of quotations from the participants, 71 mentions.

Table 5 - Categories of question 3 and participants' quotations

Categories indicative of a change	Total quotations from participants
C2: General changes	28
C3: Interpersonal changes	71

Source: Data from research (2022).

Regarding the quotes that evidenced general changes (C2), a general transformation in the participants' interpersonal relationships was observed from statements such as that of participant P1, who started evaluating emotions before resolving issues and thinking more before making important decisions. The change occurred in the participant's words: "Evaluating my emotions before resolving issues, thinking more before making important decisions."

Concerning the change in interpersonal relationships (C3), participant P3 assured to be more focused on the subject during the interactions and seek more information about what was

discussed to be clear with her interlocutors. "During the interactions, I am fully focused on the subject and seek to gather as much information as possible and be clear."

Question 4 was designed to verify with the participants if they considered that the training brought subsidies for them to make themselves understood more clearly by students' parents and to demonstrate their justifications in the affirmative case (Table 6). The results indicated 67 justifications in Category D2 about the acquisition of subsidies to communicate more clearly with the student's parents, and 21 citations in Category D7 stated the existence of new results.

Table 6 - Categories of question 4 and participants' quotations

Categories indicative of a change	Total quotations from participants
D2: Justification	67
D7: Indication of new result	21

Source: Data from research (2022).

Regarding the justification (D2) about the training having brought subsidies for managers to communicate more clearly with the students' parents, participant P3 said he increased his interaction with parents and that he could clarify to them more about the school's operation rules. He stated, "My interaction with parents has increased and even the ability to clarify the School Unit's work rules, given the many questions from parents/guardians about the School Unit's methodology during the pandemic period."

Referring to the indication of new results (D7), directly connected to managers having received more subsidies to communicate with parents, participant P15 commented that, after the training, families began to participate more in school issues. The participant described the change as follows: "Yes, based on the course proposals, the interaction between family and school has advanced, even causing an impact on the participation of families in the school."

Question 5 was designed to verify if the participants considered the training brought subsidies for them to transmit information to their employees about procedures and processes to be more effective and to demonstrate their justifications if so (Table 7). There were 57 justifications in category E2 about the acquisition of subsidies to communicate more clearly with their employees, and in category E7, there were 14 citations that indicated the existence of new results.

Table 7 - Categories of question 5 and participants' quotations

Categories indicative of a change	Total quotations from participants
E2: Justification	57
E7: Indication of new result	14

Source: Data from research (2022).

Regarding the justification (E2), related to the training having brought subsidies for managers to transmit information to employees more effectively, participant P7 reported feeling more secure passing on information about procedures, norms, and follow-up on agreements.

The participant described, "Yes, today I feel safer to verbalize the procedures and norms, ask, question, teach, do together, and even, ask for the elaboration of the activities and agreements made with the team."

About the indication of new results (E7), referring to managers being able to pass on information more effectively, participant P15 stated that a very favorable climate was created with school employees, allowing communication to be organized more fluidly, generating more understanding and decreasing conflicts. According to the statement: "Yes, all learning has been of great importance in communication with school employees, thus creating a favorable climate, a structured and fluid communication channel was created. It brought subsidies for the transmission of information; I could observe that the understanding expanded, and there was a decrease in conflicts."

Question 6 was designed to verify with the participants if they considered the training helped them to deal with conflicts in an agile way with and among their subordinates and to demonstrate their justifications (Table 8). There were 63 justifications in category F3 about the acquisition of subsidies to communicate more clearly with their collaborators, and category F8 presented 23 citations indicating new results.

Table 8 - Categories of question 6 and participants' quotations

Categories indicative of a change	Total quotations from participants
F3: Justification	63
F8: Indication of new result	23

Source: Data from research (2022).

Regarding the justification (F3), referring to the training having helped managers to be agile in dealing with conflicts among their subordinates, participant P21 said he was more attentive to managing his emotions to find more control when facing conflicting situations. He mentioned: "Yes. I can perceive my physical reactions as a biopsychosocial being and find self-control through breathing in situations that can make me uncomfortable."

In relation to the indication of new results (F8), satisfactory changes were observed from reports such as that of participant P29, who described being more aware of conflicts, knowing how to deal with them better, and avoiding them sometimes. In his words, he detailed: "Yes, because many times the conflicts, now more visible to me, were generated by the lack of connectivity of those involved, sometimes by past frustrations, sometimes by lack of understanding of what was passed on to each team member, which avoided many reworks and many conflicts that could have arisen if the attitudes taken by me were based on what I used to do. This course was very good, productive, and reflective. I loved participating".

5 Discussion

From the results presented, it was possible to identify that the customized training based on neuroscience improved the communication skills of the group of managers, positively impacting their professional interactions. The results indicated positive changes after the training intervention regarding communication skills and professional interactions. Communicational skills are directly connected to how someone expresses themselves during

an exchange, and according to Navarro (2011), the human body forms a system of symbols that all other human beings can recognize and when expressed, can generate in the interlocutors' readings such as danger, fear, joy, closeness, and repulsion.

Given the results, the participants began to express themselves in a way to bring their interlocutors closer to the changes that occurred in their communicational skills. This corroborates what Maturana and D'Ávila (2015) said about the type of relational space that builds more and better conditions for human beings to become more collaborative with each other and manage to develop in living with others. Therefore, the improvement in communicational skills provided by the training which were expressed through the change in communication elements identified in the categories found, such as body posture, facial expression, speech, voice, emotions, and attention (WEIL; TOMPAKOW, 2015; NAVARRO, 2021; CHUN, 2000; NAVARRO, 2011; LIN; MAKEDON, 2010), reflected in the improvement of school managers' professional interactions with students' parents and with their collaborators. These results align with previous studies (OGAWA; FILIPAK, 2013; VERMA; PANDE, 2016), which indicated that developing communicational skills would improve managers' interactions.

In summary, based on the findings about the communication elements that directly impacted the change in the managers' communication skills, body posture, facial expression, speech, voice, emotions, and attention were the ones that presented the most explicit changes in the managers' perception since their confirmation came from the qualitative reports. Regarding the communicational skills, the first one was related to the managers' interaction with the students' parents, and there was an improvement in these skills. Perrenoud (2000) stated that for some professionals, dialoguing with parents is a reason for wear. When the participants reported an improvement in making themselves understood, it was suggested that there was a greater closeness in the interactions between the managers and the students' parents.

Another communication skill explored and improved with the training was communicating with employees in an agile way to solve conflicts. Given the participants' reports, a change in the condition of knowing how to deal with conflicts was suggested. The ability to deal with conflicts is vital for managers, and according to Knapik (2011), when a manager learns how to deal with conflicts in the school, new learning spaces open within the team. It is also suggested that there may have been a strengthening in the relationships between school professionals because, according to Guimarães and Filipkowski (2021), to the extent that professionals can deal with conflicts more consciously, there is a greater closeness between people, with strengthened relationships and increased production. Moreover, conflict resolution is achieved through communication, which corroborates an improvement in the participants' communication skills.

The last communicational skill investigated was that of transmitting information to employees related to processes and procedures in an effective way. From the training application, managers improved this ability. Therefore, it was possible to identify changes after the training, indicating a possible improvement in the group's deliveries and communication. According to Knapik (2011), by changing the quality of interactions in the professional environment, the psychological climate improves, improving the productivity of the people involved. When there is an improvement in relational skills, there is a willingness the exchange, feedback, and openness to receive suggestions and give them, indicating an improvement in professional interactions.

6 Conclusion

This study aimed to analyze the perception of public school primary education managers regarding improving their communicational skills in their professional interactions after taking customized training based on neuroscience and oriented to developing communicational skills. The findings showed that the objective was met and that the participants' perceptions confirmed a positive change regarding the perceived communicational skills in their professional interactions.

Customized training based on neuroscience contributed to the effectiveness of better results in the professional routine of the participants. By knowing more about how human beings work, the participants understood how their way of communicating directly impacts their interactions and could adjust their body posture, facial expressions, speech, voice, emotions, and attention in daily school situations. Therefore, it is possible to believe that the participants improved their communication skills with the school community since they perceived the transformation in communication elements during their interactions.

From a practical perspective, the training enabled the managers to deal more effectively in situations with the school community because they learned to communicate more clearly and closely with the students' parents and employees and began to deal with conflicts more agilely. Therefore, it is suggested that communication skills can directly influence communication processes and their results.

It is concluded that it is essential to create new training that improves school managers' communication skills, including neuroscience, focusing on understanding human functioning. As a result, these professionals, responsible for leading the environments that promote the early development of future Brazilian citizens, will have more resources to provide an effective school environment.

The limitation of the study may be in the data collection period, which occurred during the COVID-19 pandemic and may have influenced participation and engagement during the meetings and training activities. For further studies, it is possible to replicate the training with school managers in other cities to confirm the results obtained in this study. Also, new studies may quantitatively confirm the influence of communication elements in human interactions to confirm the results obtained in this study. It is also possible to investigate other aspects of communication than those researched here.

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