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Towards a methodology to integrate knowing-being with emotions, speech acts and natural language processing in conversational agents

Bárbara María-Esther García-Morales¹, María Lucila Morales-Rodríguez¹, Adriana Morales-Rodríguez², Rubén Salas-Cabrera¹

¹ Tecnológico Nacional de México, Instituto Tecnológico de Ciudad Madero, Ciudad Madero, Tamaulipas, México

² Tecnológico de Monterrey, Altamira, Tamaulipas, México.

D10070255@cdmadero.tecnm.mx, lucila.mr@cdmadero.tecnm.mx, adrianamorales@tec.mx,
ruben.sc@cdmadero.tecnm.mx

Abstract. This research aims to integrate a Conversational System in virtual educational environments, reflecting the three dimensions of educational knowledge: knowing – knowing, knowing – doing and knowing – being. Its purpose is to improve the personalization and quality of online learning through educational coaching. Although online interaction is increasingly relevant, current systems do not holistically integrate these three areas of knowledge. This study focuses on modeling "knowing – being", using speech act theory, socratic dialectic and personality profile to generate responses that encourage active and reflective listening. Through natural language processing, the intelligent agent can interact more effectively, acting as a virtual coach that provides empathetic and personalized feedback. The research seeks to optimize virtual learning environments and advance the simulation of realistic interactions with virtual entities.

Keywords: Conversational System, Artificial Intelligence, Empathy, Educational Coaching, Natural Language Processing.

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1 Introduction

In the educational field, there are fundamental principles that ensure quality teaching, among which knowledge, the application of pedagogical techniques and the human dimension of the teacher stand out. In this context, advances in information technologies and artificial intelligence have opened new possibilities to transform education, highlighting the use of intelligent conversational agents as a key tool in educational support.

These agents, equipped with natural language processing algorithms and advanced machine learning techniques, not only emulate the knowledge of a teacher, but play a more integral role: that of an educational coach. Through personalized interaction, these intelligent systems have the ability to adapt to the unique profile of each student, providing continuous feedback, adjusting their responses and using dialectics and empathic listening as pillars to guide the learning process.

The highlight of this innovation is that the conversational agent is not limited to the transmission of information, but rather creates a dynamic, interactive and deeply human educational environment. Its ability to adjust responses based on the students' emotions and reactions offers closer, more accessible and effective educational support. In this way, not only is the traditional role of the teacher redefined, but the relationship between the student and technology is transformed, providing a personalized and meaningful learning experience.

Artificial intelligence applied to educational coaching marks a new era for personalized education, in which the interaction between the student and the machine stops being a simple transaction and becomes a collaborative and enriching process.

2 Redefining teaching through knowledge and empathy

This work integrates various theories and fundamental concepts that serve as a basis for the design of a virtual coach focused on active and reflective listening. These include the three types of knowledge in education, speech act theory, socratic methodology, virtual conversational agents, as well as active, reflective and empathetic listening approaches. The connection between these elements helps to understand how an educational environment can be transformed through interactions that promote reflection and empathy.

2.1 The three approaches to knowledge in education

The three approaches to knowledge ("knowing – knowing", "knowing – doing", "knowing – being") offer a comprehensive framework for understanding the different aspects of learning. "knowing – knowing" refers to theoretical knowledge acquired academically. "knowing – doing" deals with the practical application of that knowledge in specific situations. Finally, "knowing – being" focuses on socio-emotional competencies, ethics and empathy, essential for effective interaction with others (Cuadra-Martínez et al., 2018).

This project places special emphasis on "knowing – being", considering that emotional and ethical skills are fundamental to improve educational coaching. A coach's ability to understand and empathize with students not only fosters an inclusive environment, but also creates space for deeper, more meaningful learning.

2.2 Language as action: speech act theory

Speech act theory, initially developed by John L. Austin (1962) and later deepened by John Searle (1969), maintains that language not only serves to communicate ideas, but also to perform actions. Speech acts are divided into three types: locutionary (literal content), illocutionary (intentions of the speaker) and perlocutionary (effects on the listener).

Within the context of a virtual coach, illocutionary acts acquire special relevance, since they are what allow generating responses that invite reflection and understanding. In this way, the virtual coach can create a space where interactions are more than informative, transforming into opportunities for deep and meaningful learning.

2.3 The socratic method in learning

The socratic methodology is an educational approach based on dialogue and reflective questions García-Morales et al., (2023). Its objective is to guide students in a process of self-discovery, encouraging them to build their own knowledge based on powerful questions such as What?, How?, Why? and for What? These types of questions seek not only to increase understanding, but also to encourage critical and autonomous thinking.

Incorporating socratic dialectics into a virtual agent allows not only to generate a space for deep reflection, but also to bring the user closer through a more empathetic and close dialogue. Integrating various types of listening to create reflective questions and phrases can contribute to more reflective and, at the same time, more human learning.

2.4 Types of listening in the educational context

Listening plays a fundamental role in building meaningful relationships within the educational field. This work distinguishes three types of listening: active, reflective and empathetic.

- Active listening: It involves full attention to the interlocutor, showing interest both verbally and non-verbally. This way of listening facilitates mutual understanding through reformulation and synthesis (Delgado, 2023).
- Reflective listening: Focused on the analysis of prejudices, beliefs and emotions during the interaction, promoting self-reflection in both the listener and the speaker.
- Empathic listening: It goes beyond words and seeks to capture the underlying emotions, providing responses that validate and emotionally support the interlocutor (Naranjo, 2018).

Furthermore, empathic listening is divided into different levels, ranging from understood listening (where the listener shows that he has understood the message) to brotherly listening, which facilitates collaboration and deep understanding between the parties (EALDE, 2016). This ability, essential in human interactions, can be implemented or emulated in virtual agents designed as learning facilitators.

2.5 Virtual agents as learning facilitators

Virtual agents are systems that use natural language processing algorithms to simulate human interactions (Morales-Rodríguez et al., 2008). These agents are essential in the educational field, since they allow personalized and fluid communication, adapting to the context and needs of the user.

In this work, the virtual agent fulfills the function of a coach that integrates the three approaches to knowledge. Through techniques such as personality modeling and empathic listening, the virtual agent seeks to provide a closer and more human educational experience. By incorporating artificial intelligence techniques, the agent can emulate empathetic listening, adapting its responses to the student's emotions in real time, creating a more dynamic and personalized educational experience. This can be achieved by analyzing tone of voice, text patterns and emotional cues detected in user responses, allowing for interactions that effectively simulate human empathy.

The combination of the elements discussed allows us to create an interaction model that favors active and reflective learning, adapted to different educational contexts. The integration of artificial intelligence not only optimizes the personalization of learning, but also reinforces the importance of empathy and reflection in educational development, opening new opportunities for more humanized and effective coaching.

3 Related works

This project is supported by a series of previous research and technological developments that serve as a basis for the creation of a virtual coach focused on educational knowledge and being. Below is an analysis of the key works and theories that are closely linked to the purpose of this project:

3.1 The three approaches to knowledge in education

Approaches to knowledge, such as "knowing-knowing", "knowing-doing" and "knowing-being", have been widely analyzed in educational literature. According to Cuadra-Martínez et al. (2018), "knowing-being" is crucial for the development of socio-emotional skills in students. In this context, the project seeks to integrate "knowing-being" in the design of a conversational agent, an approach that has not been widely explored in previous studies, despite its relevance in the comprehensive training of students.

3.2 Empathic, reflective and active listening in learning

Listening plays a fundamental role in interactions and learning. Rogers (1957) introduced active listening as a tool to build trust and improve understanding between parties. Subsequently, Egan (2014) and Rosenberg (2022), highlighted the importance of empathetic listening to facilitate deep emotional connections and enrich the educational process. The integration of these different levels of listening in conversational agents allows for the creation of more meaningful and student-centered interactions. To understand the meaning of phrases within the interactions between the coach and the coachee, it is necessary to resort to communication theories such as speech acts, which can describe the characteristics of phrases in a dialogue.

3.3 Speech act theory and its application in virtual agents

Speech act theory, formulated by Austin (1962) and developed by Searle (1969), provides a fundamental theoretical basis for understanding how language can generate actions. Recent research, such as that of Delgado-Hernández et al. (2019), applies this theory in the design of conversational agents, demonstrating how illocutionary acts can structure effective dialogues. This project advances by incorporating speech acts with the goal of generating reflective and empathetic responses in an educational environment, which can enrich the learning experience.

3.4 The application of socratic dialectics in virtual environments

Socratic dialectic, which promotes self-discovery and deep reflection through key questions, has been explored in digital environments by authors such as Castellero Mimenza (2018) and García-Morales et al. (2023). These works demonstrate how socratic questions in virtual systems can improve problem solving and foster critical thinking. This project uses the socratic methodology to promote reflection and independent thinking in users through a virtual agent.

3.5 Serious games and conversational agents

A relevant example of the use of serious games in education is Virtual Speech: Immersive Soft Skills Training Thompson & Barnard (2016), which uses immersive environments to train soft skills. Although this game seeks to improve communication skills, its focus is limited, since it does not holistically integrate the three educational knowledge. This project differentiates itself

by incorporating "knowing-being" as a central axis, using reflective and empathetic methodologies to promote a more complete socio-emotional development.

Unlike Virtual Speech, which focuses on the development of specific skills within predetermined scenarios, the virtual coach proposed in this project adapts dynamically to the individual needs of the user. Through a conversational agent, it seeks to promote personalized and close learning, integrating empathetic listening and the adaptation of content according to the user's characteristics.

These key functions of the virtual coach adjust to the personality of the coachee, creating an immersive environment within the educational context. In this way, teaching is achieved that reflects the personality of the user, functioning as an emotional mirror that enriches the dialogue and favors a more authentic and meaningful learning experience.

3.6 The integration of personality in virtual agents

Modeling personality in conversational agents, using theories such as the five-factor model (OCEAN), has proven to be effective in personalizing interactions. Castro-Rivera (2018), observed that personality traits can help virtual agents reflect more human behaviors, which improves their credibility and effectiveness. This project extends this approach by linking the user's personality with the creation of thoughtful and empathetic questions, facilitating deeper and more meaningful interaction.

3.7 Advances in artificial intelligence for the personalization of empathy

A key area of recent advancement in educational technology is the use of artificial intelligence (AI) to emulate empathy in virtual interactions. According to OpenIA (2021), tools like ChatGPT have demonstrated the potential of AI systems to generate natural and contextual conversations, although they lack a systematic focus on reflective methodologies. This project aims to integrate empathy more deeply through algorithms that detect emotional signals in interactions, adapting the agent's responses to foster a more humanized and student-centered educational experience.

4 Artificial intelligence in virtual coaching: language processing, emotions and empathy for a transformative education

The architecture and design of a virtual coach focused on the emulation of educational knowledge - being in virtual environments, in this work, is based on the integration of the three knowledges of education (knowing - knowing, knowing - doing and knowing - being), with the use of empathetic, active and reflective listening methods. This system is designed to promote meaningful communication between coach and coachee, creating a learning environment that is both personalized and reflective.

4.1 Proposal for the structure of the virtual coach.

The project architecture is founded on key principles of intelligent systems, such as reactivity, internal state and objectives, allowing it to dynamically adapt to user needs. For its construction, the BDI (Belief-Desire-Intentions) architecture has been chosen Iglesias-Fernández (1998), which incorporates essential characteristics such as autonomy, sociability and reasoning, and allows the symbolic representation of the elements of the real environment. In this context, the agent's beliefs are related to his personality, reflecting both his identity and the environment in which he interacts. Desires, on the other hand, align with the agent's goals, such as asking structured questions based on dialectics and the user's personality. The agent's intentions refer to its ability to offer suggestions that foster a reflective environment, allowing the user to explore and generate their own solutions to the problems posed.

The architecture incorporates advanced models developed in the field of behavioral simulation, an area taught at the Ciudad Madero Technological Institute. In particular, the model of García-Morales et al. (2022) is used, which focuses on conversational analysis through speech acts, as an integral part of the dialectical technique used to structure the dialogue. In addition, the personality model proposed by Castro-Rivera (2018) is integrated, which allows calculating the parameters that define the behavior and preferences of the virtual coach. This ensures that the questions and phrases asked by the agent are not only coherent, but also respectful and appropriate to maintain a fluid and appropriate interaction at all times.

This architecture is broadly composed of three main components: sensors, cognitive process, and actuators. The sensors component includes the information reception module. Figure 1 details the general architecture of the Intelligent Virtual Agent (IVA). In the cognitive process, the three knowledges of education are modeled: knowing – knowing, knowing – doing and knowing – being. Knowing – knowledge is represented through the characterization of speech acts, which allows the agent to

understand the context in which it operates. Knowing – doing is related to the appropriate use of techniques within educational coaching; To do this, a question selection model based on socratic dialectics is integrated. For its part, knowing – being addresses the agent's ability to respond with congruence, empathy and security in their work environment. The actuators component includes the graphical user interface module.

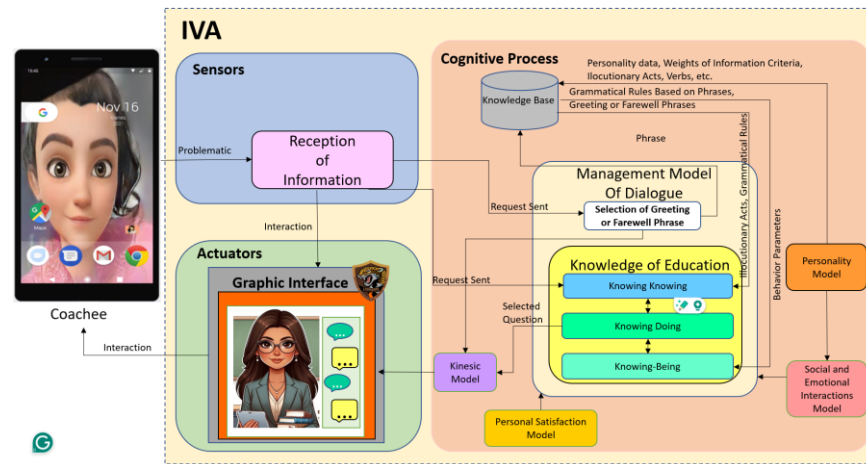


Fig. 1. General architecture of a virtual coach.

4.2 Analysis and design to model empathy: integration of knowing-being and knowing-knowing through intention, personality and emotions in a virtual coach

In the current context of artificial intelligence, the design of conversational agents has evolved beyond simple logical and functional interaction. The aim is for these agents not only to understand the explicit intentions of the users, but also to respond empathically, recognizing and adapting to the emotions and personalities of the interlocutors. This approach not only addresses knowing how to know, related to technical and factual knowledge, but also focuses on knowing how to be, which encompasses the ability of agents to interact in an emotionally intelligent and empathetic way.

In this work, the necessary characteristics to model empathy in virtual agents are presented, through an analysis and design that integrates the dimensions of intention, personality and emotions in natural language processing. By combining these elements, the aim is to create a conversational agent that not only responds, but also reflects and adjusts to the user's emotional and cognitive profile, favoring a more enriching and personalized experience.

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In the context of a socratic dialogue, the impact of words in a conversation can be characterized by quantifying the illocutionary verbs present in the sentences. This quantification aims to reflect how each verb influences the development of the dialogue, according to various information criteria. These criteria are fundamental to evaluate the importance, clarity and lexical enrichment of the words contained in a phrase, considering their function within speech acts. The information criteria proposed in this analysis are:

1. Importance of the Information (II): This criterion measures the relevance that an illocutionary verb brings to the informative context of the dialogue. It is an indicator of how the verb influences the direction or structure of the speech.
2. Clarity of Information (CI): Reflects the precision and transparency of the information transmitted by the verb. It measures how clear and direct the message is in the context of the dialogue.
3. Lexical Enrichment (LE): This criterion evaluates the lexical value that the verb contributes to the dialogue. It reflects the verb's ability to add semantic nuance, complexity and depth to speech.

4.3 Quantification of information criteria proposed in this work

Each information criterion is measured on a scale from 0 to 1, allowing the impact of an illocutionary verb to be evaluated within a socratic dialogue. This scale is detailed below, with specific values that reflect different levels of impact:

- **Null impact (0):** This value indicates that the illocutionary verb or word used has a negligible impact on the dialogue. Their presence does not contribute effectively to the information or the dynamics of the conversation. For example, a greeting or a word of courtesy may have zero impact, since it does not provide significant content to resolve a problem or advance the conversation.
- **Low impact (0.33):** This value indicates a limited impact of the verb in the dialogue. The illocutionary verb contributes to the conversation to some extent, but its relevance is minimal. Often, these verbs are useful in an introductory context or in basic social interactions, but they do not play a prominent role in furthering the topic under discussion. An example may be a superficial question that does not delve into the content of the problem, but that initiates a direction for dialogue.
- **Medium impact (0.66):** A verb with medium impact has a moderate contribution to the dialogue. The information provided is relevant and helps advance the development of the topic, but does not necessarily establish a significant change in the direction of the conversation. These verbs are common in the development of ideas and serve to create links or connections between different aspects of the dialogue, without necessarily solving the central problem directly. An example could be a statement that provides important details, but is not conclusive or decisive in moving the conversation forward.
- **High impact (1):** This value represents a maximum impact, where the illocutionary verb has a significant and direct relevance in the development of the dialogue. Verbs with high impact are usually those that guide the direction of the conversation decisively, providing essential information to resolve a problem or reach an important conclusion. For example, a key statement or a powerful question that prompts deep reflection are verbs that can have a high impact, as they are fundamental to the progress of dialogue and the clarification of ideas.

Table 1 presents the impact quantification ranges and nominal values used to evaluate the information criteria in this study.

Table 1. Generic phrases with maieutics and irony.

Criterion	Low impact (0)	High impact (1)
Importance	Minimal or no relevance	Significant relevance.
Clarity	Ambiguity or imprecision	Total precision and clarity.
Lexical Enrichment	Lexical poverty	Enriching lexical contribution.

This quantification allows us to characterize the impact of each illocutionary verb in the dialogue, assigning each word of the phrase a value according to the aforementioned information criteria. The application of this approach is an adaptation of the methods used in the work of García-Morales et al., (2023). Adjusted for its implementation in this project.

According to the perception of each verb in a socratic dialogue, nominal information impact values have been assigned according to the relevance of each illocutionary verb in the context of the dialogue. For example, a greeting in a socratic dialogue has less impact compared to an affirmation, since a greeting does not provide information useful for solving a problem, while an affirmation can offer key details that advance the conversation.

Table 2 presents the quantification of the impact of the information criteria: Importance (II), Information Clarity (IC) and Lexical Enrichment (LE), applied to the different illocutionary acts listed in Table 3. If the value of the importance of the information exceeds 0.33 and the type of illocutionary act does not belong to the class of expressive acts, the coach could use this information to structure a powerful question, based on the effect (verb perlocutionary) that you perceive in the communicative intention of the phrase.

To characterize phrases within socratic dialectic, a key relationship is established between the types of illocutionary classes and the types of powerful questions. This relationship allows the coach to ask specific questions based on the type of illocutionary class present in a sentence. For example, if a sentence contains an illocutionary verb of the assertive class, the coach can ask a clarifying question, which seeks to obtain a more detailed explanation of a statement made by the interlocutor. This interaction is essential to deepen the conversation and explore ideas more effectively.

The socratic dialogue technique can be effectively applied in virtual coaching by integrating structured textual concatenations with predefined phrases. These phrases are drawn from a corpus specifically designed to reflect both the formulation of socratic questions and general dialogue-based interactions. In this study, a sentence generation mechanism has been implemented that allows the contextual integration of socratic elements by adding certain introductory words to the base sentences.

Table 2. Quantification of illocutionary verbs and impact criteria.

Illocutionary verb	Perlocutionary verb	Type of illocutionary class	Illocutionary force	II (Importance)	CI (Clarity)	EL (Lexical Enrichment)
Greet	Greet	Expressive	Greeting	0.33	0.33	0.66
Thank	Thank	Expressive	Gratitude	0.33	0.33	0.66
Dismiss	Dismiss	Expressive	Farewell	0.33	0.33	0.66
Approve	Approve	Declarative	Approval	0.66	1	0.66
Question	Question	Executive	Ask	0.66	0.66	0.66

4.4 Use of socratic dialectic in phrases

The integration of socratic dialectics into the system aims to encourage reflection through the use of phrases that employ maieutics and irony. Phrases generated to represent maieutics include: What do you think is the reason why? And how do you think that? To represent irony, phrases such as: Why do you think that? And what do you think is the cause that? These phrases are predefined to encourage a dialogue that provokes reflection in users.

Table 3. Generic phrases with maieutics and irony.

Dialectics		Phrases				
Maieutics	What do you think is the reason why...	What do you think is the reason why...	What will be the reason why...	How did I believe that...	How do you think...	How is...
Irony	Why do you think that...	Why...	Why did I think that...	What do you think is the reason why...	What do I think is the reason why...	What reason could it be for...

For example, introductory words such as "Feels", "Wants", "Has", "Had", "Se", "Le(s)", "Feel(s)", "Want(s)", "Has (n)", "I wanted(n)", "I had(n)" and "I felt(n)" serve as modular components that enrich the formulation of contextualized socratic questions. A practical example involves a base phrase taken from the corpus, such as "Do you have difficulty with calculus?" or "Are you referring to the calculus subject?" These base phrases are combined with a socratic interrogative structure taken from Table 1, generating expanded formulations such as "What is the reason why you have difficulty calculating?"

In this process, the segmentation of the dialogue is divided into two fundamental parts: a predefined structure that acts as a question pattern and content dynamically recovered from the corpus. The first part, which corresponds to the formulation of the socratic question, allows the user's reasoning to be guided, while the second part is adapted to the specific situation of the dialogue. In this way, a dynamic and adaptable conversational framework is achieved, aligned with personalized coaching strategies.

Table 4 classifies this relationship into five different groups, connecting illocutionary classes with the types of powerful questions a coach might ask, depending on the nature of the statement or communicative action performed. Below is the table that reflects this connection.

Table 4. Relationship between the different types of illocutionary class and the types of powerful questions.

Type of illocutionary class	Power question type
Assertive	Clarifying questions.
Committed	Perspective questions.
Executive	Questions that require reason and evidence.
Declarative	Questions about causes and consequences.
Expressive	Origin questions.

Table 4 shows the relationship between the type of dialectical question, interrogative pronouns and perlocutionary verbs that are used to structure powerful questions in a socratic dialogue, specifically under the techniques of maieutics and irony. In the socratic maieutics approach, which is based on guiding the interlocutor toward self-exploration and deep understanding, the pronouns Which? or How? These pronouns are appropriate when the perlocutionary verbs involved are Offer, Promise, Seek, or Predict. These verbs are associated with creating expectations, offering options, or making predictions, making questions formed with Which? or How? They are useful to obtain a more detailed and in-depth reflection on these topics.

On the other hand, when using the socratic irony technique, the goal is to ask questions that lead the interlocutor to question or reconsider an idea or statement. In this case, the pronouns Why? or What? are the most appropriate to structure the question. Perlocutionary verbs associated with irony include Approve, Affirm, and Admit, which are used to make statements or validate statements, which can then be questioned through ironic questions to explore the reasons behind those statements.

This relationship between perlocutionary verbs, interrogative pronouns and the type of dialectical question is crucial to structuring the dialogue effectively, allowing the coach to guide the interlocutor towards a greater understanding of their own thinking.

Table 5. Relationship of the type of question based on dialectics, pronouns and perlocutionary verbs.

Dialectic question type	Interrogative pronoun	Perlocutionary verb
Maieutics	Which? / How?	Offer, Promise, Seek, Predict.
Irony	Why? / What?	Approve, Affirm, Admit.

In the design of conversational agents, it is essential to consider not only the logical structure of the communication, but also the emotional and personality dimensions that influence the interaction. Speech acts, such as expressions of statements, questions, or promises, are fundamental to understanding how communication occurs. These acts not only reveal linguistic intentions, but also interact with the personality of the speaker, reflecting their communication style, whether directive, expressive or engaged.

4.5 Relationship between attributes of illocutionary classes and MBTI-KTS labels

In this way, a relationship is established between the attributes of the illocutionary classes and the labels of the MBTI-KTS model, where it seeks to correlate personality types with the illocutionary classes used in a socratic dialogue. By identifying the attributes of the phrases expressed by the participants (coachee and coach), each personality type is associated with a specific illocutionary class, allowing for more precise and empathetic communication, aligned with the emotional and cognitive profile of each individual.

The following table describes this relationship between MBTI and KTS models.

Table 6. Relationship between MBTI-KTS labels and illocutionary class types.

MBTI-KTS label	General description	Type of illocutionary class	Description of the type of illocutionary class
ENTJ	Strong and decisive, assume leadership easily	Assertive	States or admits some fact.
ENFJ	Energetic, empathetic, help your neighbor	Committed	Commits or offers to perform a certain act.
ESTP	Energetic, thrill seeker	Executive	Question and request elements of previously planned events.
ISFP	Friendly and helpful avoid conflicts	Declarative	Approves information received by the issuer.
ESFP	Encouraged, values common sense	Expressive	Express happiness, pleasure or complaint, for example, through a greeting or farewell.

Table 6 presents a relationship between the labels of the MBTI-KTS personality model and the types of illocutionary classes, which are fundamental to understanding communicative interactions. Each personality type (such as ENTJ, ENFJ, ESTP, ISFP, and ESFP) is associated with a specific illocutionary class, which describes the type of speech act used in a dialogue. For example, the ENTJ, known for being strong and decisive, tends to employ an assertive illocutionary class, where a fact is stated

or admitted. The ENFJ, empathetic and energetic, leans towards a committing act, in which he or she commits to performing or completing an action. The ESTP, characterized by their energy and excitement seeking, uses a directive style, questioning or requesting planned facts. The ISFP, friendly and helpful, uses a declarative class, where it approves information received.

Finally, the ESFP, lively and valuing common sense, adopts an expressive tone, communicating emotions such as happiness or complaint through everyday interactions. This correlation allows us to analyze how personality characteristics influence the type of communication used, facilitating a deeper understanding of the interaction in educational or coaching contexts. Another important part in the generation of conversational agents are emotions, which play a crucial role, since they affect the way in which messages are perceived and responded to in the dialogue.

4.6 Emotions and personality in conversational agents: reflecting knowing-being through empathic interaction

Emotions and levels of empathy are closely related, as empathy involves the ability to understand and share the feelings of others. In the context of educational coaching, a teacher's knowing how to be is transformed into a fundamental competence that integrates the teacher's emotional, empathic and reflective skills, with the aim of facilitating the learning and comprehensive development of students. This approach not only focuses on the transmission of content, but on the ability to guide, accompany and understand the emotions and needs of students through an interactive and personalized process. When this process is facilitated by a conversational agent, the teacher's role is complemented with a digital tool that also has the ability to recognize and manage emotions and interactions, creating an educational space that integrates coaching with emotional intelligence.

4.7 Relationship between "knowing knowing to being", listening levels and primary emotions

The "Knowing Knowing to Being" of a teacher implies not only technical knowledge, but also a great capacity for emotional connection with students, especially in an educational coaching environment guided by a conversational agent. The teacher must be able to adjust his or her responses, both in content and form, according to the student's emotional state and the type of conversation.

1. **Knowing Knowing to Being and Levels of Listening:** A teacher who has a high "Knowing Knowing to Being" knows how to identify when he or she needs to listen deeply, paying attention to the primary emotions that emerge in the interaction with the student. Active and reflective listening plays a crucial role in creating a space of trust where the student can express himself openly, and the teacher can adapt his intervention based on the emotion detected.
2. **Knowing Knowing to Being and Primary Emotions:** Primary emotions (joy, anger, sadness, fear) influence the way students interact. A teacher with a good "Knowledge of Being" is capable of recognizing these emotions and adjusting to them, modulating their pedagogical approach. For example, if a student is experiencing fear, the teacher can opt for a more engaging approach, ensuring the student feels supported, while if the student expresses joy, the teacher can be more expressive and encourage that positivity.
3. **Connection of Listening and Emotions in the Conversational Agent:** The conversational agent, being a tool that assists the teacher in the interaction, must be able to identify these levels of listening and emotions to adjust their responses. If the agent detects that a student is in a sad emotional state, it could generate a more empathetic and understanding type of response, while, if anger is detected, the response could be more directive or focused on problem solving.

To create a system based on empathic listening, it was necessary to study how human interactions occur in educational contexts and adapt these principles to a virtual agent. Three types of essential listening were identified: active, reflective and empathetic, each with key characteristics and associated emotional elements. Based on this analysis, phrases were designed that reflect these levels of listening within an educational coaching context.

The construction process included the following steps:

1. **Identification of Levels of Listening:** The six levels of empathic listening were explored to understand how they progress from simple understanding to a deep emotional connection.
2. **Key Empathic Elements:** Elements such as validation, trust and emotional support were selected to strengthen the relationship between the virtual coach and the user.
3. **Creation of the Corpus of Phrases:** Using these elements, specific phrases were designed that allow the virtual coach to reflect empathetic listening and generate trust in the coachee.

This structuring seeks to ensure that the virtual agent not only offers informative responses, but also fosters a learning experience deeply connected to the emotions and personal context of the coachee.

Table 7. Relationship between primary emotions and listening levels.

Primary emotions	Understood	Served	Trusted	Close	Brother
Happiness	—	Yes	Yes	—	—
Anger	—	Yes	—	Yes	—
Sadness	Yes	—	Yes	Yes	—
Fear	Yes	—	—	—	Yes

This table 7 shows how primary emotions are related to the different levels of listening in the context of educational coaching guided by a conversational agent. Each level of listening reflects a different emotional state in which the coachee or coach is: The level of Understood: It is mainly linked to the emotions of sadness and fear, since these emotions are usually perceived as needs for understanding or emotional validation. , the Attended Level: It is associated with the emotions of joy and anger, since both emotional states require active listening that validates the message without the need for in-depth analysis, the Trusted: It is related to joy and sadness, since in these cases the Trust relationship facilitates more open communication and the willingness to share emotions without reservation, while the Close: It is linked to anger and sadness, since the emotions of frustration or pain usually motivate a need for closeness and empathy in the conversation and finally the Brother level: With fear the which is the one most associated with this level, because when the interlocutor is scared, the level of empathy must be deep to generate a feeling of security and support, almost fraternal.

A person's emotional profile plays a critical role in how emotions are experienced and perceived during an interaction, especially in the context of active listening. When a teacher or conversational agent understands a student's underlying emotions, they can adapt their listening approach, whether to create an environment of trust, closeness, or support. Primary emotions such as joy, anger, sadness and fear are reflected in the levels of active listening and its empathic elements.

Active listening not only involves hearing, but also understanding and connecting emotionally with the interlocutor. In this context, empathic elements such as mindfulness, understanding and emotional support are activated according to the emotional profile of the listener. For example, when a student expresses sadness, a teacher with a high level of empathy can activate an attended listening level, providing the attention necessary to understand and alleviate the emotion. Likewise, if the student is showing anger or frustration, close listening can be crucial to allow for more open communication and achieve resolution.

Thus, individuals' emotional profiles directly influence how emotions are managed within the active listening process, creating a cycle of interaction in which emotions are validated and responded to appropriately to foster more effective and understanding communication.

Table 8. Relationship between primary emotions and illocutionary classes.

Primary emotions	Expressive	Declarative	Executive	Assertive	Committed
Happiness	Yes	Yes	—	—	—
Anger	—	—	Yes	Yes	—
Sadness	Yes	Yes	Yes	—	—
Fear	Yes	—	—	—	Yes

This table 8 shows how the primary emotions (joy, anger, sadness and fear) are related to the illocutionary classes (expressive, declarative, directive, assertive, compromising). Each illocutionary class is a type of speech act that serves a different function in a conversation, and these primary emotions influence how these acts are performed:

- Joy: It is mainly related to expressive and declarative illocutionary acts, since joy usually manifests itself as an expression of well-being or approval.
- Anger: It is typically linked to directive and assertive acts, since anger often drives actions to control or affirm the situation.

- Sadness: It is associated with expressive, declarative and directive acts, since expressions of sadness can be both descriptive and reactive to situations that affect emotionally.
- Fear: It is related to expressive and compromising acts, since fear can trigger an emotional expression of concern or an offer of security and commitment to resolve tense situations.

Table 9. Relationship of primary emotions, illocutionary classes and listening emotions.

Primary emotions	Illocutionary classes	Emotions of listening
Happiness	Expressive, Declarative	Understood, Trusted.
Anger	Directive, Assertive	Close, Attended.
Sadness	Expressive, Declarative, Directive	Understood, Trusted, Close.
Fear	Expressive, Commissive	Understood, Brother.

Primary emotions, illocutionary classes and listening emotions directly influence the interaction and response in a conversation. For example, joy is associated with expressive or declarative illocutionary classes, favoring open and affirmative communication, and close and trusting listening. On the other hand, anger generates directive or assertive responses, with listening aimed at managing the conflict and validating frustration. Sadness, being more complex, can involve combined illocutionary classes (expressive, declarative and directive), with listening that oscillates between knowledgeable and close. Finally, fear is linked to expressive and compromising illocutionary classes, offering comfort and support, with deeply understanding listening.

4.8 Design of phrases with empathic, active and reflective listening

Empathetic, active and reflective listening is made up of various emotions that are reflected in the dialogue, seeking to generate trust, understanding, cooperation and closeness with the recipient. This allows for more effective communication, eliminating barriers or formalities typical of a conventional conversation. For example, when interacting with someone unknown, the lack of mutual information can make problem solving difficult, which may require several dialogue sessions. The number of these sessions will depend on the trust established between the interlocutors, whether quickly or long term.

Table 10. Relationship between MBTI-KTS labels, illocutionary class types and listening levels.

(MBTI-KTS) label	Illocutionary class type	Illocutionary class description	Empathic listening levels	Emotion description
ENTJ	Assertive	Affirm or admit some fact	Attended	Bond. Level of active listening, showing interest in what is being said and paying full attention.
ENFJ	Committed	You commit to Offers to meet certain act	Brother	Humanize the conversation, showing that you genuinely want to help like a brother.
ESTP	Directive	Question and request the elements of the planned events previously	Close	Use the same language to show that you can belong to the same world of the interlocutor.
ISFP	Expressive	Approve the information received by the sender	Trusted	Create a climate of trust, showing a willingness to listen without prejudice or judgment.
ESFP	Expressive	Express happiness, pleasure or complaint, for example through a greeting or farewell	Understood	Understand the meaning of message for clearer communication and empathetic.

Active listening involves the emotions of “attended” and “understood”. Empathic listening is formed from the emotions of “trusted” and “brother”. Lastly, reflective listening is primarily associated with the emotion of “close”. These emotions are grouped as moral, instrumental and empathic emotions. They are linked to the primary emotions (joy, anger, sadness and fear) and to the illocutionary classes of speech acts (expressive, declarative, directive, compromising and assertive), due to the similarities in their descriptions. Table 10 shows how Empathic listening levels (attended, brother, close, trusted and understood) are related to illocutionary classes through their descriptive characteristics, in the context of educational coaching.

Each personality type of the MBTI-KTS model is associated with a specific illocutionary class (assertive, compromising, directive, declarative, expressive), which reflects the way a person interacts and responds in a conversation. In turn, these illocutionary classes are linked to different moral and instrumental emotions of empathic listening.

- ENTJ (Assertive): It is associated with the emotion Attended, which reflects an active bond during listening, indicating that the interlocutor feels fully heard and understood.
- ENFJ (Compromising): The linked emotion is Brother, which humanizes the conversation, showing a disposition of genuine and fraternal help.
- ESTP (Directive): Here the emotion is Close, which seeks to create a deeper connection, using language that allows the interlocutor to feel that they share the same space.
- ISFP (Declarative): It is related to the emotion trusted, which refers to generating an environment of trust, where the coachee can express themselves freely without feeling judged.
- ESFP (Expressive): The emotion of Understood reflects the ability to capture and understand the meaning of what the interlocutor is transmitting, which helps establish empathetic communication.

In Table 11, the three types of listening are classified (active, reflective and empathetic), with their respective levels ranging from understood listening to brother listening. These levels reflect the different degrees of emotional and reflective connection that can be achieved in an interaction, with empathetic elements associated with each level and representative phrases for each type of listening.

Empathic, active and reflective listening integrates a set of emotions that are manifested in dialogue, promoting trust, understanding, cooperation and closeness towards the recipient. This ensures more satisfactory interactions in various contexts, by eliminating barriers or formalities typical of a common conversation. For example, in a dialogue with an unknown person, the information shared may be limited, which could prolong the resolution of a problem, requiring multiple sessions. The number of interactions necessary will depend on the level of trust established between the interlocutors, whether in the short or long term.

Active listening includes the emotions of “attended” and “understood”; empathic listening encompasses “trusted” and “brother”; while reflective listening is defined solely by the emotion “close.” These emotions, classified as moral, instrumental and empathic, are related to the primary emotions (joy, anger, sadness and fear) and to the illocutionary classes of speech acts (expressive, declarative, directive, compromising and assertive), due to similarities in their descriptions.

Table 11. Representative phrases according to the types of listening and elements of empathy.

Listening type	Listening level	Empathic element	Representative phrase
Active	Understood listening	Emotional recognition	"I understand that this situation may be difficult for you".
	Trusted listening	Offering supportive	"I am willing to help you find a solution".
Reflective	Attended listening	Validation of feelings	"I know this is not easy and I appreciate your effort".
Empathic	Close listening	Explicit empathy	"I understand what you feel and I am here to support you".
	Brother listening	Positive reinforcement	"He's doing a great job despite the circumstances".

4.9 Dialectical and speech act analysis for emotional characterization in educational knowing-being

The characterization of phrases in a socratic dialogue is carried out through a process divided into two parts: the characterization of attributes and the characterization of values. Next, it is explained how this process is carried out, with the use of various criteria that represent the fundamental elements of this automation and the words present in the coachee's sentence.

The sentence characterization process focuses on identifying the attributes that define each statement within a dialogue. In this sense, the table proposed by García-Morales (2022), in his article is taken as a basis, which establishes various criteria to classify phrases within a communicative context, particularly in the educational field.

The table categorizes the phrases according to a series of parameters, such as:

- Type of Illocutionary Class (Expressive, Declarative, Commissive, Directive, Assertive): This criterion defines the communicative intention underlying the statement, with values from 1 to 5.
- Type of Illocutionary Act (Direct, Indirect): This criterion considers the way in which the speech act is presented, classifying it as direct or indirect (values 6-7).
- Illocutionary Strength (Greeting, Thank you, Farewell, Approval, Ask, etc.): This group evaluates the function of the speech act according to its objective and its impact on the recipient, with values from 8 to 18.
- Perlocutionary Verb (Greet, Thank, Dismiss, Approve, Interrogate, Offer, etc.): Here the verbs used in the phrase are examined, which determine the actions and emotions involved, assigning values from 19 to 29.

- Type of Powerful Question (Clarifying Questions, Perspective Questions, etc.): The nature of the questions asked is analyzed, with values between 30 and 34.
- Type of Question Based on Dialectics (Maieutics, Irony): The relationship between the question and its dialectical approach is observed, such as maieutics or irony, with values from 35 to 36.
- Interrogative Pronouns Mayeutics (Which?, How?): The use of certain interrogative pronouns that point to the construction of knowledge through dialogue, with values between 37 and 38.
- Interrogative Pronouns Irony (Why?, What?): Here the interrogative pronouns that orient towards irony are identified, assigning values from 39 to 40.
- Impact of Information on Speech Acts (Importance, Clarity, Lexical Enrichment): This criterion evaluates how the information transmitted impacts the quality and depth of the speech act, with values from 41 to 43.
- MPBCD Decision Profile (Optimistic, Collaborative, Inquiring, Strict): In this group, the speaker's decision-making style is analyzed, with values from 44 to 47.
- MPBCD Personality Type (ENTJ, ISTP, ENFJ, ESFP/ISFP): The personality profile of the speaker is taken into account, with values between 48 and 51.
- Dialogue Phase (Opening, Confrontation, Argumentation, Closing): This group classifies the phrase according to the phase in which the dialogue is, with values from 52 to 55.
- Actor or Author (Coachee, Coach): It is differentiated who is the sender in the speech act, assigning values between 56 and 57.
- Context (Moral, Political, Academic): Here the context in which the dialogue takes place is taken into account, with values from 58 to 60.
- Emotions (Joy, Anger, Sadness, Fear): This criterion reflects the emotions involved in the statement, with values from 61 to 64.
- Listening Levels (Understood, Attended, Trusted, Close, Brother): The level of listening experienced in the exchange is categorized, with values from 65 to 69.
- Words in the Coachee's Phrase (total number of words in the coachee's phrase): The number of words that make up the coachee's response is taken into account, with values starting at 69.

Following this same structure, more values could be added related to other aspects of the interaction, such as emotional intensity, clarity of the message or even the relationship between the participants. In this way, an even more precise and detailed characterization of the sentences within an educational context could be obtained, allowing a better understanding of educational knowledge and the emotions involved in the communicative process.

4.10 Characterization process

The characterization of the phrases in a socratic dialogue aims to identify the specific attributes of each phrase said by the coachee (counseee) or the coach, so that each of them can be distinguished. This process is divided into two phases: attribute characterization and value characterization. In the first phase, we seek to identify the attributes or criteria that define each phrase. In the second phase, numerical values are assigned to these attributes in order to evaluate them.

To characterize the phrases in a socratic dialogue, it is proposed to use a total of 64 criteria, plus the words that make up the coachee's phrase. These criteria are organized into several groups. The first 29 criteria correspond to four groups based on the concepts of speech act theory. The criteria between 30 and 40 belong to four groups related to the technique of dialectics.

Criteria 41 to 43 are focused on quantifying the impact of the information. Criteria 44 to 51 are related to the coachee's personality, which can be identified through the phrases they use. Criteria 52 and 55 identify the dialogue stage, while criteria 56 and 57 focus on the actor in turn in the conversation. Criteria 58 to 60 are intended to identify the context of the dialogue. Finally, criteria 61 to 64 focus on the coachee's emotion.

In addition to the aforementioned attributes, the characterization also includes the words that make up the phrase said by the coachee, which allows a more complete evaluation of each intervention in the dialogue.

The algorithm begins with the initialization of two dictionaries. The first, called `Num_illocutionary_class`, is used to count how many words belong to each illocutionary class. The second, `Sum_criteria`, accumulates the values of the criteria of importance, clarity and enrichment. Both dictionaries start with zero for each illocutionary class.

4.11 Algorithm for characterizing the values of illocutionary classes

1. **INITIALIZE** *Num_illocutionary_class* as a dictionary with the keys "expressive", "declarative", "directive", "commissive", "assertive" and values set to 0.
2. **INITIALIZE** *Num_listening_level* as a dictionary with the keys "active", "empathetic", "reflective", "validating" and values set to 0.
3. **INITIALIZE** *Sum_criteria* as a dictionary containing the values for each illocutionary class and each listening level (initialized to 0).
4. **FOR** each sentence **IN** sentences:
 - **FOR** each word **IN** sentence:
 - **Step 1:** Search for the illocutionary force of the word
 - *illocutionary_force* = *Search_illocutionary_force*(word)
 - **Step 2:** Obtain the type of illocutionary class
 - *illocutionary_class* = *Search_Illocutionary_Class_Type*(*illocutionary_force*)
 - **Step 3:** Determine the listening level associated with the illocutionary class
 - *listening_level* = *Determine_Listening_Level*(*illocutionary_class*)
 - **Step 4:** Locate the information criteria (Importance, Clarity, Enrichment)
 - *Im* = *Locate_information_criteria*(*illocutionary_class*, *listening_level*, "Importance")
 - *Cl* = *Locate_information_criteria*(*illocutionary_class*, *listening_level*, "Clarity")
 - *En* = *Locate_information_criteria*(*illocutionary_class*, *listening_level*, "Enrichment")
 - **Step 5:** Accumulate the criteria
 - *Sum_criteria*[*illocutionary_class*][*listening_level*] += (*Im* + *Cl* + *En*)
 - **Step 6:** Increment the counters of the illocutionary class and listening level
 - *Num_illocutionary_class*[*illocutionary_class*] += 1
 - *Num_listening_level*[*listening_level*] += 1
 - **END FOR**
- **END FOR**
5. **Step 7:** Calculate the average criteria for each illocutionary class and listening level
 - **FOR** each *illocutionary_class* **IN** *Sum_criteria*:
 - **FOR** each *listening_level* **IN** *Sum_criteria*[*illocutionary_class*]:
 - *Avg*[*illocutionary_class*, *listening_level*] = $\frac{\text{Sum_criteria}[\text{illocutionary_class}][\text{listening_level}]}{(\text{Num_illocutionary_class}[\text{illocutionary_class}] * \text{Num_listening_level}[\text{listening_level}])}$
 - **END FOR**
 - **END FOR**
6. **Step 8:** Assign values to the criteria based on the calculated average
 - **INITIALIZE** *CRITERIA* as an empty dictionary
 - **FOR** each *illocutionary_class* **IN** *Sum_criteria*:
 - **FOR** each *listening_level* **IN** *Sum_criteria*[*illocutionary_class*]:
 - **IF** *Avg*[*illocutionary_class*, *listening_level*] > 0.66 **AND** *Avg*[*illocutionary_class*, *listening_level*] <= 1 **THEN**
 - *CRITERIA*[*illocutionary_class*, *listening_level*] = 1 # High impact
 - **ELSE IF** *Avg*[*illocutionary_class*, *listening_level*] > 0.33 **AND** *Avg*[*illocutionary_class*, *listening_level*] <= 0.66 **THEN**
 - *CRITERIA*[*illocutionary_class*, *listening_level*] = 0.66 # Medium impact
 - **ELSE IF** *Avg*[*illocutionary_class*, *listening_level*] > 0 **AND** *Avg*[*illocutionary_class*, *listening_level*] <= 0.33 **THEN**
 - *CRITERIA*[*illocutionary_class*, *listening_level*] = 0.33 # Low impact
 - **ELSE**
 - *CRITERIA*[*illocutionary_class*, *listening_level*] = 0 # No impact
 - **END IF**
 - **END FOR**
 - **END FOR**

7. RETURN CRITERIA

The algorithm then processes each word of the analyzed sentence. For each word, first determine its illocutionary force, evaluating the intensity with which the communicative purpose is expressed (for example, whether it is a statement, a command, or a question). Based on this evaluation, the word is assigned an illocutionary class, which can be one of the following: expressive, declarative, directive, committing, or assertive. Subsequently, the algorithm obtains the values of the importance, clarity and enrichment criteria for the given illocutionary class. These values are added to the running total of that class, while the word counter is incremented.

Once all the words have been processed, the algorithm calculates the average of the criteria (importance, clarity and enrichment) for each illocutionary class. This calculation is done by dividing the total sum of the accumulated criteria by the number of words that belong to that class. From these averages, the algorithm assigns a value to the criteria of each illocutionary class according to the impact:

- If the average is greater than 0.66 and less than or equal to 1, a value of 1 is assigned, indicating a high impact.
- If the average is greater than 0.33 and less than or equal to 0.66, a value of 0.66 is assigned, indicating a medium impact.
- If the average is greater than 0 and less than or equal to 0.33, the assigned value is 0.33, which indicates a low impact.
- If the average is 0, a value of 0 is assigned, indicating that the illocutionary class has no impact.

Finally, the algorithm returns the values assigned to each criterion (importance, clarity and enrichment) for each illocutionary class.

4.12 Grammatical prioritization of empathic listening phrases

The table 12 presented organizes the grammatical elements according to their priority, from articles (priority 1) to nouns (priority 8). These elements influence the structure and coherence of the sentences generated by the conversational agent, allowing responses adapted to the context and emotions of the coachee. Each priority contributes to the effectiveness and tone of responses, which are selected based on primary emotions (such as joy, anger, sadness, or fear) and listening emotions (such as "attended" or "trusted"). This approach ensures that the agent maintains a fluid, empathic conversation aligned with the emotional needs of the interlocutor.

The prioritization of grammatical elements in the analysis of the responses generated by the conversational agent allows attention to be focused on the key aspects that ensure coherent and appropriate responses to the emotional and educational context of the coachee. Through this organization, it is guaranteed that agents maintain a fluid and empathetic conversation, adapted to the primary emotions of the interlocutor.

Table 12. Grammatical types with their respective priority in a sentence.

Grammatical type	Priority
Article	1
Interjection	2
Conjunction	3
Preposition	4
Adverb	5
Adjective	5
Verb	6
Pronoun	7
Name/Noun	8

Table 13 defines the rules that assign values to listening emotions, based on primary emotions, which is crucial to properly manage responses in a dialogue. Depending on the intensity of the primary emotions (joy, anger, sadness, fear), values from 0 to 1 are assigned to the listening emotions, such as Understood, Trusted, Attended, Close and Brother. These rules allow the interaction of the conversational agent to be personalized, ensuring empathetic responses appropriate to the emotional context of the coachee.

Table 13. Rule for assigning values of the listening emotion criteria through the value of the primary emotion criteria.

Primary emotion	Ruler	Emotion of listening
Happiness	If joy > 0.66	Got it=1
	If joy > 0.33	Trusted=0.66
	If joy < 0.66 and the Expressive act > Declarative act	Got it=0.33
	If joy < 0.66 and the Expressive act < Declarative act	Trusted=0.33
Anger	If anger > 0.66	Close=1
	If anger > 0.33	Attended=0.66
	If anger < 0.66 and the Directive act > Assertive act	Close=0.33
	If anger < 0.66 and the Directive act < Assertive act	Attended=0.33
Sadness	If sadness > 0.66	Understood= (Understood+1)/2
	If sadness > 0.33	Close= (Close+0.66)/2
	If sadness < 0.66 and 0.33	Trusted= (Close+0.33)/2
Fear	If fear > 0.66	Understood= (Understood+1)/2
	If fear > 0.33	Brother= 0.66
	If fear < 0.66 and 0.33 and the Expressive act > Committing act	Got it=(Got it+0.33)/2
	If fear < 0.66 and 0.33 and the Expressive act < Committing act	Brother=0.33
	Committing act	

Once the rules are applied, the predominant listening emotion is identified and a corresponding generic phrase is selected. This phrase is combined with other more contextualized ones to generate coherent responses, aligned with the principles of educational coaching. The modeling of the three knowledges of education in the virtual coach is organized in three blocks: knowing – knowing, knowing – doing and knowing – being. The knowing – knowing block includes a speech acts module that breaks down dialogue into locution, illocution and perlocution, and uses synthesis and reflective interpretation to formulate appropriate questions or phrases.

5 Discussion and future work

In this section, we analyze the elements related to listening levels, primary emotions, speech acts, and personality obtained in this research, highlighting both the progress made and the areas of opportunity that require improvement. In addition, we propose future lines of work to validate the performance of the virtual coach in this study with other conversational agents or systems from the literature. We also seek to validate the performance of the virtual coach through student perceptions or satisfaction when interacting with this conversational system and the positive impact on the academic and socioemotional development of users.

5.1 Discussion

This study has highlighted the importance of integrating a conversational system into virtual educational environments, focused on "knowing-knowing" and supported by natural language processing, speech act theory and empathic listening methodologies. The incorporation of a virtual coach with these characteristics has proven to be an effective strategy to improve learning, fostering more reflective and meaningful support for students.

One of the main proposals of this work is the ability of the conversational agent to adapt its responses based on the emotional state of the user. By using socratic dialectics and personality modeling, the system will be able to formulate reflective questions that reflect the emotions of the individual. This can be a relevant contribution to intelligent tutoring (coaching) systems used to improve educational interaction. However, one of the challenges of implementing a conversational system with the characteristics mentioned above is the integration of emotions and empathy in the dialogue. The interpretation of ambiguous or emotionally complex sentences remains a challenge, despite the use of speech act-based analysis and information criteria proposed in this research.

In the context of educational coaching, the accurate identification of the coachee's emotions and the appropriate adaptation of the coach's responses are key aspects to establish an empathic and effective relationship. Table 14 allows us to analyze how primary

emotions, speech acts, illocutionary classes, active listening, depth levels, empathy, and personality types interact in a conversation. Each element plays an essential role in communication between coach and coachee.

Table 14. Example of selection, characterization of phrases said by the coachee and the virtual coach in an empathic virtual learning environment.

Actor	Phrase	PE	EV	SA	IC	IF	AET	ES	PT
Coachee	"I feel overwhelmed with so many responsibilities. I don't know if I can handle everything"	Fear	0.66	Expressive - Origin question	Expressive, Commissive	Gratitude	Reflective	0.66	Analytical.
Coach	"It seems like you have a lot on your mind. Do you want to talk more about what is worrying you right now?"	Fear	0.66	Committed - Perspective question	Expressive, Commissive	Ask	Active	0.66	Supportive.
Coachee	"Yes, I feel like no matter how much I try to organize myself, there is always something else to do, and I can't move forward"	Sadness	1	Expressive - Origin question	Expressive, Declarative, Directive	Approval	Reflective	1	Reflective.
Coach	"I understand. Sometimes the feeling of being trapped in an endless cycle can be exhausting. Have you tried taking strategic breaks to assess your progress?"	Sadness	0.66	Executive - Questions that require reason and evidence	Expressive, Declarative, Directive	Ask	Active	0.66	Solution-Oriented.
Coachee	"I hadn't thought of it that way, but maybe it could help me see what I have actually accomplished"	Happiness	0.66	Declarative - Questions about causes and consequences	Expressive, Declarative	Approval	Reflective	0.66	Optimistic.
Coach	"That's a good start. We all need to remind ourselves of our achievements. I want you to know you're not alone in this"	Happiness	1	Assertive - Clarifying questions	Expressive, Declarative	Gratitude	Empathetic	1	Supportive.
Coachee	"Thank you, it means a lot to me to hear that. Sometimes I just need to feel that someone understands me"	Happiness	1	Expressive - Origin question	Expressive, Declarative	Gratitude	Empathetic	1	Empathetic.
Coach	"I will always be here to listen to you. Your effort and dedication are valuable, and you deserve support on your journey"	Happiness	1	Declarative - Questions about causes and consequences	Expressive, Declarative	Farewell	Empathetic	1	Compassionate.

The PE (Primary Emotion) reflects the basic emotion expressed in the utterance, such as fear, sadness, or happiness. This emotion is assigned a PEV (Emotion Value), which ranges from 0 (weak emotion) to 1 (intense emotion). The SA (Speech Act) is classified according to the type of illocutionary class, such as expressive, engaged, executive, or declarative. The IF (Illocutionary Force) shows the intensity of the speech act, such as gratitude, request, or affirmation. The LT (Listening Type) describes the type of listening used: reflective (analytical), active (continued interest), or empathic (emotional engagement). The EV (Empathy Value) measures the perceived empathy in the conversation, also on a scale of 0 to 1, from low to high empathy. Finally, the PT (Personality Type) refers to the interlocutor's personality profile, based on the MBTI model, which helps contextualize their way of interacting.

The first sentence in this table is "I am overwhelmed by everything I have to do". In this statement, the PE expressed is fear, as the coachee feels a sense of overload and anxiety about the number of tasks or responsibilities. The EV is 0.6, indicating that fear has a considerable impact on the coachee's emotional state. The SA in this sentence is declarative, as it is the coachee's expression of their situation. The SA is expressive, as the coachee is sharing a personal feeling or emotion. The IF in this case is 0.66, reflecting a moderate intensity of emotional expression, without requiring direct action or demands. LT in this moment is reflective, as the coach must listen and reflect on what has been said, interpreting the underlying emotions in order to respond appropriately. The depth level is 0.66, indicating that the coach must delve a little deeper to fully understand the coachee's anxiety. The ES is 0.66, which shows that the coach must be highly empathetic and understand the coachee's emotions on a deep level to offer the necessary support. The most suitable TP for this situation would be ENFJ, as this personality is empathetic and energetic, which will allow the coach to help the coachee process their emotions effectively and carefully.

The next sentence is "I feel like I'm not making any progress". Here, the PE expressed is sadness, as the coachee feels frustrated and demotivated by the perception that they are not making progress toward their goals. The EV is 1, reflecting a significant influence of sadness on the coachee's emotional state. The speech act is again declarative, as the coachee is sharing how they feel about their progress. The SA remains expressive, as the coachee expresses a negative feeling about their situation. The IF is 1, indicating a moderate expression without a direct or explicit request for action. LT, in this case, should be reflective, as the coach must reflect on the expressed emotion of sadness and provide space for the coachee to explore their feelings further. The depth level is 0.66, reflecting a deeper process of understanding, where the coach needs to go beyond the surface of frustration and explore the underlying reasons for the lack of progress. The ES is 0.66, indicating that the coach should be highly empathetic, understanding the coachee's frustrated emotions and providing emotional support. In this case, a coach with the ISFP PT, who is friendly and conflict-avoidant, would be suitable, as they could help the coachee process their feelings calmly and without pressure.

The third sentence is "I'm beginning to see a way to handle all of this". In this statement, the PE expressed is happiness, as the coachee experiences a sense of relief and optimism at realizing they have found a solution to their problems. The EV is 0.66, indicating that happiness is playing a significant role in the coachee's emotional state at this moment. The SA is declarative, as the coachee is affirming positive progress in their situation. The SA is declarative, as the coachee is expressing a statement about their perceived progress. The IF is 0.66, reflecting a strong and clear statement about the progress made. LT is now empathic, suggesting that the coach should validate this positive feeling and celebrate it alongside the coachee, showing support and understanding in their emotional growth. The depth level is 1, as the coachee has gained a deeper understanding of their situation and how to handle it. The EV is 1, which indicates that the coach should fully reflect the coachee's enthusiasm and motivation, showing that they share their joy at this progress. The most appropriate PT for this moment would be ENFJ, as this personality type, characterized by empathy and energy, is excellent for reinforcing the coachee's emotional progress and maximizing their confidence.

Finally, the fourth statement is "I am so grateful for everything you have taught me!" Here, the PE expressed is happiness, as the coachee experiences a sense of gratitude and satisfaction for the lessons learned. The PE score is 1, indicating that happiness is the predominant emotion in this statement. The SA is expressive, as the coachee is expressing an emotion of gratitude for the help received. The IF is 1, indicating that the statement is of moderate intensity, with no immediate action required. LT is empathic, as the coach must be fully present and share the coachee's gratitude, validating the learning and progress they have experienced. The depth level is 1, reflecting that the coachee has reached a deep understanding of the lessons learned during the process. The ES is 1, which means the coach must resonate with the coachee's sense of gratitude, demonstrating a genuine emotional connection. In this case, the most appropriate PT would be ENTJ, who is strong, decisive, and able to guide the coachee with clarity and direction, reinforcing the sense of gratitude and the trust achieved in the relationship.

This analysis shows how emotions, speech acts, and illocutionary forces intertwine in a coaching conversation, facilitating an evolution in the coachee's emotional state. As the dialogue progresses, the coachee begins with emotions of fear and sadness, then

reaches a level of happiness and trust. The coach's interventions, based on reflective and empathic listening, help the coachee process their emotions and move toward a deeper understanding of their situation. The analysis reveals a clear example of how, as the dialogue progresses, a deeper level of understanding and empathy is reached, culminating in a relationship of trust and brother. This type of empathic listening becomes the climax of the conversation, where both parties find themselves in a space of complete understanding and mutual support, achieving a true emotional breakthrough.

Another challenge to consider is to validate the performance of the sentences resulting from the model proposed in this research with those of other models in the literature. Also, it should be considered to evaluate the performance of the model with the perceived satisfaction of the students with respect to the empathy and emotions reflected in the sentences resulting from the virtual coach in the conversation.

5.2 Future work

Based on the previous discussion and analysis, the following lines of future work are proposed to optimize the educational coaching model of this research:

User perception assessment: Conduct studies based on the satisfaction of individuals (students and teachers) to understand how they perceive the performance of the virtual coach model, from the point of view of the congruence of the phrases given as a response, as well as the display of empathy and emotions. **Comparison with other existing models:** Analyze the performance of the system in relation to other virtual tutoring platforms or conversational agents, evaluating its strengths and areas for improvement in terms of personality modeling, empathy and learning effectiveness.

This work represents a significant advance in the application of artificial intelligence to educational coaching, opening up new possibilities in learning and emotional support in virtual environments. However, the validation of the performance of the model of this research work and its optimization are still under development for future research.

6 Conclusions

This study has demonstrated the relevance of integrating Know-Being in virtual educational environments through conversational agents driven by natural language processing. Based on the modelling of speech acts, socratic dialectics and personalization according to the user profile, it has been shown that artificial intelligence can be a key facilitator to improve the learning experience. The brief analysis of the resulting sentences made to the virtual coach suggests that, beyond the simple transmission of information, a conversational agent with an empathetic and reflective approach can enrich the educational process, allowing a more meaningful and personalized interaction with the student.

The development of this virtual coaching model has emphasized the importance of active, reflective and empathetic listening in building dialogue. It has been shown that the ability to interpret and respond to the user's emotions in real time, using artificial intelligence techniques, contributes to strengthening the educational bond and promoting self-reflection. By integrating emotions and listening levels, conversational agents can not only improve understanding and learning, but also generate an environment where the student feels validated and motivated to continue their educational process. In this context, natural language processing has been a key tool to transform teaching, allowing virtual educational systems to more effectively reflect human communication dynamics. The combination of personality modeling, illocutionary acts and socratic theory in virtual agents demonstrates that education can significantly benefit from more humanized and personalized approaches.

Finally, the integration of artificial intelligence in educational coaching leads us to reflect on the role of technology in the education of the future. Truly meaningful learning requires not only technical knowledge and skills, but also the ability to connect with others in authentic and empathetic ways. In this sense, conversational agents can become powerful tools to enhance teaching, as long as they are designed with an approach that prioritizes deep listening and emotional understanding. This approach not only redefines the interaction with technology, but also reinforces the importance of Knowing-Being as a fundamental pillar in 21st century education.

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