

“REAL FEELING”: EXPLORING THE EDUCATIONAL RELATIONSHIP IN THE ERA OF ARTIFICIAL INTELLIGENCE

“REAL FEELING”: ESPORARE LA RELAZIONE EDUCATIVA NELL’ERA DELL’INTELLIGENZA ARTIFICIALE

Arianna Cittadini
Pegaso University

arianna.cittadini@unipegaso.it



Aurora Biancalani
Pegaso University

aurora.biancalani@unipegaso.it



Francesca Nobiloni
Camerino University

francesca.nobiloni@unicam.it



Stefania Morsanuto
Pegaso University

stefania.morsanuto@unipegaso.it



Francesco Peluso Cassese
Pegaso University

francesco.pelusocassese@unipegaso.it



Double Blind Peer Review

Citazione

Cittadini, A., Biancalani, A., Nobiloni, F., Morsanuto, S., & Peluso Cassese, F. (2024). “Real feeling”: exploring the educational relationship in the era of artificial intelligence. *Italian Journal of Health Education, Sports and Inclusive Didactics*, 8(2), Edizioni Universitarie Romane.

Doi:

<https://doi.org/10.32043/gsd.v8i2.1196>

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gsdjournal.it

ISSN: 2532-3296

ISBN 978-88-7730-493-3

ABSTRACT

This article aims to explore the growing use of artificial intelligence (AI) in the educational landscape, seeking to understand the value it can assume and the potential contribution it can make in this context, which is one of the primary environments in which relationships are established.

The aim of this study is to show the potential and limitations of artificial intelligence in the context of the educational relationship and teaching, through experimental research conducted with a sample of primary and secondary school teachers. The evidence suggests the need to maintain the human aspect for the emotional dimension underlying the educational relationship, such as artificial intelligence. Specifically, the 'Hugging Chat' software showed obvious limitations in understanding emotions. However, it has proven to be a valuable support in educational design, where it serves as a facilitator by helping and simplifying the teacher's organisational work.

Il presente articolo si propone di esplorare il crescente coinvolgimento dell'intelligenza artificiale (IA) nel panorama educativo, cercando di comprendere il valore che essa può assumere e l'eventuale contributo che può apportare in tale contesto, che rappresenta uno degli ambienti primari in cui si instaura la relazione. L'obiettivo è fare luce sulle potenzialità e limiti dell'intelligenza artificiale nel contesto della relazione educativa e della didattica, attraverso una ricerca sperimentale fatta con un campione di docenti di scuola primaria e secondaria di primo grado. Ciò che emerge dallo studio è la necessità di mantenere l'aspetto umano per la dimensione emotiva alla base della relazione educativa in quanto l'IA, nello specifico il software “Hugging Chat” ha mostrato evidenti limiti nella comprensione delle emozioni ma al contrario sembrerebbe essere un valido supporto nella progettazione didattica per la quale svolge il ruolo di facilitatore andando a supportare e semplificare il lavoro organizzativo del docente.

KEYWORDS

Digital-Innovation, Emotional-Dimension, Educational-support.
Innovazione Digitale, Dimensione emotiva, Supporto educativo.

Received 21/05/2024

Accepted 19/06/2024

Published 24/06/2024

Introduction¹

Living in an increasingly connected and digital age, the advent of artificial intelligence is bringing significant transformations in lifestyle, work dynamics and interpersonal relationships.

Due to progress in algorithms and the increasing accessibility of technology, artificial intelligence is exerting a significant influence on various sectors and applications, of which, educational systems are amongst the most significantly impacted areas.

Indeed, scientific literature highlights how artificial intelligence in the educational field represents a fast-growing field (Baker & Smith, 2019).

In light of this, the following paper aims to explore the growing involvement of artificial intelligence (AI) in the educational landscape, seeking to understand its value and possible contribution in this context, which is one of the primary environments in which relationships are established.

In particular, the objective is to analyse its limitation in managing the emotional component in teacher-student relationships.

The literature suggests that through various software and chatbots, AI can make a valuable contribution to improving and expanding educational delivery and supporting the role of the teacher, who cannot be replaced, but rather supported to enrich the learning experience (Lameras & Sylverster, 2021; Ozigagun,2024).

On the contrary, although there are still few studies related to the analysis of the emotional aspect, it is pointed out that this component, an essential part of the educational process, represents one of the limitations of Artificial Intelligence. Indeed, the latter cannot adequately replicate the complexity and subjectivity of human emotions since it does not possess innate emotions. (Oritsegbemi,2023).

Neuroscientific evidence has shown how emotional and cognitive dimensions are identified as interconnected processes; therefore, thinking and emotions influence each other, playing a key role in an individual's learning processes (Immordino-Yang & Damasio, 2007).

Artificial Intelligence, through the support it offers in learning processes, can have a cascading, positive impact on emotional intelligence, however, its contribution in relational and social dynamics within the classroom group turns out to be limited and limiting.

¹ Arianna Cittadini: author of paragraphs Introduction, 2,4, and Discussion

Aurora Biancalani: author of paragraphs 1, 1.1, 1.2, 3.1

Francesca Nobiloni: author of paragraphs Introduction, 3, 3.2 and Conclusion

Stefania Morsanuto: Supervisor

Francesco Peluso Cassese: Supervisor

The purpose of this research was to evaluate the proficiency of an LLM software, specifically HuggingChat (which is amongst the most accessible as it is free) with respect to teachers in tasks related to the emotional component (Fonagy & Bateman, 2004; Kirshteyn, 2024). In order to make this comparison, a view-oriented metric, based on RMET, which seeks to determine a model's ability to interpret and identify emotional cues from facial expressions (Baron-Cohen, 2001), and a textual metric, through a pilot study, based on administering complex relational situations related to bullying to the chatbot, were used.

Through experimentation, the intent is to test the hypothesis that considers the emotional dimension, inherently human and therefore not reproducible by technologies.

This dimension is crucial in the educational context, as it forms the basis for establishing an effective relationship between teachers and students.

The demonstration that artificial intelligence lacks the emotional component underscores the fact that although it can offer valuable support in teaching, it cannot replace the teacher's contribution in the classroom. In fact, through its emotional skills, the teacher can facilitate the creation of an inclusive and stimulating learning environment.

The literature highlights how the empathic relationship is critical to success in education and schooling (Mason, 2013).

1. Artificial Intelligence

Artificial intelligence (AI) is a form of nonbiological intelligence, which through the use of algorithms and artificial neural networks is able to emulate human cognitive processes, thus enabling machines and computer systems to analyze data, learn and draw conclusions to solve problems (McCarthy et. al, 2006).

The birth of artificial intelligence as a discipline, can be traced back to the Dartmouth conference in 1956, during which scientists gathered with the aim of investigating the feasibility of automating tasks and processes by using technologies and machine learning that exceeded the cognitive domain of humans (Howard, 2019). However, the foundations of artificial intelligence can be traced back to computer scientist Alan Turing who in 1950 introduced "The Turing Test" through which he sought to verify the existence of intelligence indistinguishable from human intelligence in machines (Sejnowski, 2022).

In the 21st century, AI has experienced significant growth and diffusion, due to a combination of several factors that have contributed to significant advances such as technological advancements like increased computing power for learning

complex models, Big Data, a key resource that enables availability of increasingly large datasets, development of Sophisticated Algorithms that allow machines to deal with complex queries, and the availability of Cloud Computing resources that enable the implementation of AI-based applications (Kersting, 2020).

1.1 Machine Learning e Deep Learning

AI learns through the processes of Machine Learning (ML) "Machine Learning" and Deep Learning (DL) "Deep Learning" which represent two subcategories of artificial intelligence.

Machine Learning is a process by which a network of algorithms, after receiving external input (e.g. training from humans) uses structured and complex data to automatically learn new information (Popenici & Kerr, 2017; Russel & Norvig, 2010). Machine Learning algorithms require human programming, and the learning process is manifested through data analysis. Such analysis involves identifying patterns, namely relationships between variables and significant aspects that characterize the data itself. This process allows for greater understanding of the data, enabling the identification of useful information for making decisions and predictions.

Deep Learning, is considered to be a subcategory of Machine Learning and distinct from the latter which requires human control and structured data for processing, DL processes unstructured amounts of data using deep artificial neural networks inspired by the workings of the human brain, enabling autonomous learning and decision making without the need for human training.

1.2 Limits of Artificial Intelligence: Emotional-Relational Dimension

Thanks to advances in machine learning and deep learning models, artificial intelligence has acquired skills such as the ability to recognize and generate images and videos, human language processing and understanding, and problem-solving and data interpretation capabilities that were previously exclusive to human intelligence (Longa; Scorza, 2020).

Intelligence can be defined as a general mental capacity that includes deductive reasoning, planning, problem solving, abstract reasoning, understanding complex ideas, rapid learning and learning from experience (Gottfredson,1997). Within the construct of intelligence, a differentiation between fluid and crystallized components is evident: fluid intelligence is the component that allows one to tackle new problems, solve complex situations due to the speed of processing and

cognitive flexibility that enables the person to adapt quickly to new information; crystallized intelligence is the component of intelligence that incorporates all cultural knowledge, verbal skills and information acquired over time through experience, education and interaction with the surrounding environment (Cattell,1941).

This differentiation can also be found within the construct of artificial intelligence, which is designed to address both complex and novel challenges by exploiting fluid intelligence, and to perform specific tasks based on previously acquired knowledge. *So what are the limitations found in artificial intelligence?*

Taking into consideration Gardner's model of multiple intelligences (Gardner, 1983), what has emerged from research to date is that artificial intelligence may excel in tasks related to linguistic, logical-mathematical, and spatial intelligence, but it may find difficulty and be limited in replicating human capabilities in interpersonal or intrapersonal intelligences, which involve understanding human relationships and self-awareness.

AI is excellent in performing specific tasks and calculating results based on predefined patterns, but there are limitations when the demands involve social dynamics, creative, expressive or human-value-driven choices (Sant'Angelo, Leone; 2023).

Human intelligence is based on a deep and multidimensional understanding involving various cognitive, emotional and social aspects that interact to form an understanding of the world around us, and affect decision-making that is deeply influenced by ethical, social and cultural choices.

Artificial intelligence, on the other hand, may find difficulty in situations that require a deep understanding of the human context or judgment that falls into the specificity of the individual person, understood as a complex system.

Thus, it is inferred that the limitation found is mainly defined in the emotional component. This stands to signify that the gap currently still unfilled by technological and digital progress falls within the realm of emotional intelligence.

2. Emotional Intelligence and Mentalization

The construct of Emotional Intelligence refers to the ability an individual has to control, recognize and be able to distinguish his or her own and others' emotions (Salovey and Mayer 1990). Daniel Goleman, amongst the leading exponents to speak of emotional intelligence, identifies five essential pillars for successfully dealing with any situation in life: *Self-awareness*, a dimension that focuses on self-awareness of one's emotional state, providing a solid foundation for self-

confidence and a better understanding of one's feelings and thoughts; *Self-management*, concerns the ability of self-control in managing intense emotions and maintaining personal integrity, means being able to regulate one's emotional reactions appropriately, even in stressful or difficult situations.

Empathy involves the ability to emotionally tune in to others, understanding their feelings and perspectives. Empathy is essential for establishing meaningful relationships and dealing with conflict constructively. *Motivation*, essential to pursue one's goals with commitment and positivity and social skills so having good emotion management so one can deal effectively with interactions with others, even the most problematic ones (Goleman, 2011). These are crucial on both a personal and social level. In fact, they guide individual action, enabling the person to self-regulate and deal with the emotional challenges that arise in interactions with others.

Through emotional intelligence, human beings are able to understand and control their emotions and maintain or change mediations with the environment in effective and socially appropriate ways (Saarni, 1999).

Being emotionally competent, therefore, enables individuals to establish effective social relationships. Subsequently, underlying success in social interactions is the ability to first and foremost understand one's own mental states and simultaneously those of others. This ability can be encapsulated in the term "Mentalization" (Fonagy & Bateman, 2004). This concept refers to an advanced cognitive competence on which the ability to understand others' emotional expressions, emotion regulation, impulse control and self-surveillance depend. In essence, these are psychological processes that enable understanding of both personal and others' functioning in terms of mental states such as feelings, beliefs, intentions and desires.

This notion encompasses a number of related concepts, such as: theory of mind, social cognition, perspective taking, emotional awareness, and empathy, each of which plays a crucial role in our social interactions and emotional management.

Strong mentalization skills are closely linked to the development of theory of mind (TOM), a cognitive skill that emerges during childhood and enables the individual to understand that others possess mental states, desires and emotions similar to his or her own, making it possible to interpret their behavior. This skill plays a crucial role in social functioning, empathy and interpersonal relationships.

Having a well-structured theory of mind can foster the development of more advanced emotional intelligence. Indeed, understanding the mind necessarily involves considering emotions, which play a key role in managing interpersonal relationships and empathy. Against this, the ability to understand the minds of

others, which is the core of theory of mind, can enhance our ability to manage our own emotions and interpret those of others, key elements of emotional intelligence.

Despite recent advances in large language models (LLMs), that enable algorithms to generate natural language responses, mentalization and emotional competence remain the exclusive prerogative of human beings. This translates into the fact that while the software is capable of processing complex linguistic information and understanding context, it is limited in emotional intelligence and cannot interpret emotions or mental states as a human would, especially considering the individual specificity of each person as a complex system (Bronfenbrenner, 1979).

AI may find it difficult to understand the context of an individual person or situation because it often relies on aggregate data and generalizations rather than specific, detailed information. It lacks the ability to understand situations that require a deep understanding of human context or judgment that falls into the specificity of each individual person. This level of understanding requires an intelligence that goes beyond mere data processing and involves the ability to interpret the individuality of the individual.

3. Integration of emotional dimension and technology in learning environments

The integration of the emotional aspect and technologies in learning environments is a key element in the contemporary educational context.

The educational context must embrace both the emotional element and the use of technology, which are crucial in today's educational environment. In an increasingly digitized era, recognizing the importance of emotions and relationships in the learning process becomes crucial to fostering an inclusive and engaging school environment. The introduction of technology in schools presents a valuable opportunity to enrich the learning experience of students and to adapt to ongoing technological development. However, it is vital that this integration takes place with a conscious attention to the relational aspect, so that technologies do not become mere isolated tools, but contribute to strengthening interactions between teachers and students. In this context, the role of the teachers become even more central, since they are the ones that, through their emotional sensitivity and interpersonal skills, can guide students in the responsible and critical use of technologies, creating an environment of trust and collaboration. It is therefore

essential to promote ongoing teacher training on the effective integration of technologies and the importance of keeping the emotional and relational element at the center of the educational experience. Only then will it be possible to create dynamic and inclusive learning environments that meet the needs of an increasingly complex and technologically advanced society.

3.1 Discent Emotional Dimension in the Educational Relationship between Teacher and Learner

In the educational context, the emotional dimension that defines and characterizes the relationship between teacher and student is of particular importance. This dimension, has a major impact on the learning process, and significantly influences the student's perception of himself and the surrounding context.

The relevance of the emotional dimension in the learning process has been widely confirmed by the research conducted in the field of neuroscience, through which, we overcome The traditional model of "mind," which pitted emotional and cognitive processes against each other, but on the contrary, the close link that exists between emotion and decision are demonstrated (Zan, 2007).

"The emotional areas of the brain are closely linked to all areas of the neocortex [...], giving emotions immense power in influencing the functioning of all other areas of the brain, including the thinking centers"(Goleman, 1996).

In the educational landscape, the relationship between teacher and learner is also built and transformed in response to the emotions, feelings and states of mind that the learner experiences on a daily basis.

From this perspective, the role of the teacher emerges as fundamental within the relational dimension. To be effective, an educational relationship must be marked by reciprocity and acceptance, requiring an empathetic and authentic environment (Rogers, 1973). Such an environment, by fostering a climate of trust, creates the optimal conditions for meaningful learning.

Through an emotional intelligence-driven and person-centered approach, the teacher strives to understand and enhance students' individual resources, paying special attention to their internal dimensions.

The emotional component turns out to be a key element in the educational landscape, in fact it is through emotional skills such as mentalization, empathy, self-awareness, empathic communication and active listening that the teacher can establish meaningful relationships with students, adapting teaching strategies to their emotional needs. In addition, he or she can effectively manage complex situations that may arise in the classroom, such as conflicts between students,

resolving them constructively in order to promote well-being and the creation of an inclusive and stimulating educational environment.

To positively promote the emotional connection between students and the learning process, it is essential to adopt a teaching approach that recognizes and values the emotions with which students approach school and knowledge. This will enable the teacher to create a learning environment in which students feel free to explore and construct their knowledge without fear of mistakes, which, on the contrary, should be seen as opportunities for personal growth and improvement. (D'Amore; Pinilla; Marazzani & Sbaragli, 2008).

3.2 Artificial intelligence in the educational landscape

With the development of computing and information processing techniques, artificial intelligence (AI) has been widely applied in educational practices.

AI has provided new opportunities, potentials, and challenges for educational innovations, such as the shift to personalized learning, the redefinition of the role of the instructor, and the development of complex educational systems. (Baker et al., 2019; Holmes et al., 2018; Starcic, 2019).

By harnessing AI as an additional tool and catalyst for renewing teaching and learning processes, students can creatively explore and transform ideas and solutions based on an experiential and interactive approach.

Three paradigms of AI use in education have been developed with an increasing degree of integration and relationality between human and machine (Ouyang, Jiao, 2021). The first is based on the foundation of behaviorism and sees AI as the representative of knowledge and the learner as the recipient. Learning is thus an enhancement of knowledge acquisition. The second, based instead on a cognitive and social view of learning, sees AI as a support and the student as a collaborator, so an exchange of information takes place between the two. The AI system dynamically captures the student's individualized and emergent information as input to adapt the model to the student, while the student collaborates with the system to communicate and achieve more effective and personalized learning (Baker et al., 2019; du Boulay, 2019; Rose et al., 2019). This second paradigm moves an important step toward student-centered human learning through mutual interpretation and continuous collaboration between the student and the AI system. Its limitation lies in the lack of continuous communication and synergistic human-computer interactions (Ouyang, Jiao, 2021). The third paradigm relies on complexity theory, characterizing AI as a tool to augment human intelligence, as it

recognizes learning as a complex adaptive system. Seeing AI as supporting the learning process, the learner assumes full autonomy in managing the learning process, promoting the integration of human intelligence to artificial intelligence by addressing issues such as biases in AI algorithms, lack of governance, and non-transparency of why and how a decision on AI is made (Hwang et al., 2020; Hwang & Tu, 2021). Thus, artificial intelligence impacts teaching and learning not only from a technological perspective but also from a pedagogical, ethical, and teacher skill development perspective (Holmes et al., 2019). Therefore, through the use of AI, teachers are able to understand how students learn optimally and how this process is influenced by prior knowledge (Lameras & Sylverster, 2021).

Let us look at three possible uses of AI as a tool for enhancing learning processes: Intelligent Tutoring Systems (ITS), Dialogue-based Tutoring Systems (DBTS), and Exploratory Learning Environments (ELE). ITSs, the first to be used in the school context, offering personalized, step-by-step instructional support to each student, guiding them through the topics of a discipline in an accurate and structured manner, one such system is MATHia (Ritters et al., 2015). DBTSs base their mode of interaction with the student on the use of conversation: in this way, the user is accompanied in the learning process through dialogue with a virtual tutor. This approach is reminiscent of the Socratic method: the tutor begins with a question, receives the student's response, provides feedback and suggestions, and continues the dialogue to improve understanding of the study topic.

Watson (Ventura et al., 2018) for example, is a virtual assistant that can keep track of a student's progress and in interacting with him or her offers materials to support study. ELEs, on the other hand, encourage exploration and free manipulation of a virtual educational environment, allowing students to actively construct knowledge, thus moving away from an extremely guided tutoring approach. The ECHOS game (Bernardini et al., 2014) represents a structured exploratory learning environment for the development of social skills in children diagnosed with autism spectrum disorder.

Technology can be a valuable tool for enhancing learning and facilitating communication between teachers and students, as well as among students themselves, but in the current landscape it is almost exclusively concerned with the transmission of specific knowledge or skills. Already Buber argued that the importance in education was not only related to this specific transmission of knowledge but should concern the overall development of the person, of his or her current abilities but also of his or her future possibilities (1961). This approach highlights the importance of interpersonal relationships within the educational environment, both between teachers and students and among the students

themselves, and in the current context, where technology has assumed an increasingly predominant role in education, there are risks that this view may be overlooked.

The processes of technologizing education can sometimes emphasize the transmission of content through digital means at the expense of personal relationships and the overall formation of the person. Therefore, the criticism presented by this conception of education should be considered in the context of the balance between the use of technology and the importance of human relationships in the educational environment.

Although, in fact, Artificial Intelligence (AI) can revolutionize the field of education, it is essential to understand that the use of advanced AI processing technologies alone does not guarantee the achievement of satisfactory educational outcomes (Castañeda & Selwyn, 2018; Selwyn, 2016). The emotional component represents a fundamental pillar for success in education and forms the basis of an effective relationship between teachers and learners. This dimension is inherently human and therefore cannot be replicated by technologies, highlighting the indispensable role of teachers. The lack of this component, prevents technologies from completely replacing the essential contribution of teachers in fostering an inclusive and stimulating learning environment.

4. Experimental Study

- Goal

In order to confirm the research hypothesis, we did an analysis of the visual and textual metrics of the Huggingchat software in order to be able to critically evaluate the capabilities of artificial intelligence in emotional competence, which from the literature that has emerged so far, appears to be a purely human domain.

- Method (Visual Metrics)

Materials and Tools

Baron-Cohen et al. 2001's Reading the Mind in the Eyes (RMET) test was chosen as the primary instrument because it represents a gold standard in the study of theory of mind and mentalization deficits. The RMET is a performance-based measure designed to assess the ability to accurately identify the mental states of others using 36 photos of the eye region of a human face.

The test consists of 37 black-and-white photographs, 36 test stimuli and one test stimulus. Each photo depicts the eye region of adults, young and old people of both sexes, 18 male and 18 female. The photos are from English newspapers and magazines.

Test scores range from 0 to 36, and a score in the population average falls in the range of 26-30, with particular attention to scores below 22, which indicate the presence of "dysfunctional" visual emotion recognition.

Figure 1. Example of Items 1 and 15 of the RMET test.



Table 1: List of words used in the RMET test (target words are shown in bold)²

prova (practice)	invidioso (jealous)	preso dal panico (panicked)	arrogante (arrogant)	pieno d'odio (bateful)
1	giocososo (playful)	confortante (comforting)	irritato (irritated)	annoiato (bored)
2	terrorizzato (terrified)	turbato (upset)	arrogante (arrogant)	infastidito (annoyed)
3	scherzoso (joking)	contrariato (flustered)	con brama (desire)	convinto (convinced)
4	scherzoso (joking)	insistente (insisting)	divertito (amused)	rilassato (relaxed)
5	irritato (irritated)	sarcastico (sarcastic)	preoccupato (worried)	amichevole (friendly)
6	atterrito (agbasi)	sognante (fantasizing)	impaziente (impatient)	allarmato (alarmed)
7	contrito (apologetic)	amichevole (friendly)	a disagio (uneasy)	abbattuto (dispirited)
8	sconfortato (despondent)	sollevato (relieved)	intimidito (shy)	eccitato (excited)
9	infastidito (annoyed)	ostile (hostile)	inorridito (horrified)	assorto (preoccupied)
10	guardingo (cautious)	insistente (insisting)	annoiato (bored)	atterrito (agbasi)
11	terrorizzato (terrified)	divertito (amused)	addolorato (regretful)	civettuolo (flirtatious)

² Serafin, M., & Surian, L. (2004). Il test degli Occhi: Uno strumento per valutare la "teoria della mente"

prova (<i>practice</i>)	invidioso (<i>jealous</i>)	preso dal panico (<i>panicked</i>)	arrogante (<i>arrogant</i>)	pieno d'odio (<i>bateful</i>)
12	indifferente (<i>indifferent</i>)	imbarazzato (<i>embarrassed</i>)	scettico (<i>sceptical</i>)	abbattuto (<i>dispirited</i>)
13	determinato (<i>decisive</i>)	speranzoso (<i>anticipating</i>)	minaccioso (<i>threatening</i>)	intimidito (<i>shy</i>)
14	irritato (<i>irritated</i>)	deluso (<i>disappointed</i>)	depresso (<i>depressed</i>)	accusatore (<i>accusing</i>)
15	contemplativo (<i>contemplative</i>)	contrariato (<i>flustered</i>)	incoraggiante (<i>encouraging</i>)	divertito (<i>amused</i>)
16	irritato (<i>irritated</i>)	pensieroso (<i>thoughtful</i>)	incoraggiante (<i>encouraging</i>)	comprensivo (<i>sympathetic</i>)
17	dubbioso (<i>doubtful</i>)	affettuoso (<i>affectionate</i>)	giocoso (<i>playful</i>)	atterrito (<i>agbast</i>)
18	determinato (<i>decisive</i>)	divertito (<i>amused</i>)	atterrito (<i>agbast</i>)	annoiato (<i>bored</i>)
19	arrogante (<i>arrogant</i>)	riconoscente (<i>grateful</i>)	sarcastico (<i>sarcastic</i>)	esitante (<i>tentative</i>)
20	dominante (<i>dominant</i>)	amichevole (<i>friendly</i>)	colpevole (<i>guilty</i>)	inorridito (<i>horrified</i>)
21	imbarazzato (<i>embarrassed</i>)	sognante (<i>fantasizing</i>)	confuso (<i>confused</i>)	preso dal panico (<i>panicked</i>)
22	assorto (<i>preoccupied</i>)	riconoscente (<i>grateful</i>)	insistente (<i>insisting</i>)	implorante (<i>imploring</i>)
23	soddisfatto (<i>contented</i>)	contrito (<i>apologetic</i>)	insolente (<i>defiant</i>)	curioso (<i>curious</i>)
24	pensoso (<i>pensive</i>)	irritato (<i>irritated</i>)	eccitato (<i>excited</i>)	ostile (<i>hostile</i>)
25	preso dal panico (<i>panicked</i>)	incredulo (<i>incredulous</i>)	sconfortato (<i>despondent</i>)	interessato (<i>interested</i>)
26	allarmato (<i>alarmed</i>)	intimidito (<i>shy</i>)	ostile (<i>hostile</i>)	ansioso (<i>anxious</i>)
27	scherzoso (<i>joking</i>)	guardingo (<i>cautious</i>)	arrogante (<i>arrogant</i>)	rassicurante (<i>reassuring</i>)
28	interessato (<i>interested</i>)	scherzoso (<i>joking</i>)	affettuoso (<i>affectionate</i>)	soddisfatto (<i>contented</i>)
29	impaziente (<i>impatient</i>)	atterrito (<i>agbast</i>)	irritato (<i>irritated</i>)	riflessivo (<i>reflective</i>)
30	riconoscente (<i>grateful</i>)	civettuolo (<i>flirtatious</i>)	ostile (<i>hostile</i>)	deluso (<i>disappointed</i>)
31	che ha vergogna (<i>ashamed</i>)	fiducioso (<i>confident</i>)	scherzoso (<i>joking</i>)	abbattuto (<i>dispirited</i>)
32	serio (<i>serious</i>)	che ha vergogna (<i>ashamed</i>)	sbalordito (<i>bewildered</i>)	allarmato (<i>alarmed</i>)
33	imbarazzato (<i>embarrassed</i>)	colpevole (<i>guilty</i>)	sognante (<i>fantasizing</i>)	coinvolto (<i>concerned</i>)
34	atterrito (<i>agbast</i>)	sconcertato (<i>baffled</i>)	diffidente (<i>distrustful</i>)	terrorizzato (<i>terrified</i>)
35	perplesso (<i>puzzled</i>)	nervoso (<i>nervous</i>)	insistente (<i>insisting</i>)	contemplativo (<i>contemplative</i>)
36	che ha vergogna (<i>ashamed</i>)	nervoso (<i>nervous</i>)	sospettoso (<i>suspicious</i>)	indeciso (<i>indecisive</i>)

The software used for the study is HuggingChat, a Large language model (LLM)-based chatbot powered by a natural language processing (NLP) model called "Open Assistant" because, among its capabilities, it is able to process visual input by inserting a link in the chat. Moreover, it is considered one of the most accessible tools because it is free and the purpose is to evaluate tools that can be used by teachers and students in a school setting, and Hugging chat seems to be one of the most suitable for this purpose (Kirshteyn, 2024).

Sample

The RMET test was administered 10 times to HuggingChat, (to get more scientific feedback) for each of which, the Software chat was reset to prevent any content remaining in memory, in order not to alter the results. The chatbot was asked to choose the emotion or thought that matched each image from 4 options.

Tip given to HuggingChat: "From the options A-B-C-D, choose which word best describes what the person in the picture is feeling or thinking, keeping in mind that: A=..., B=..., C=..., D=... you can choose only one among the options, which you think is most suitable."

The same test, in the same manner used for Huggingchat, was also administered through Google Forms to a sample of 564 teachers, who were recruited through an update course for the 30 CFU qualifying pathways.

The sample ranges in age from 27 to 62, and 86 percent are female. The teachers are evenly distributed between elementary school, junior high school, and junior high school or university, and have a length of service with a mean of 10.57 years and a SD = 8.58.

Table 2: *Sample description.*

		Age				Service seniority	
Gender	N	Average	Minimum	Maximum	Std. Deviation	Average	Std. Deviation
Female	485	44.85	27	62	7.60	10.89	8.63
Male	79	43.22	27	61	8.89	8.56	8.01
Total	564	44.62	27	62	7.81	10.57	8.58

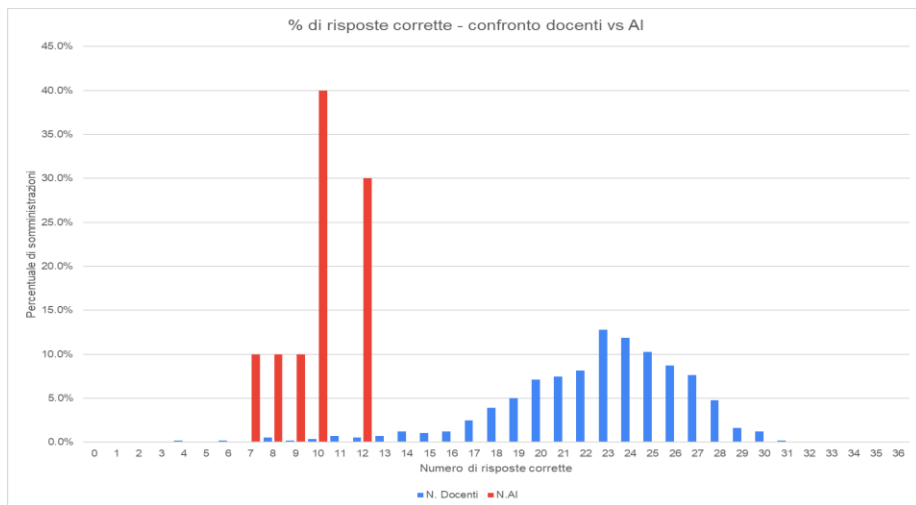
Results and Data Analysis

Data analysis was carried out through Jamovi, a software primarily used for data analysis and creating analytical solutions. It is widely used in areas such as statistics, business intelligence, data mining, predictive analytics and more.

First, the percentage of correct answers given by teachers and AI to the RMET test were compared through the use of the before-mentioned tool.

The comparative analysis showed that 52% of teachers provided between 22 and 26 correct answers out of a total of 36 questions. Whereas, Hugging Chat obtained between 10 and 12 correct answers in 70% of the interactions. The answers provided by Hugging chat turned out to be consistent across the different attempts indicating non-randomness of the answers and good reliability of the results, in fact most of the correct answers are concentrated on the same items in all ten attempts administered.

Figure 2: *Correct answers Teachers vs AI.*



To compare teachers' performance against artificial intelligence, a Z-test was used. The Z-test is a statistical method that allows to compare the proportions of two groups or conditions and determine whether they are significantly different from each other.

The results show that the proportions of correct responses are significantly different ($p < 0.001$) in the two groups, as below:

Table 3: *Outcomes Z-Test*

Ratio of correct answers by AI	Ratio of correct answers by professors	SE	Diff	Z-test	Pr < Z
0.278	0.629	0.026	-0.3508	-13.609	<.0001

Regarding the teachers, it was observed that the percentages of correct answers varied with age, progressively decreasing as age (50+ years) or seniority (8+ years) increased.

However, these differences are not found to be statistically significant.

Table 4: *Comparison of correct answers by age group.*

Age groups	Below average (score < 26)		Average (score 26-30)		Above average (score > 30)		N total	% total
	N	%	N	%	N	%		
27-38	36	27.48%	92	70.23%	3	2.29%	131	100.00%
39-44	39	30.00%	89	68.46%	2	1.54%	130	100.00%
45-49	44	33.33%	87	65.91%	1	0.76%	132	100.00%
50+	66	38.60%	103	60.23%	2	1.17%	171	100.00%
Total	185	32.80%	371	65.78%	8	1.42%	564	100.00%

Table 5: *Comparison of correct answers by seniority.*

Service seniority	Below average		Average		Above average		N total	% total
	N	%	N	%	N	%		
<=8	83	44.86%	200	53.91%	6	75.00%	289	51.24%
8+	102	55.14%	171	46.09%	2	25.00%	275	48.76%
Total	185	100.00%	371	100.00%	8	100.00%	564	100.00%

In the sample of teachers, it was also observed that there is no difference in the percentage of correct answers to the test with respect to the type of school of teaching (Primary, Secondary, Secondary, University).

- Method (Text Metric)

For the analysis of textual metrics aimed at assessing the emotional component, a pilot study involving a sample of about 30 primary and secondary school teachers was conducted. They were presented with activities performed by the chatbot, with complex relational situations related to bullying.

The literature clearly shows how crucial teachers' level of empathy is in managing and resolving bullying and conflict situations at school.

A meta-analysis with more than 100 studies (Marzano et al. 2003) shows that teachers who establish high-quality relationships based on respect, trust, and emotional support with their students experience more than 30 percent fewer behavioral problems in the classroom than those who do not create quality relationships.

Considering this, it is observed how teachers with high empathic skills, in addition to being more effective in recognizing problem behaviors, contribute to creating an inclusive and respectful school climate, reducing the incidence of aggressive behaviors and promoting positive relationships among students.

Therefore, Huggingchat was asked to explain how it would act if it were a teacher in each of the bullying stories we proposed.

The situations presented were identical; the only variation was in the age of the protagonist.

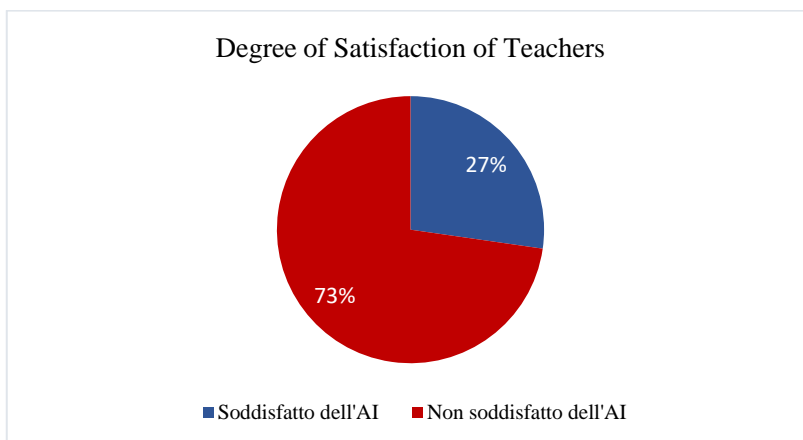
In fact, the story was being proposed in three different age groups: 6, 12 and 16.

It was chosen to evaluate three age groups to observe three different school stages, each characterized by distinct educational approaches, as well as three significant moments in the development of personal identity.

- Results

The results of the qualitative analysis show that only 27% of teachers are satisfied with the answers provided by Huggingchat. In distinction, 73% of teachers are not satisfied, noting that the responses tend to be similar regardless of the age of the protagonist and do not consider the specificity of the individual case.

Figure 3: *Degree of Teacher Satisfaction with AI.*



In light of this, it is inferred that Hugging-chat has an ability to analyze context, but does not take into account specific individual and situational characteristics and is limited in its ability to handle complex emotional situations, which require depth in understanding, sensitivity in responses, and ethical understanding.

Artificial intelligence, has no consciousness, and this limits it in emotional relationships; it can simulate understanding and offer support based on what has been programmed into it but it does not feel genuine emotions and cannot empathize in the human sense of the term. In fact, because it has no consciousness, it has neither self-awareness nor the empathic capacity that is core to the personality of the individual.

Discussion

From the data acquired from the experimentation, it can be concluded that the emotional component intrinsic to the role of the teacher cannot be replicated through artificial intelligence, which is nonetheless a supportive tool in the educational landscape, and in the learning process. Artificial Intelligence facilitates the management of teaching activities by favoring teaching strategies adapted to the individual needs of students, but it does not possess an emotional dimension that can support the teacher in the educational relationship with the student.

The finding that artificial intelligence lacks this component emphasizes the notion that while it can provide valuable support in instruction, it cannot replace the teacher's input in the classroom. In fact, due to its emotional competence, the teacher can be an important figure within the relational dimension with the student, taking into account the specificity of the individual, and thus facilitating the creation of a stimulating learning environment. (Zan,2007)

Conclusion

With the data acquired from the experimentation, it can be concluded that the emotional component intrinsic to the role of the teacher cannot be replicated through artificial intelligence, which is nonetheless a supportive tool in the educational landscape, and in the learning process, in that it facilitates the management of teaching activities by favoring teaching strategies adapted to the individual needs of students, but it does not possess an emotional dimension that can support the teacher in the educational relationship with the student.

As for the limitations of the study, one of them is the fact that only one artificial intelligence software was examined, and as for textual metrics, a qualitative analysis on a rather small sample was executed.

Therefore, future goals include extending the study to other AI tools and asking a larger sample of teachers to evaluate the responses provided by Huggingchat to relational situations, and comparing their performance in order to obtain more reliable data.

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