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Developing written communication skills in engineers in Spanish: is ChatGPT a tool or a hindrance?

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As 2023 became a disruptive year, due to the accelerated appearance of AI tools such as ChatGPT, the educational systems started to change and adapt to the new approaches observed in students, teachers, and employers. Although AI is likely to be integrated into different industrial and academic processes, its indiscriminate use could hinder the development of soft skills, including oral and written communication. Hence, it is important to identify any AI-generated assignments to secure a successful learning process. For those reasons, in this work, the effectivity of three plagiarism checkers, namely Turnitin, Unicheck and GPTZero, was evaluated on an engineering-based written text generated in ChatGPT in the Spanish language. A comparison with the plagiarism rate obtained for an original piece was conducted with One-way ANOVA. In all the cases, based on the low plagiarism rates (Unicheck: 14.44%, Turnitin: 12.43%), no plagiarism was detected in the AI-generated texts. Likewise, the GPTZero platform detected low AI-Origin in the texts created in ChatGPT (1.04%). Both results denoted the low efficiency of these platforms for assignments in Spanish and the high risk of conducting plagiarism without implications. Additionally, different alternatives were proposed for either integrating ChatGPT in learning activities or replacing the use of AI to ensure the development of skills and competencies in the students.

KEYWORDS

AI, critical thinking, written communication, engineering, soft skills, higher education

1 Introduction

At the end of 2022, the company OpenAI (2024) released ChatGPT (Generative Pre-Trained Transformer) to the world, generating polarized opinions regarding the future and applicability of AI in our lives. In a few days, several tweets around the globe showed the scope of answers and problem-solving capacity of this ChatBot, while others debated the positive and negative impacts of this technology (Rooses, 2022). Even when its capacity for remembering conversations, filtering inappropriate questions, and interacting in different languages amazed the whole world, many questions arose from the appearance of ChatGPT.

Around the world, people started wondering about its negative effect on academic processes and specific jobs such as call centers and knowledge-related jobs. As well as its threatening presence for Google and similar companies, with all the cybersecurity issues possibly related to this platform. Besides, one of the biggest concerns was its effect on the way humans work, think, and create (Gordon, 2022).

Although more critical opinions considered that ChatGPT could not comprehend the complexity of human language and human connections through its conversations (Bogost, 2022), many people positively perceived this tool (Adeshola and Adepoju, 2023). From the beginning, professionals in education started exploring the use of ChatGPT for generating materials, teaching recommendations, translations, assessment questions, and course syllabuses. Likewise, students were exposed to a potential virtual tutor who could answer multiple questions, work as a scaffold for different assignments, and provide feedback and proofreading (Lo, 2023).

Unfortunately, this tool also resulted in certain issues and concerns regarding the accuracy and reliability of its answers, the potential plagiarism performed by the students, and the low detection power of plagiarism checkers (Lo, 2023). As its human-like responses took the world by surprise, ChatGPT also raised educators' alarms regarding job replacement and incorrect information. Especially for plagiarism-related concerns, where risks from certain plagiarism detectors overlooking any AI origin, AI platforms becoming more complex and intricated, along with students developing and normalizing unethical behavior; could result in educators evaluating a deficient learning process (Grassini, 2023).

In addition to this new scenario, a common challenge for engineering programs has been providing technical and especially non-technical skills, as many of those abilities are sometimes not observed in graduates

(Mendonça et al., 2020). This has been outlined in the industrial sector, where graduates commonly lack soft skills, including creativity and innovation, along with communicative, adaptative, and collaborative skills. The industry-academia gap has been somehow potentiated by events such as the COVID-19 pandemic, while in some regions including Latin America, higher education institutions tend to prioritize technical skills over their non-technical counterparts (Reedy et al., 2020; Castelló et al., 2023).

Soft skills or socio-emotional skills are highly connected to the human nature of engineers and are fundamental for their behavioral and social assets (de Campos et al., 2020). From these, communication is included within the 4 Cs of learning for the 21st Century along with critical thinking, creativity, and collaboration (Gürdür Broo et al., 2022), which have been also classified as significant employability skills (Jackson, 2014). This is critical, as having the right and desired skills not only enhances the employability opportunities of engineering graduates but also reduces the training-related and other expenses invested by companies on their hired employees (Akdur, 2023). Unfortunately, when soft skills are not present, graduates can compromise their careers, and eclipse their technical proficiency (Hirudayaraj et al., 2021).

As already mentioned, the 2022-2023 period has been regarded as a disruptive year in which artificial intelligence (AI) gained traction and merged with the education process among other processes (industrial, health, commercial, agro-industrial) at many levels (Păvăloaia and Necula, 2023). Although in some areas this disruptive technology has been efficiently utilized, some fields are still evaluating and researching the best way to gain value from its application and integration (Bharadiya, 2023; Hendriksen, 2023; Pires and Santos, 2023), and in some cases its potential negative consequences have derived in the exploration of their legal implications (Ballell, 2019).

Additionally, as discussed by some authors, AI such as ChatGPT not only can provide low-quality responses, but on a closer look, there is a risk of generating products without practicing and gaining important skills, that were commonly acquired throughout the learning process (García-Peñalvo, 2023). For example, despite being an impressive feature, the response speed from ChatGPT represents a limitation for developing problem-solving and critical-thinking skills (Rahman and Watanobe, 2023).

In the case of Tecnológico de Monterrey (Mexico), its Tec21 educational model is based on the assessment of competencies through challenge-based learning, which makes it ideal for allowing the students to face and solve real-life issues, while developing technical and soft skills (Pérez and Campos, 2021). However, the appearance of ChatGPT and similar AI tools can compromise and modify how teachers monitor and assess the individual competency level of the students.

For engineering students, depending on the curricula, there are specific moments in which teachers can identify and provide feedback regarding oral and written communication skills. Therefore, the learning barriers that the indiscriminate use of ChatGPT can create, should be avoided at different stages of the learning process. Although Tecnológico de Monterrey has recently switched its plagiarism detectors from Unicheck to Turnitin (Turnitin, n.d.), its reported efficiency for detecting AI origin in English might be compromised because most classes and tasks occur in Spanish.

For those reasons, this work explored the effectiveness of three plagiarism checkers for detecting AI origin in argumentative texts from a Food Engineering class. This was necessary, as higher education institutions in Spanish-speaking countries (including Tecnológico de Monterrey) rely on the ability of institutional licensed plagiarism checkers to determine any lack of academic integrity when using ChatGPT. In addition, a discussion on different reported and implemented alternatives for developing and evaluating written communication skills under the menace of AI platforms, was included. The main hypothesis was that universities and educators utilize those three plagiarism detectors because of their assertiveness in detecting AI-related plagiarism even for assignments that are written in Spanish.

2 Materials and methods

2.1 Class selection and activity settings

The selected class was the "Design of Process Management and Safety Systems" class with code TA2006b,[1] which is a 5-week class

1 https://samp.itesm.mx/Materias/VistaPreliminarMateria?clave=TA2006B&lang=EN

from the Food Engineering program at Tecnológico de Monterrey, Campus Monterrey (Monterrey, Mexico). The class was taught in Spanish to 25 students (8 male, 17 female) from the fifth semester. In this class, in addition to the food safety and quality assurance technical activities, the students were asked to produce a one-page written opinion/reflection about "The importance of effective communication applied in a collaborative work." For comparison, all the students had to produce two written opinions on the topic. The first written opinion was an original piece created in Word (maximum one-page, Arial 12, 1.5 line spacing) by reflecting on the topic and writing their main thoughts in a structured and coherent manner (25 opinions in total). The second written opinion was a text obtained through ChatGPT (25 opinions in total). To allow more diversified responses from ChatGPT, there were no specific feeding criteria, the main instruction was to ask ChatGPT to create a one-page opinion on the topic, with a structured order (introduction, development, conclusion). Hence, each student was free to ask in their own words, by only respecting the given topic title in the request.

2.2 Originality of the written opinions

The students were asked to produce and submit both opinions through CANVAS as separate activities, between November 23rd and 28th, 2023. Both activities were linked on CANVAS to plagiarism check with Unicheck, which was the utilized checker at Tecnológico de Monterrey. From the beginning of 2024, Tecnológico de Monterrey switched to Turnitin as a plagiarism checker, hence the opinions were resubmitted on CANVAS, between February 23rd and 26th, 2024, where plagiarism with Turnitin was linked on the CANVAS submission interface (In this period only 20 opinions were received through CANVAS). In both submissions, a plagiarism check was linked to each submission and automatically conducted as the students uploaded each text. The plagiarism level results were individually collected as percentages, and an average percentage was calculated for each plagiarism checker tool. Additionally, the 25 ChatGPT-generated texts were individually analyzed through GPTZero,[2] from which the rate (%) of human, AI, and mixed origin were recorded and averaged. The experimental design is indicated in Figure 1.

2.3 Alternative solutions for assessing arguments and written communication skills

Different papers were included to outline some reported alternatives considering the utilization, integration, or replacement of ChatGPT and AI in academic activities focused on developing oral and written communication skills. Besides, the author's experience and perception of already implemented alternatives in class were also included in the discussion.

2 https://gptzero.me/

2.4 Statistical analysis

All the statistical analysis (normality tests, One-way ANOVA with Tukey Test) were performed in Minitab 21.4 Statistical Software, with a confidence level of 95%.

3 Results and discussion

3.1 Effectiveness of plagiarism checkers for detecting originality and AI-generated texts

The comparison of the Unicheck detection for both groups is indicated in Figure 2a, while its ANOVA data is presented in Table 1. No plagiarism was identified by Unicheck in both the original and the ChatGPT-generated opinions, as noted by their similarity percentage values (Original: 10.14 ± 6.88%; ChatGPT: 14.44 ± 7.13%). Despite the significantly higher plagiarism percentage found in the ChatGPT-generated opinions ($p = 0.037$), both groups portrayed low similarity percentages below 15%, which resulted in a green-colored result from Unicheck, indicating an acceptable plagiarism rate.

The results of the plagiarism check through Turnitin are shown in Figure 2b, and its ANOVA data is displayed in Table 2. The results from Turnitin were also below a similarity value of 15% (Original: 8.60 ± 4.92%; ChatGPT: 12.43 ± 7.85%). In the case of this plagiarism checker, no significant differences (Table 2) were found between the original and the ChatGPT groups ($p = 0.071$), which denoted the lack of capacity from this tool for detecting AI-generated texts, written in Spanish.

On the other hand, the GPTZero tool could not identify any AI origin, which is graphically indicated in Figure 3. As noted, any AI origin was calculated with an average of 1.04 ± 1.14%, as all the documents were mainly attributed to human origin (82.52 ± 5.77%) or a combination of human and AI contributions (16.16 ± 5.04%).

Unfortunately, these results reflect the lack of effectiveness from Unicheck, Turnitin and GPTZero for identifying documents generated in Spanish language, with the aid of ChatGPT. Likewise, this evidenced the ease of those AI platforms for generating humanized responses that could impede the development of written communication skills in learners, which are commonly practiced and improved when writing argumentative essays (Muthmainnah et al., 2022).

Unicheck and Turnitin are subscription tools utilized by many higher education institutions to detect plagiarism in different types of tasks and activities, due to the possibility of obtaining a colored plagiarism percentage, which is very useful and visual for educators. In the case of Turnitin, since its appearance in 1997, it has been utilized for its diverse searching scope, supported document formats, and language availability (19 languages) (Chandere et al., 2021).

Often referred to as text-matching software products, Unicheck and Turnitin have different strengths and weaknesses. For instance, Turnitin is more suitable for detecting letter-like symbols and plagiarism tricks known as disguised plagiarism, while Unicheck is more functional for quoted plagiarism. Nevertheless, Unicheck

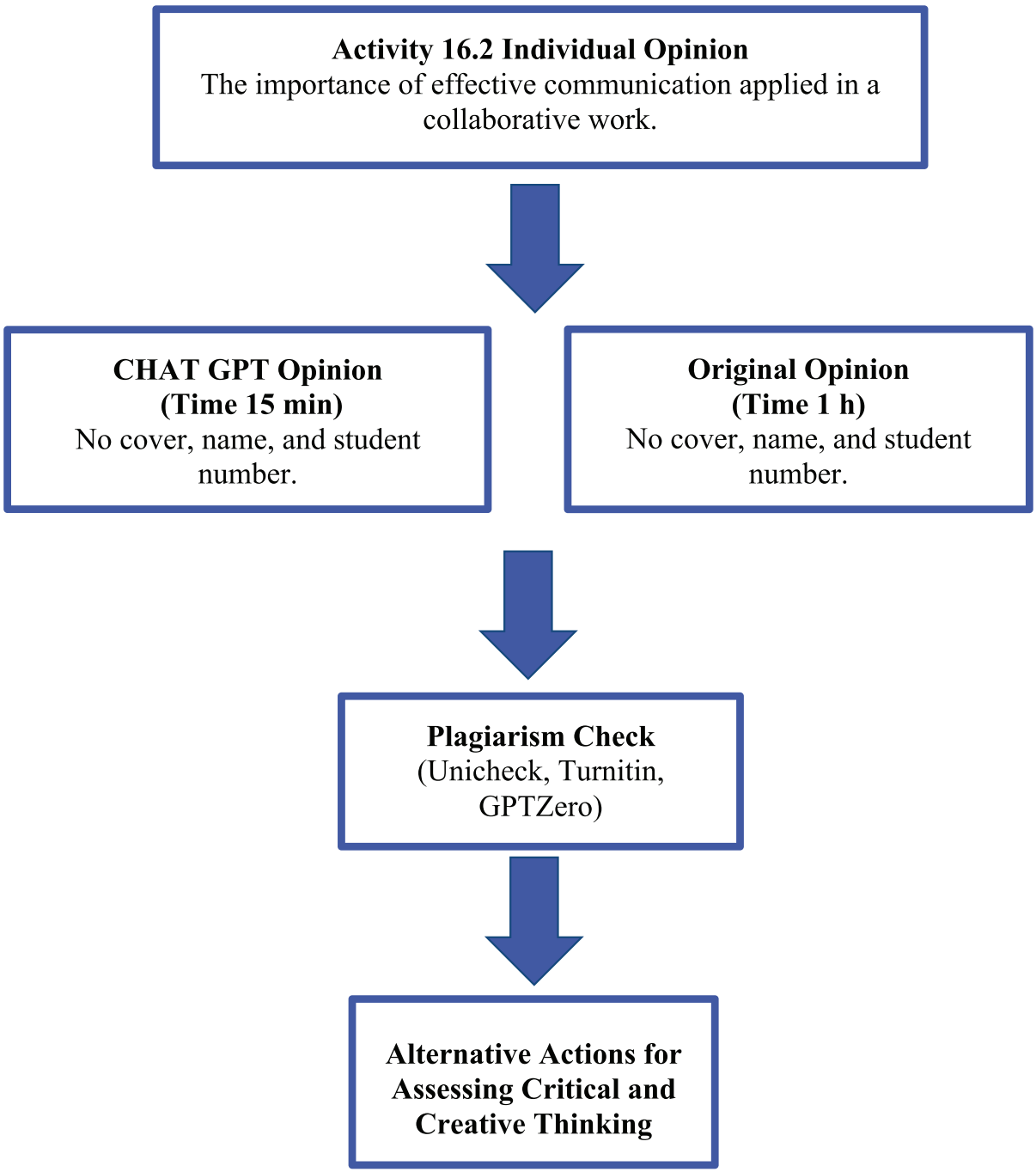

FIGURE 1
Experimental approach of this work for the evaluating the effectiveness of plagiarism checkers on detecting AI generated products.

has been disclosed as non-functional for plagiarism tricks, such as copying images into text, modifying the font size and color, replacing letters with symbols, and inserting invisible letters. Yet, just as observed in this work, in terms of plagiarism percentage, Unicheck has been reported as slightly more effective than Turnitin (Elkhatat et al., 2021).

Because of the complexity of detecting the origin and construction of texts, platforms such as Turnitin and Unicheck still face a challenge in identifying machine-generated content. Hence, the incorporation of these checkers into AI detection tools is a potential integration to detect AI-related plagiarism (Dalalah and Dalalah, 2023). Unfortunately, the observed low efficiency when detecting ChatGPT-generated texts could motivate morally disengaged individuals to get involved in AI-related plagiarism (Zhang et al., 2024).

Although this scenario might seem negative, AI platforms can still be applied to acquire and support current technical and non-technical skills. In the case of GPTZero, this platform has been reported as the most prominent for identifying ChatGPT and AI-generated texts, yet a conscious and critical use should

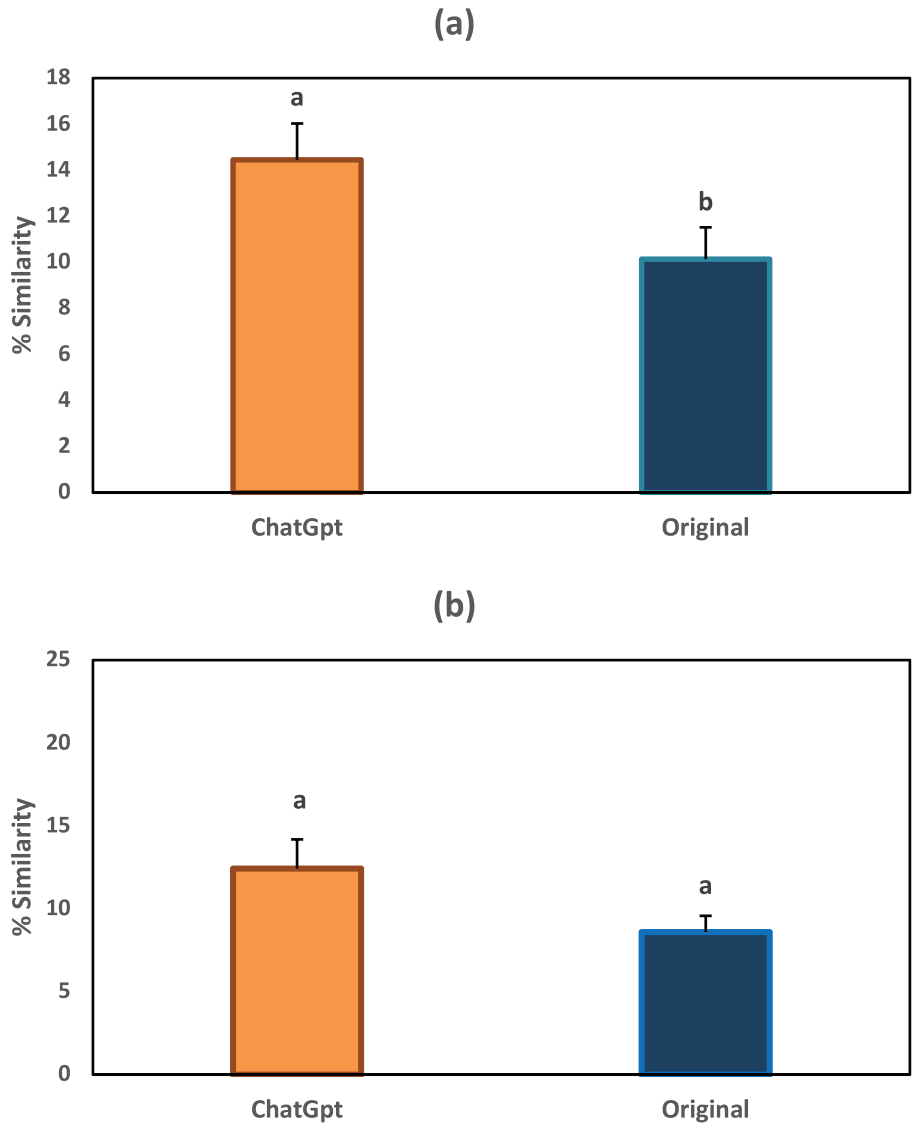

FIGURE 2
Average similarity percentage (mean ± SE) detected in the ChatGPT and the original opinions with **(a)** Unicheck (n = 25, α = 0.05, p = 0.037, 95% CI ChatGPT: 7.27–13.02, 95% CI Original: 11.62–17.26) and **(b)** Turnitin (n = 20, α = 0.05, p = 0.071, 95% CI ChatGPT: 9.52–15.34, 95% CI Original: 5.62–11.58). Different letters indicate significant differences between the compared groups, $p \leq 0.05$).

TABLE 1 One-way ANOVA and Tukey test for the plagiarism check in Unicheck.

Source	DF	Adj SS	Adj MS	*F*-value	*P*-value
Factor	1	226.1	226.06	4.61	0.037
Error	47	2306.1	49.07		
Total	48	2532.2			
Factor	***N***	**Mean**	**Grouping**		
CGPT	25	14.44	A		
OG	25	10.14		B	

be implemented to avoid false positives (Heumann et al., 2023). In addition, GPTZero has also been rated as low/mediocre when identifying false negatives, which results in the mistaken classification of AI-generated texts as human origin (Habibzadeh, 2023). The latter corresponds to the observed result in this work, where only 1 % of the opinions were detected as AI originated. Even when higher education institutions integrate Unicheck and Turnitin as institutional plagiarism checkpoints, while some educators filter suspected AI-plagiarized assignments through GPTZero, their effectiveness should be questioned and

TABLE 2 One-way ANOVA and Tukey test for the plagiarism check in Turnitin.

Source	DF	Adj SS	Adj MS	*F*-value	*P*-value
Factor	1	150.2	150.15	3.46	0.071
Error	39	1693.9	43.43		
Total	40	1844.1			
Factor	***N***	**Mean**	**Grouping**		
TCGPT	20	12.43	A		
TOG	20	8.60	A		

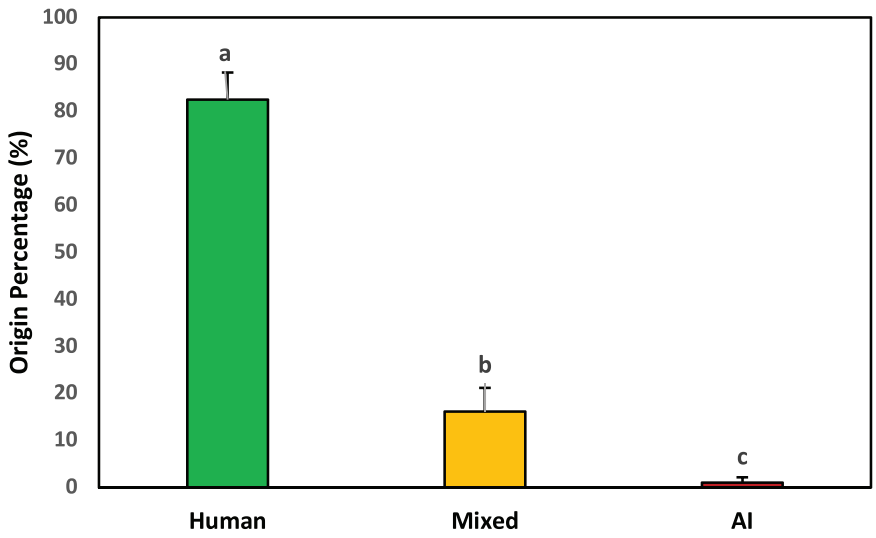

FIGURE 3
Average origin by percentage for the 25 opinions generated in ChatGPT according to the GPTZero platform (n = 25, α = 0.05, 95% CI Human: 80.74–84.30, 95% CI Mixed: 14.38–17.94, 95% CI AI: −0.742 to 2.822).

proven for different languages, before its widespread use in many assignments.

3.2 Alternative options for assessing and promoting critical and creative thinking in engineering students: the specific case of ChatGPT

From the moment ChatGPT was presented to the world in 2022, a worldwide revolution in the educational systems occurred at an accelerated speed. Far from the initial frightened approximation from educators, ChatGPT has been currently integrated into different fields, mainly due to its versatility for generating texts, social media content, problem-solving, data analysis, and information search (Diego Olite et al., 2023).

There are many concerns regarding the use of ChatGPT in terms of academic integrity, especially since it has been designed to provide humanized natural language interactions, including creative and argumentative texts. The main concern about this AI platform is the worldwide availability and accessibility, and the possibility for its users to generate essays irresponsibly, without the appropriate tools for identifying its utilization as potential cheating and plagiarism (Eke, 2023). In addition to the academic integrity issues, the use of ChatGPT could be affected by low-quality inputs, the output's veracity, the absence of knowledge acquisition as part of a cognitive process, which is limited by the sole acquisition of data through AI, as well as the generation of incorrect, biased and judgmental responses (Dalalah and Dalalah, 2023).

The way ChatGTP receives any input requires an appropriate use of grammar and syntax. Therefore, this tool is an opportunity for educators to improve and redesign their pedagogical approach and learning strategies. Nevertheless, it also represents a challenge for achieving deep learning, receiving truthful responses, and utilizing it with criticism and responsibility (Diego Olite et al., 2023).

The written opinion analyzed in this work is integrated and assessed in the selected course, to promote the student's reflection on their role as food engineers. This has been linked to a conscious development of competencies in the students, including social intelligence, collaborative skills, and negotiation effectiveness. In addition, this activity also works as an opportunity for the students to practice their writing skills, as well as their capacity for communicating their thoughts and ideas.

Through this activity and after feedback is provided, improvements can be observed throughout the course in the student's writing and communication skills. Unfortunately, with the use of ChatGPT and other similar text-generation AI platforms, many educators started questioning the effectiveness of these types

TABLE 3 Proposed actions for the integration of ChatGPT and similar AI in writing assignments.

Integration of ChatGPT			
Proposed action	Positive aspects	Negative aspects	References
Utilization of antiplagiarism platforms/tools	– Establishment of an acceptable similarity percentage value.	– Depends on the tool's efficiency.	Kangas-Olson, 2023
Training staff in the use of ChatGPT and its diverse	– Identification of dishonest behavior.	– Ethical and regulatory considerations should be established and included.	Eke, 2023
Generation of texts that can be perfected in class.	– Utilization of AI for the generation of ideas. – Application of AI as an academic assistant.	– It should be applied during the class and with the supervision of educators.	Eke, 2023
Controlled utilization of ChatGPT	– Utilize ChatGPT as a support tool for certain processes, similar to when a calculator is used when developing mathematical-related competencies.	– Requires ethical considerations. – The students should possess critical analysis, regarding the utilization of AI.	García-Peñalvo, 2023
Draft editing and language editor	– Requires an initial writing step by the students. – Enhanced text coherence.	– Comprehension of the way in which AI understands different concepts. – Requires ethical considerations.	Lingard, 2023

TABLE 4 Proposed alternatives to prevent the use of ChatGPT and similar AI in writing assignments.

Alternatives to ChatGPT			
Proposed action	Positive aspects	Negative aspects	References
Application of individual assignments with interesting topics.	– Production of personalized data sets. – Increased interest and investment.	– There is still risk of plagiarism.	Kangas-Olson, 2023
Application of assignments in first person	– Gives a voice to the students in – They need to give structure and revise their texts	– There is still risk of plagiarism.	Kangas-Olson, 2023
Application of paper-based assignments.	– Diminishes the possibility of using AI. – Compels the students to sharpen their writing skills.	– The students could still copy an AI text. – Requires the supervision from educators. – It is a less sustainable option.	Shidiq, 2023
Debate regarding a topic	– Formulation and presentation of ideas in real time. – Real-time evaluation of competencies.	– Requires implementation times. – The facilitator should generate the space and moments for the participation of every student.	Implemented in class
Oral presentation/ oral exam	– Showcasing competencies and arguments in real time. – Direct and immediate feedback and evaluation.	– The student could memorize an AI generated text. – This implementation requires designated times within the class programming.	Implemented in class
Video	– The students demonstrated different skills by designing, preparing and recording a video on a specific topic. – The video can be produced as a task for home. – Different platforms (e.g., Flipgrid, YouTube) can used for sharing the video.	– The video script can be AI generated.	Implemented in class

of activities for truly assessing competency achievement levels, especially when considering the time invested in evaluating these products. Hence, this is an ongoing discussion, for creative writing assignments where practicing is crucial for learning and acquiring skills (Shidiq, 2023).

Different alternatives for using, limiting, and avoiding ChatGPT in creative writing are indicated in Tables 3, 4. Some reported strategies outline the use of ChatGPT as a tool for starting texts or editing an original piece (Eke, 2023). Nevertheless, as there are divided opinions among educators, many universities have established guidelines for the use of ChatGPT (Harvard University, n.d.; Tecnológico de Monterrey., 2023), in which there are sections regarding the protection of confidential data and working with academic integrity.

Apart from plagiarism detectors, educators can identify language inconsistencies, uncited content or segments, lack of coherence, and similar details related to AI utilization (Rahman and Watanobe, 2023). Based on previous teaching experiences, the authors of this work have applied certain recommendations for avoiding the irresponsible use of ChatGPT (Table 4).

One of the perceived key aspects is the creation of a safe studying environment, formed by a teacher-student trust relation. If this bond is created, educators can easily explain the importance of an original written text with total understanding from the students. In some cases, assigning specific moments for in-class activities, is crucial for the total inspection and control of this type of activity during the class, which also eliminates the uncertainty when the students work on their assignments at home.

There are still more changes and adequations to come in the education and industrial fields. Whether AI integration or ban is selected by educators and employers, specific guidelines, ethical considerations, and regulations, are necessary elements to consider in light of the exponential growth of AI (Dalalah and Dalalah, 2023).

4 Conclusion

Oral and written communication skills are necessary to increase the employability of engineering graduates, and to fulfill the demands of the labor market. However, the fast appearance of different AI platforms, such as ChatGPT sets a challenging scenario for the different actors involved in the educational process, especially when developing and evaluating soft skills through creative and argumentative activities.

Even with current plagiarism checkers, one of the main challenges is linked to the inefficiency of these tools for detecting AI-generated products, especially when other languages are utilized. Because of the low AI-detection power observed from Unicheck, Turnitin, and GPTZero, for assignments written in Spanish, pedagogical modifications should consider not only the implementation of new learning strategies but also the familiarization of facilitators and learners with applicable AI tools that could enrich the education process and the developed skills. Moreover, educators should be able to identify the use of ChatGPT without using plagiarism checkers and create activities where the students truly practice and develop skills without recurring to plagiarism.

Finally, ethical considerations and academic integrity should be promoted and developed in the students, to avoid any indiscriminate use of ChatGPT. This is expected to prevent barriers, gaps, and limitations during the development of technical and non-technical skills.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this activity.

Author contributions

VM-M: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Validation, Visualization, Writing – original draft, Writing – review and editing. RG-G: Conceptualization, Investigation, Project administration, Validation, Writing – review and editing.

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Conflict of interest

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

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