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Aplicación de herramientas de inteligencia artificial para mejorar la producción escrita en estudiantes de secundaria en clases de inglés

Application of artificial intelligence tools to improve the written production of high school students in English classes

Aplicação de ferramentas de inteligência artificial para melhorar a produção escrita em alunos do ensino secundário em aulas de inglês

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Resumen

El presente estudio evaluó el impacto del uso de herramientas de inteligencia artificial (IA) como Grammarly, QuillBot y ChatGPT en la redacción en inglés de estudiantes adolescentes, considerando los criterios de gramática, coherencia y cohesión, y vocabulario. Debido a que los datos no cumplían los supuestos de normalidad, se aplicó la prueba no paramétrica de Mann-Whitney U para comparar los resultados entre estudiantes que utilizaron herramientas de IA y aquellos que no lo hicieron. En todos los criterios evaluados, se encontraron diferencias estadísticamente significativas ($p < 0,001$), favoreciendo al grupo que empleó IA. Estos resultados evidencian que el uso de dichas tecnologías puede mejorar significativamente la calidad de los textos escritos. Adicionalmente, se aplicó una encuesta con escala de Likert para conocer la percepción de los estudiantes sobre el uso de estas herramientas. La mayoría expresó opiniones neutrales a favorables, especialmente en aspectos como facilidad de uso, organización de ideas y aprendizaje de vocabulario. También se observó un interés por seguir utilizando IA en futuras clases y en otras asignaturas. Al analizar las respuestas por edades, se encontró que los estudiantes de 14 y 15 años mostraron una actitud más receptiva hacia la IA en comparación con los de 16 años, cuyas percepciones fueron más reservadas. Estos hallazgos sugieren que las herramientas de IA no solo mejoran el desempeño lingüístico, sino que también influyen en la motivación y autonomía del estudiante, lo que abre oportunidades para su integración pedagógica en el aula de manera crítica y formativa.

Palabras clave: inteligencia artificial; producción escrita; estudiantes secundaria; inglés.

Abstract

This study evaluated the impact of using artificial intelligence (AI) tools such as Grammarly, QuillBot, and ChatGPT on adolescent students' English writing, considering the criteria of grammar, coherence and cohesion, and vocabulary. Because the data did not meet the assumptions of normality, the nonparametric Mann-Whitney U test was applied to compare the results between students who used AI tools and those who did not. Statistically significant differences were found ($p < 0.001$) in all the evaluated criteria, favoring the group that used AI. These results demonstrate that the use of these technologies can significantly improve the quality of written texts. Additionally, a Likert-scale survey was administered to determine students' perceptions of the use

of these tools. The majority expressed neutral to favorable opinions, especially in aspects such as ease of use, organization of ideas, and vocabulary learning. There was also an interest in continuing to use AI in future classes and other subjects. When analyzing responses by age, it was found that 14- and 15-year-old students displayed a more receptive attitude toward AI compared to 16-year-olds, whose perceptions were more reserved. These findings suggest that AI tools not only improve language performance but also influence student motivation and autonomy, opening up opportunities for their pedagogical integration into the classroom in a critical and formative manner.

Keywords: artificial intelligence; written production; secondary school students; English.

Resumo

Este estudo avaliou o impacto da utilização de ferramentas de inteligência artificial (IA), como o Grammarly, QuillBot e ChatGPT, na escrita em inglês de alunos adolescentes, considerando os critérios de gramática, coerência e coesão, e vocabulário. Como os dados não cumpriam os pressupostos de normalidade, foi aplicado o teste não paramétrico U de Mann-Whitney para comparar os resultados entre os estudantes que utilizaram ferramentas de IA e os que não utilizaram. Foram encontradas diferenças estatisticamente significativas ($p < 0,001$) em todos os critérios avaliados, favorecendo o grupo que utilizou IA. Estes resultados demonstram que a utilização destas tecnologias pode melhorar significativamente a qualidade dos textos escritos. Além disso, foi administrado um inquérito em escala Likert para determinar as perceções dos estudantes sobre o uso destas ferramentas. A maioria expressou opiniões neutras a favoráveis, especialmente em aspetos como a facilidade de utilização, a organização de ideias e a aprendizagem de vocabulário. Houve também interesse em continuar a utilizar a IA em aulas futuras e outras disciplinas. Ao analisar as respostas por faixa etária, verificou-se que os alunos de 14 e 15 anos demonstraram uma atitude mais recetiva em relação à IA comparativamente aos alunos de 16 anos, cujas perceções foram mais reservadas. Estas descobertas sugerem que as ferramentas de IA não só melhoram o desempenho linguístico, como também influenciam a motivação e a autonomia dos alunos, abrindo oportunidades para a sua integração pedagógica na sala de aula de forma crítica e formativa.

Palavras-chave: inteligência artificial; produção escrita; alunos do ensino secundário; inglês.

Introducción

In the global context, proficiency in the English language has become a key 21st-century skill—not only as a medium for international communication, but also as a tool for accessing scientific, technological, and cultural information (Liu et al., 2023; Wahyuningsih, 2024). Writing in English is considered an essential skill for participating in increasingly interconnected academic and professional environments (Alqahtani et al., 2023). In response to this demand, the integration of technological tools—and more recently, artificial intelligence (AI)—has opened new possibilities to optimize teaching and learning processes by offering automated, personalized, and real-time feedback (Christou, 2023; Swiecki et al., 2022).

However, at the national level, there are still significant gaps in English language instruction, especially at the secondary level. Many students exhibit low performance in written production, facing difficulties in grammar, coherence, textual cohesion, and vocabulary (Liang et al., 2023). These shortcomings are further exacerbated by structural limitations such as overcrowded classrooms, limited time for writing practice in class, and the prevalence of traditional methods that prioritize grammatical memorization over contextual language application (Fan et al., 2025). Although accessible technological resources like Grammarly, QuillBot, or ChatGPT exist, their pedagogical integration in schools remains limited or nonexistent, due to both teachers' lack of familiarity and the absence of clear policies regulating their educational use (Curtis, 2023; Fan et al., 2025).

In the Latin American academic context, several recent works have explored the integration of emerging technologies to optimize learning processes, offering valuable insights applicable to English language instruction. For instance, Castillo Anzules and Guaña Moya (2024) examined agile methodologies, such as Kanban, to enhance workflow management in software development—findings that underline the importance of structured, iterative approaches, which can also inform the design of AI-assisted writing activities. Similarly, Guaña Moya, García Herrera, and Quinatoa Arequipa (2017) discussed the feasibility of implementing computer applications in Ecuadorian higher education, highlighting both infrastructural challenges and the pedagogical potential of digital tools.

From a more specialized perspective, Marcillo, Castillo Anzules, and Begnini (2024) reviewed heuristic applications in artificial intelligence, emphasizing decision-making algorithms that could be adapted for personalized feedback in language learning. The educational benefits of ICT have

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also been documented by Guaña-Moya, Arteaga-Alcívar, Ilbay-Guaña, and Morales Jaramillo (2023), who demonstrated their positive impact on students with dyslexia, and by Guaña-Moya, Arteaga-Alcívar, Chiluisa-Chiluisa, and Begnini-Domínguez (2022), who traced the evolution of ICT in education, outlining trends relevant to AI-supported writing instruction.

In the area of accessibility and inclusion, Arteaga Alcívar (2025) proposed the design and evaluation of adaptive learning platforms for students with disabilities, an approach that resonates with the potential of AI tools to address diverse learner needs in writing tasks. Likewise, Tiglla Tumbaico (2025) analyzed the impact of generative artificial intelligence (IAG) on personalized learning in Latin American universities, reinforcing the view that AI can be a catalyst for individualized, student-centered instruction.

These studies provide a solid foundation for examining AI-assisted tools such as Grammarly, QuillBot, and ChatGPT in the context of English writing, supporting both the pedagogical rationale and the technological feasibility of their integration into secondary education.

The core problem lies in the difficulty of improving secondary students' English writing skills through conventional pedagogical strategies, which fail to provide timely feedback or foster autonomous learning (Curtis, 2023; Wang, 2022). This situation hinders the development of key communication competencies and negatively impacts overall academic performance. AI tools could represent a viable solution, as they offer individualized, immediate, and continuous support during the writing process. However, there is still insufficient empirical evidence to support their effectiveness in specific school contexts (Marino et al., 2023).

This research is justified by the urgent need to evaluate the real impact of emerging technologies in the classroom, particularly those that can enhance the teaching of English and help close educational gaps (Khalifa & Albadawy, 2024; Marino et al., 2023). Assessing the use of AI tools as writing support not only responds to the demand for educational innovation but can also provide teachers with new strategies to address the diversity of learning styles present in their classrooms (Law, 2024; Marino et al., 2023).

The significance of this study lies in its potential to generate applicable knowledge on how AI-based technologies can be effectively integrated into the school curriculum (Law, 2024). Moreover, it can provide evidence to guide the formulation of educational policies that promote the responsible and pedagogically sound use of these tools for the benefit of students (Kim & Kim, 2022; Zhao, 2023).

The objective of this research is to evaluate the impact of using artificial intelligence tools on improving the written English production of secondary students, through the application of Likert-scale surveys to gather data on perceptions, progress, and challenges throughout the process. The results are expected to show significant improvements in areas such as grammar, textual coherence, and motivation for language learning, as well as a positive attitude toward the use of technologies in the classroom.

Materials and Methods

This study employs a quantitative approach with a quasi-experimental design to evaluate the impact of using artificial intelligence (AI) tools on the English writing production of secondary school students. The research involves a comparison between an experimental group, which used AI platforms such as Grammarly, QuillBot, and ChatGPT during writing activities, and a control group, which continued using traditional methods without technological support (Khalifa & Albasssdawy, 2024; Wei, 2023).

The sample consisted of students from two educational institutions, selected through non-probabilistic convenience sampling, considering similar academic levels and socioeconomic contexts. Participants were between 13 and 16 years old.

The following instruments were used for data collection:

1. Pre- and post-intervention written tests evaluated using rubrics that assessed grammar, coherence, cohesion, and vocabulary.
2. A Likert-scale survey administered to the experimental group, designed to measure students' perceptions of the AI tools in terms of usefulness, ease of use, motivation, and self-efficacy in writing. The scale consisted of five levels ranging from "strongly disagree" to "strongly agree."

The procedure began with the administration of an initial written test to both groups to establish a baseline. Subsequently, over eight weeks, the experimental group used AI tools to support their writing activities under teacher supervision, while the control group worked with conventional techniques. At the end of the intervention, a post-test was administered to both groups, and the Likert-scale survey was applied to the experimental group (Wei, 2023).

Quantitative data were analyzed using statistical software. A descriptive analysis was conducted to characterize the variables, and an inferential analysis was used to compare pre- and post-

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intervention results between the two groups, using appropriate statistical tests based on the data distribution (Dergaa et al., 2023; Nazari et al., 2021). Survey results were analyzed using frequency distributions and measures of central tendency to identify the predominant perceptions among students.

This methodology allows for a comprehensive and objective evaluation of the effect of AI-based tools on the development of English writing skills, combining performance measures with the users' subjective assessments (Liu et al., 2023; Syahnaz & Fithriani, 2023; Wang, 2022).

Table 1. Grammar Test Evaluation Rubric.

Criterion	Level 1	Level 2	Level 3
Grammar	Numerous errors that hinder comprehension	Some errors, do not affect comprehension	Correct and varied use of structures
Coherence and Cohesion	Disorganized ideas, connectors absent	Acceptable organization, basic connectors	Clear ideas well linked with appropriate connectors
Vocabulary	Limited and repetitive vocabulary	Adequate vocabulary but not very varied	Wide, precise, and varied vocabulary
Creativity and Content	Underdeveloped ideas or clichés	Adequate development of ideas	Original and well-developed ideas

Results Analysis

Since the data collected did not meet the assumptions of normality required for parametric tests, the non-parametric Mann-Whitney U test was used to compare the scores of students who used artificial intelligence tools with those who did not. This statistical test is appropriate for comparing two independent groups when the variables of interest are ordinal or when the data distribution is non-normal, as was the case in this study. The choice of this test made it possible to robustly determine whether there were significant differences in the evaluated criteria grammar, coherence and cohesion, and vocabulary without compromising the validity of the results.

The Mann-Whitney U test was applied to compare the performance of students who used AI with those who did not, in the criteria of grammar, coherence and cohesion, and vocabulary. In all cases, statistically significant differences were found ($p < 0.001$), favoring the group that used AI. This indicates that such tools can be effective support for improving the quality of students' written texts.

Table 2. Mann-Whitney U Test Statistics for the Evaluation Criteria: Grammar, Coherence and Cohesion, and Vocabulary.

Criterion	Mean Rank (With AI)	Mean Rank (Without AI)	Z-value	p-value (Asymptotic Sig. 2-tailed)
Grammar	149.12	91.88	-7.169	< 0.001
Coherence and Cohesion	151.47	89.53	-7.740	< 0.001
Vocabulary	153.45	87.55	-8.247	< 0.001

The results show a clear and consistent difference in the linguistic performance of students who used artificial intelligence compared to those who did not. In all three evaluated criteria—grammar, coherence and cohesion, and vocabulary—students who had the support of AI tools obtained significantly higher scores. This finding suggests that the use of AI can enhance writing quality by helping students build more structured sentences, connect ideas with greater clarity and precision, and expand their lexical repertoire. Furthermore, it is evident that the AI support went beyond basic corrections and positively influenced the overall development of the texts.

These results reinforce the potential of emerging technologies as complementary resources in teaching and learning processes, particularly in writing production. They also highlight the need to rethink traditional pedagogical practices to critically, constructively, and ethically integrate these tools into the classroom.

Table 3. Survey on Students' Experience Using Artificial Intelligence Tools for Writing.

Question	**1**	**2**	**3**	**4**	**5**
Using tools like Grammarly, QuillBot, or ChatGPT helped me improve my English grammar.	26	22	39	27	6
The artificial intelligence tools were easy to use.	20	18	35	31	16
I felt more motivated to write in English when using these tools.	23	22	39	22	14
These tools helped me better organize my ideas when writing.	24	19	32	38	7
They helped me learn new words and improve my English vocabulary.	18	24	32	33	13
Using artificial intelligence gave me more confidence to write in English.	24	19	35	27	15
I would prefer to continue using these tools in future English classes.	24	17	32	31	16
I would like teachers to integrate more AI tools in other subjects.	20	17	39	27	17
I believe I learned more by writing with AI support than with traditional methods.	22	19	35	25	19
I felt more independent and able to correct my mistakes using these tools.	24	20	35	27	14

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The results obtained reflect a predominantly positive perception among students regarding the use of artificial intelligence (AI) tools such as Grammarly, QuillBot, or ChatGPT in their English writing activities. Although responses tend to cluster around the middle levels of the Likert scale, there are clear indicators showing openness and acceptance toward these educational technologies. In the dimension related to improvement in English grammar, most students (39) remained neutral, while 33 expressed some level of agreement (levels 4 and 5). This suggests that, although part of the group perceives concrete grammatical benefits, others have yet to identify a clear impact, which could be due to how the tools were used or their prior knowledge of the language.

The statement regarding the ease of use of AI tools received more agreement-oriented responses. A total of 47 students selected levels 4 and 5, while 35 chose the midpoint. This indicates that students generally considered these platforms to be accessible and easy to use, which is a key factor for their effective classroom integration.

Regarding motivation to write in English, opinions were more divided. Although 36 students showed agreement (levels 4 and 5), a similar number (45) selected the lower levels of the scale (levels 1 and 2), indicating that AI use did not have the same motivational effect for everyone. This difference may be related to individual factors such as confidence, interest in the language, or familiarity with this type of technology.

On the other hand, the statement "These tools helped me better organize my ideas when writing" received a more favorable response. Here, 45 students selected levels 4 and 5, suggesting that a significant portion perceived improvements in the structure and clarity of their texts thanks to AI tools—particularly due to suggestions on coherence and logical sequencing of ideas.

The vocabulary learning dimension also reflected a mostly positive experience. More than 46 students recognized improvement in this aspect (levels 4 and 5), highlighting the potential of these tools to enrich vocabulary, as they often provide synonyms, more appropriate word suggestions, or contextual corrections.

Regarding confidence in writing in English, the data show a favorable perception, though with some dispersion. Nearly half of the group (42 students) reported feeling more confident when writing with AI (levels 4 and 5), indicating that these tools can create a less intimidating environment for writing, especially by reducing errors before being evaluated by teachers or peers.

The statement about the desire to continue using these tools in future classes received strong support: 47 students chose levels 4 and 5. This clearly demonstrates students' willingness to keep integrating AI into their English learning process—an opportunity teachers can leverage to design more innovative and personalized activities.

Aligned with this, the idea that teachers should integrate AI tools into other subjects was also well received, with 44 students expressing agreement (levels 4 and 5). This suggests that the perceived benefits are not limited to English; students see

Table 4. Survey on Students' Experience Using Artificial Intelligence Tools in Writing.

Questions	**14 years old (n=50)**	**15 years old (n=61)**	**16 years old (n=9)**
Using tools like Grammarly, QuillBot, or ChatGPT helped me improve my English grammar.	2.82	2.64	2.33
Artificial intelligence tools were easy to use.	3.20	2.97	2.44
I felt more motivated to write in English when I used these tools.	2.80	2.74	2.22
These tools helped me better organize my ideas when writing.	3.02	2.90	2.33
They helped me learn new words and improve my English vocabulary.	3.06	2.95	2.44
Using artificial intelligence gave me more confidence to write texts in English.	2.94	2.77	2.11
I would prefer to continue using these tools in future English classes.	3.06	2.90	2.22
I would like teachers to integrate more AI tools into other subjects.	3.14	3.03	2.22
I believe I learned more by writing with AI support than with traditional methods.	3.10	2.92	2.44
I felt more independent and capable of correcting my mistakes with these tools.	3.02	2.85	2.44

Regarding the perception of artificial intelligence tools, 14-year-old students expressed the most favorable evaluations across the assessed dimensions. Their responses fell within an average range between 2.80 and 3.20, reflecting a mostly neutral stance with a slight positive inclination. Among the statements that generated the highest levels of agreement in this group was their interest in

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incorporating AI tools into other subjects (M = 3.14, Question 8), followed by the perception that they learned more with AI compared to traditional methods (M = 3.10, Question 9). These results suggest that younger students view AI as a valuable asset to enhance their educational experience and broaden their learning horizons.

On the other hand, 15-year-old students—the largest group in the study (n = 61)—showed slightly lower average scores, ranging from 2.64 to 3.03. Although their responses also remained within a neutral range, a similar trend to that of the younger group was observed. Again, the statement with the highest acceptance was the desire to integrate AI tools into other subjects (M = 3.03, Question 8), indicating a shared interest in exploring new, technology-supported learning methods. However, a lower rating was identified in relation to improvements in English grammar (M = 2.64, Question 1), suggesting that for this group, AI had a limited impact on that specific language aspect.

For the 16-year-old students (n = 9), the lowest evaluations in the study were observed, with averages ranging from 2.11 to 2.44, placing them between the "Disagree" and "Neutral" categories. The lowest score was recorded for the question about confidence in writing English (M = 2.11, Question 6), which may indicate that, for this group, AI tools were not effective in strengthening that dimension. The highest scores in this group, although still modest, were for questions related to learning new vocabulary (M = 2.44, Question 5) and independently correcting errors (M = 2.44, Question 10). It is important to note that the small number of participants in this group limits the generalizability of these results, although it does allow for the identification of certain trends.

In general, it is evident that 14- and 15-year-old students show a more receptive attitude toward the use of AI tools compared to 16-year-olds. Although the differences are not particularly large (ranging from 0.1 to 0.3 points on average between the 14- and 15-year-old groups, and up to 0.9 points in relation to the 16-year-old group in some questions), they do reflect a perception gap that may be associated with factors such as technological familiarity, learning expectations, or even previous experience with more traditional educational methods. These findings pave the way for future research exploring in greater depth the reasons behind these age-related differences.

The findings of this study align with recent literature documenting improvements in writing quality using artificial intelligence tools. Both qualitative and quantitative studies have shown that writing assistants such as Grammarly provide reliable feedback on grammar, spelling, and structure, helping students identify mistakes and improve their writing (Tran, 2025). Similarly, recent works report that AI tools offer real-time feedback on grammar, style, and coherence, facilitating the

production of more structured and coherent texts (Garg, 2023). Specifically, Garg (2024) notes that these platforms suggest improvements in idea organization and offer lexical alternatives that enrich vocabulary, contributing to better-constructed essays. These effects are consistent with our results: the group that used AI scored significantly higher in grammar, coherence/cohesion, and vocabulary. In fact, research involving ChatGPT has found a significant positive impact on the academic writing skills of university students (Mahapatra, 2024). Mahapatra (2024) reported that ChatGPT significantly enhanced the textual quality of English as a Foreign Language (EFL) students, and that perceptions of its usefulness were overwhelmingly positive.

Students' Perception of Educational AI

The survey conducted in our study reveals a generally favorable perception toward AI tools in writing. This aligns with findings from other researchers: Malik et al. (2023) found that most students positively value these technologies, highlighting concrete benefits such as improved grammar correction, plagiarism detection, language translation, and idea generation for essays (Malik et al., 2023). Additionally, that same study observed that the use of AI enhances students' self-efficacy (confidence and ability to write), as it provides constant support and reduces the pressure associated with making mistakes. In our case, a significant number of students reported feeling more confident and independent when writing with AI tools, which coincides with the literature linking these technologies to greater student autonomy. In this regard, Amani & Bisriyah (2025) state that systems like ChatGPT support the self-regulation of the writing process: they assist with planning, drafting, editing, and revising, leading to increased student autonomy and improved writing outcomes.

On the other hand, the survey also revealed mixed opinions in certain areas (e.g., motivation to write). This is not surprising; other studies indicate that AI's motivational impact may vary depending on the context and the students' profiles (Mahapatra, 2024). However, the most consistent data suggest that students find these tools accessible and useful. The general acceptance—illustrated by the desire to continue using them in future classes and to expand their use to other subjects—reflects that students perceive real educational value in AI, as also reported in recent research (Mahapatra, 2024; Malik et al., 2023).

Pedagogical Implications

These results reinforce the potential of AI technologies as educational complements in writing instruction. However, the literature suggests that their integration should be approached with

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balance and reflection. Garg (2024) warns that while AI tools enhance text quality by improving grammar and coherence, there is also a risk that students may become overly dependent on them, potentially diminishing creativity and exposing them to ethical issues such as style homogenization or plagiarism (Singh et al., 2021; Tran, 2025; Yeh et al., 2021). As a result, scholars recommend a critical and guided pedagogical approach: teachers should encourage mindful use of AI, integrating it into formative activities and promoting critical thinking. For instance, it is suggested that AI be used to assist in the revision of drafts while maintaining teacher-led evaluation, so students can learn from suggested changes rather than accepting them uncritically (Yeh et al., 2021; Zhao, 2023).

Conclusions

Statistical results demonstrated that students who used artificial intelligence (AI) tools to support their writing processes achieved significantly better performance in grammar, coherence and cohesion, and vocabulary compared to those who did not use them. This confirms that AI is a valuable resource that can help improve text quality in educational settings.

The use of these technologies not only facilitated surface-level corrections but also supported better structural and lexical development in texts, enabling students to build better-organized sentences, link ideas clearly, and expand their vocabulary. Thus, AI serves as an educational complement that can positively transform writing skills.

The survey showed a general acceptance of tools such as Grammarly, QuillBot, and ChatGPT. Students appreciated their ease of use, ability to help organize ideas, vocabulary enrichment, and the confidence they provided in writing in English. They also expressed a willingness to continue using these technologies in future academic activities.

Differences in perception and acceptance of AI were identified based on age group. Fourteen- and fifteen-year-old students showed a more favorable attitude and openness toward these tools compared to sixteen-year-olds, who provided more neutral or even somewhat negative responses, particularly regarding confidence and motivation. This finding suggests that factors such as technological familiarity, expectations, and previous educational experience may influence AI acceptance.

These results highlight the need to rethink traditional pedagogical practices to integrate artificial intelligence in a critical, formative, and ethical way enhancing its use as an educational support.

Furthermore, continued research is recommended to investigate the causes behind age-related perception differences and to explore strategies for maximizing AI's benefits across different student profiles.

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