BAHASTRA
Vol. 46 (2) 2026, pp. 397-410
P-ISSN: 0215-4994 | E-ISSN: 2548-4583
http://journal1.uad.ac.id/index.php/BAHASTRA/index

An application for paraphrasing assisted by artificial intelligence to reduce plagiarism levels in multilingual academic writing

Nursaid [a, 1, *], **Yenni Hayati** [a, 2], **Tressyalina Tressyalina** [a, 3], **Ella Wulandari** [b, 4], **Bima Mhd Ghaluh** [b, 5]
[a] Universitas Negeri Padang, Padang, Indonesia
[b] Universitas Negeri Yogyakarta, Yogyakarta, Indonesia

[1] nursaid@fbs.unp.ac.id; [2] yennihayati@fbs.unp.ac.id; [3] tressyalina@fbs.unp.ac.id; [4] ella0016fbsb.2023@student.uny.ac.id; [5] bima0015fbsb.2023@student.uny.ac.id
* Correspondent author

Received: April 16, 2026 **Revised:** July 4, 2026 **Accepted**: July 6, 2026

KEYWORDS
Languafrasa
AI-Based Paraphrasing
Plagiarism Reduction
Academic Writing
Indonesian Language
Student Perception

ABSTRACT

This research focuses on creating and evaluating the efficacy of Languafrasa aimed at decreasing plagiarism rates in student essays. Beyond lowering similarity scores, the study positions Languafrasa as an educational writing companion that helps students compare alternative expressions, preserve meaning, and practise responsible paraphrasing in Indonesian academic writing. Languafrasa is designed to incorporate AI-powered paraphrasing functionalities in Indonesian and 102 other languages. The study followed an experimental design involving 30 students who were divided into two groups. One group used conventional essay writing methods, while the other utilized the Languafrasa application. The experimental outcomes revealed a significant decrease in plagiarism levels among students using the Languafrasa application. Additionally, students in the experimental group demonstrated higher efficiency than those in the control group. Feedback from the questionnaire administered to all participants corroborated these results, with most students favoring the application over traditional writing methods. Users found Languafrasa enjoyable, user-friendly, and an effective aid in essay-writing instruction. These findings suggest that Languafrasa contributes not only to textual originality but also to students' confidence and engagement in learning how to paraphrase**.** The application is accessible at https://languafrasa.com.

Introduction

Paraphrasing is a core academic writing skill because it enables writers to engage with source texts, preserve meaning, and produce original formulations without relying on copied wording (Rossi, 2022). It supports comprehension, activates prior knowledge, and strengthens academic writing development (Hasanah & Fatimah, 2020; Michiels et al., 2022; Yağız, 2020). However, many students still struggle to paraphrase effectively, particularly in Indonesian academic contexts where students may face limited access to academic sources, uneven writing support, and difficulty applying formal paraphrasing conventions (Huang, 2023; Mira & Fatimah, 2020; Pratama et al., 2022; Yuliani et al., 2023).

These difficulties are closely connected to broader concerns about plagiarism in student writing. Previous studies show that plagiarism appears in both intentional and unintentional forms and is influenced by academic pressure, limited awareness of academic integrity, easy access to online materials, and weak procedural knowledge of citation and paraphrasing practices (Awasthi, 2019; Curtis et al., 2013; Farahian et al., 2022; Mavrinac et al., 2010; Nabee et al., 2020; Zafarghandi et al., 2012). Plagiarism has been

reported across several disciplines and institutional contexts, including medicine, engineering, pharmacy, veterinary science, and research-focused higher education settings (Babelghaith et al., 2022; Khaled & Al-Tamimi, 2021; McGrail & McGrail, 2015; Singh, 2017). Although policies, workshops, online academic integrity training, and plagiarism detection tools can help reduce misconduct, students still need instructional support that helps them understand academic integrity and reformulate ideas responsibly (de Maio et al., 2020; Fudge et al., 2022; Mirzaei-Alavijeh et al., 2021; Rathore et al., 2018).

Digital and AI-based technologies have increasingly been used to respond to these challenges. Plagiarism detection systems can compare large volumes of text, identify copied passages, and support academic integrity checks, while AI-based systems can also detect patterns of cheating in online learning environments (Gasparyan et al., 2017; Patel et al., 2011). Writing assistance tools may further help students revise, paraphrase, and cite sources more appropriately (Gasparyan et al., 2017). Nevertheless, detection and automated rewriting do not automatically develop students' ability to understand source meaning, select appropriate wording, and maintain coherence in academic prose.

Because paraphrasing is central to both academic integrity and language learning, it has also become an important area in natural language processing (NLP). Prior studies define paraphrasing as expressing a sentence through alternative wording while preserving meaning and syntactic acceptability (Siddique et al., 2020), and they show that paraphrase generation has been explored through data-driven, neural, and unsupervised approaches (Androutsopoulos & Malakasiotis, 2010; Liu et al., 2020; Madnani & Dorr, 2010; Qian et al., 2019; Siddique et al., 2020). These approaches have supported tasks such as question answering, information retrieval, simplification, program comprehension, taxonomy augmentation, natural language understanding, query expansion, automated utterance generation, and summarization (Cornelissen et al., 2009; Marton, 2013; Parikh et al., 2020; Plachouras et al., 2018; Qian et al., 2019). Resources such as the Paraphrase Database have also supported the development of paraphrasing applications (Apidianaki, 2016; Cocos & Callison-Burch, 2016). However, automatic paraphrasing tools may also raise new academic integrity concerns when students use them to rewrite assignments with minimal effort, making it more difficult to identify the original source (Cocos & Callison-Burch, 2016; Forgas et al., 2023). This makes evaluation important because paraphrase quality cannot be understood only through surface-level similarity or sentence-pair classification (Chen et al., 2020).

AI and NLP also provide broader support for language enhancement. NLP helps computational systems interpret and generate human language (Martinez, 2010; Taskin & Al, 2019; Tilton & Arnold, 2019), while AI-based models have been used to support language learning and assessment, including English as a Second Language contexts (Almutairi et al., 2020). AI technologies have also been applied to augmentative and alternative communication, library and information science, information retrieval, text mining, document classification, and automated essay scoring (Al Braiki et al., 2020; Ding et al., 2020; Taskin & Al, 2019). These developments show that AI can provide feedback and language support, but they do not by themselves explain how students learn to paraphrase responsibly in Indonesian academic writing.

Although research on plagiarism and AI-assisted writing has expanded, relatively few studies have examined how an Indonesian-oriented paraphrasing application can support students' writing competence while also reducing textual similarity. Languafrasa was therefore developed not simply to detect or avoid plagiarism, but to provide a practical learning environment in which students can practise reformulating ideas, consult lexical support, and become more aware of academic integrity.

Against this background, the present study does not treat AI merely as a shortcut for producing different wording. It positions Languafrasa as a guided writing support that helps students notice how ideas can be restated, checked, and refined while the original meaning is maintained. This focus is important because many existing paraphrasing tools are designed as general-purpose rewriting services, whereas Languafrasa combines Indonesian-language paraphrasing with dictionary, thesaurus, and spelling support so that students can use the application as part of a learning process. This study aimed to address the following research questions (RQs):

RQ1. Is Languafrasa effective in paraphrasing and reducing plagiarism?
RQ2. How does Languafrasa compare to traditional paraphrasing methods in terms of effectiveness?
RQ3. Does Languafrasa provide a more engaging experience compared to conventional paraphrasing techniques?
RQ4. Are students' views indicative of Languafrasa fostering increased motivation and interest in learning?
RQ5. How do students perceive the ease of using Languafrasa during paraphrasing activities?

By addressing these research questions, the study evaluates both the effectiveness of Languafrasa and students' perceptions of its usefulness during paraphrasing activities. More importantly, the study clarifies how an AI-assisted paraphrasing tool can be integrated into academic writing instruction without reducing paraphrasing to a mechanical attempt to avoid similarity detection. The remainder of the paper presents

the method, the development of Languafrasa, the experimental findings, the questionnaire analysis, the pedagogical implications, and the conclusion.

Method

This study focused on developing and evaluating Languafrasa as an AI-assisted paraphrasing application for academic writing instruction. The evaluation was designed to examine two related but distinct aspects: whether the application reduced textual similarity in student essays and whether students experienced the application as a helpful support for learning to paraphrase. The research procedure was organized into the following four steps:

1. To evaluate the usefulness of the Languafrasa application, an experimental method was employed, including 30 participants who were randomly assigned to either the control or experimental group.
2. The control group wrote essays using traditional methods, whereas the experimental group used Languafrasa during the writing process. Before the essay task, the experimental group received training on how to input text, compare paraphrased alternatives, use dictionary and thesaurus support, and revise the output so that the final essay remained meaningful and coherent. Both groups received the same instructions and writing topics.
3. Textual similarity was assessed using Turnitin as the main quantitative indicator of originality. However, the Turnitin score was not treated as the only evidence of paraphrasing quality. The interpretation also considered whether students perceived the application as helpful, easy to use, and supportive of the paraphrasing process.
4. In addition to the essay evaluation, questionnaires were distributed to all participants to gather feedback on their learning experience. The questionnaire included items on perceived effectiveness, ease of use, interest in learning, and enjoyment. Experimental and questionnaire data were analyzed using SPSS, allowing the study to connect plagiarism reduction with students' perceptions of how the application supported their academic writing practice.

Development of Languafrasa

The Application

In this study, Languafrasa is presented as an Indonesian paraphrasing application to reduce plagiarism in scientific writing, which can be accessed through the web: https://languafrasa.com. This application provides several features, namely Indonesian paraphrasing, spelling checker, dictionary, and thesaurus. Its distinctive contribution lies in the combination of AI-based paraphrasing with language-support features that are useful for Indonesian academic writing. Rather than only producing a rewritten sentence, the application allows students to inspect possible changes, check vocabulary choices, and refine their writing before submitting a final essay. In the paraphrasing feature, students were allowed to input up to 6000 characters for paraphrasing. They were also able to view the changes made. In addition, students could paraphrase languages other than Indonesian. The features of Languafrasa are listed in Table 1.

Table 1. The Features of the Languafrasa Application

No.	*Feature*	*Language supported*
1	Paraphrasing	(1) Afrikaans (Afrikaans), (2) Albanian (shqiptar), (3) Amharic (አማርኛ), (4) Arabic)5), (عربی(Armenian (հայերեն), (6) Azerbaijani (Azərbaycan), (7) Basque (Euskal), (8) Belarusian (беларускі), (9) Bengali (বাঙালি), (10) Bosnian (Bosanski), (11) Bulgarian (български), (12) Catalan (Català), (13) Cebuano (Cebuano), (14) Chichewa (Chichewa), (15) Chinese Simplified (简体中文), (16) Chinese Traditional (中國傳統的), (17) Corsican (Corsu), (18) Croatian (Hrvatski), (19) Czech (čeština), (20) Danish (dansk), (21) Dutch (Nederlands), (22) English (English), (23) Esperanto (Esperanto), (24) Estonian (Eesti keel), (25) Filipino (Filipino), (26) Finnish (Suomalainen), (27) French (français), (28) Frisian (Frysk), (29) Galician (Galego), (30) Georgian (ქართული), (31) German (Deutsche), (32) Greek (Ελληνικά), (33) Gujarati (ગુજરાતી), (34) Haitian Creole (Kreyòl Ayisyen), (35) Hausa (Hausa), (36) Hawaiian (Ōlelo Hawai'i), (37) Hebrew (עברית), (38) Hindi (हिंदी), (39) Hmong (Hmoob), (40) Hungarian (Magyar), (41) Icelandic (Íslensku), (42) Igbo (Igbo), (43) Indonesian (bahasa Indonesia), (44) Irish (Gaeilge), (45) Italian (italiano), (46) Japanese (日本人), (47) Javanese (Wong Jawa), (48) Kannada (ಕನ್ನಡ), (49) Kazakh (Қазақша), (50) Khmer (ភាសាខ្មែរ), (51) Korean (한국어), (52) Kurdish (Kurmanji), (53) Kyrgyz (Кыргызча), (54) Lao (ລາວ), (55) Latin (Latine), (56) Latvian (Latviešu valoda), (57) Lithuanian (Lietuvių),

		(58) Luxembourgish (Lëtzebuergesch), (59) Macedonian (Македонски), (60) Malagasy (Malagasy), (61) Malay (Melayu), (62) Malayalam (മലയാളം), (63) Maltese (Malti), (64) Maori (Maori), (65) Marathi (मराठी), (66) Mongolian (Монгол хэл), (67) Myanmar (မြန်မာ (ဗမာ)), (68) Nepali (नेपाली), (69) Norwegian (norsk), (70) Pashto)71), (پښتو(Persian (فارسی), (72) Polish (Polskie), (73) Portuguese (Português), (74) Romanian (Română), (75) Russian (русский), (76) Samoan (Samoa), (77) Scots Gaelic (Gàidhlig na h-Alba), (78) Serbian (Српски), (79) Sesotho (Sesotho), (80) Shona (Shona), (81) Sindhi)82), (سنڌي(Sinhala (සිංහල), (83) Slovak (slovenský), (84) Slovenian (Slovenščina), (85) Somali (Somali), (86) Spanish (Español), (87) Sundanese (Sunda), (88) Swahili (Kiswahili), (89) Swedish (svenska), (90) Tajik (Тоҷикӣ), (91) Tamil (தமிழ்), (92) Telugu (తెలుగు), (93) Thai (ไทย), (94) Turkish (Türk), (95) Ukrainian (Українська), (96) Urdu)97), (اردو(Uzbek (O'zbek), (98) Vietnamese (Tiếng Việt), (99) Welsh (Cymraeg), (100) Xhosa (isiXhosa), (101) Yiddish (ייִדיש), (102) Yoruba (Yorùbá), (103) Zulu (Zulu).
2	Dictionary	Indonesian (bahasa Indonesia)
3	Thesaurus	Indonesian (bahasa Indonesia)

The features are displayed in Fig. 1, 2, and 3.

Fig. 1. Paraphrase Feature

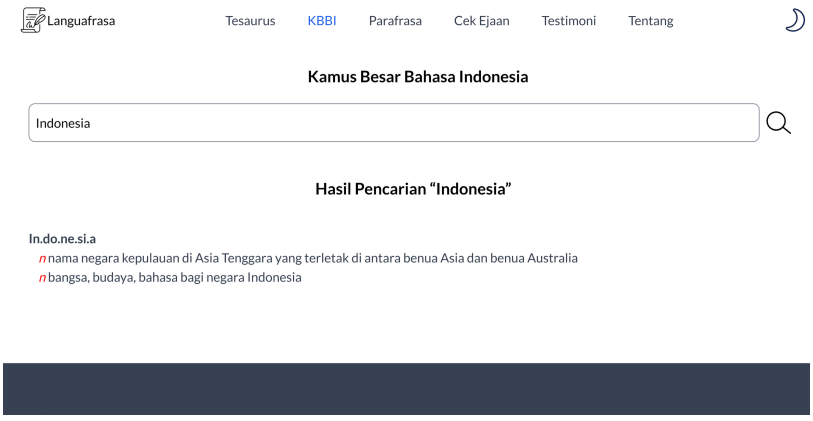

Fig. 2. Dictionary Feature

Fig. 3. Thesaurus Feature

The Technology

Languafrasa employs the following technologies:

1. Hypertext Markup Language (HTML) (Steinke, 2020).
2. The user interface and dynamic website interactivity were designed using JavaScript (Wirfs-Brock & Eich, 2020).
3. Server-side scripting and database connections were made possible using NodeJS (Baran & Halvoník, 2021).
4. Kamus Besar Bahasa Indonesia V (Indonesian Dictionaries) showcases translations, synonyms, definitions, and examples of words in its online dictionary (Kemendikbud, 2023).
5. Tesaurus Tematis Bahasa Indonesia (Indonesian Thesaurus) (Luthfita & Yanit, 2023).
6. NLP interface (Khurana et al., 2023).
7. Gemini AI as a web paraphrasing API (Perera & Lankathilake, 2023).
8. Phonetic applications are used to strengthen the paraphrase API (Nursaid et al., 2024).
9. Tailwind CSS for styling and design (Bhat, 2023).
10. We also used the Tailwind CSS in our previous study (Hayati et al., 2024).

Experimental Design

Participant

A total of 30 undergraduate students from diverse academic disciplines—ranging from education, engineering, social sciences, to linguistics—voluntarily participated in a two-week study on academic essay writing. These students were randomly assigned into two equally sized groups: the Experimental Group (EG) and the Control Group (CG), each consisting of 15 participants. The EG engaged with *Languafrasa*, an AI-driven paraphrasing application, while the CG performed the same essay writing task using conventional strategies without technological assistance.

Prior to the intervention, participants completed a demographic questionnaire covering age, gender, semester level, and prior experience with AI-based writing tools. As shown in Table 2, both groups were relatively balanced across demographic variables, and introductory scaffolding was provided to the EG to ensure baseline familiarity with the app. All participants received the same essay prompt, timeline, and instructions to maintain consistency across conditions can be seen in Table 2.

Table 2. Demographic Profile of Participants (N = 30)

Variable	***Category***	***EG***	***CG***	***Total***
Gender	Male	6	7	13
	Female	9	8	17
Age	18–20 years	7	6	13
	21–23 years	8	9	17
Semester level	Semester 4	5	4	9
	Semester 6	7	6	13
	Semester 8	3	5	8
Field of study	Education	5	4	9
	Engineering	3	3	6
	Social Sciences	4	5	9
	Linguistics/Humanities	3	3	6
Prior experience with AI tools	Yes	3	2	5
	No	12	13	25

Experimental Tools

Data were collected through two complementary instruments: an essay-writing task and a student perception survey. The essay task measured changes in textual similarity before and after the intervention, while the survey captured students' learning experience when using Languafrasa. The experimental group received guided practice before writing, including how to read the source text, generate paraphrased alternatives, compare the output with the original meaning, and revise the final wording in their own academic style. Guided by uniform writing instructions and themes, both groups wrote essays on corruption in Indonesia. Turnitin was used to evaluate the essays for textual similarity, and the outcomes were statistically analyzed using a t-test to identify notable variations between the two groups. The survey was created using Google Forms and comprised 20 diverse question formats, including multiple-choice, yes/no, linear scale (0: Not at all—5: Very much, as shown in Table 7), and short-response inquiries. The survey items were designed to evaluate four learning-related dimensions: perceived effectiveness, ease of use, interest in learning, and enjoyment. This design made it possible to interpret the application not only as a plagiarism-reduction tool but also as a support for students' paraphrasing practice. Finally, app usage and user details were gathered using Google Analytics, including standard page views, specific devices, operating systems, and browser types.

Experimental Procedure

The experimental procedure was conducted over two weeks. Thirty participants were divided evenly into the CG and EG, each consisting of 15 students. In the initial stage, both groups received the same essay prompt, writing instructions, and deadline. The CG completed the essay using conventional paraphrasing strategies, while the EG used Languafrasa as part of the writing process. Before writing, the EG received guided training on how to use the paraphrasing, spelling, dictionary, and thesaurus features. Students were encouraged to treat the application's output as material for revision rather than as a final answer, so that they remained responsible for preserving meaning, coherence, and academic tone. After the essay-writing process, essays were collected and assessed for plagiarism using Turnitin. The *t*-test was used to analyze differences between the two groups. In addition to the essay evaluation, questionnaires were distributed to all participants to collect feedback on their experiences using Languafrasa. Finally, the experimental and questionnaire data were analyzed using SPSS to determine the application's effectiveness and to provide insight into students' overall learning experience.

Data Analysis

The initial and follow-up essay tests were analyzed using Turnitin and SPSS. Descriptive statistics, including mean, median, mode, and standard deviation, were calculated to summarize students' essay scores and questionnaire responses. A dependent-sample t-test was used to examine changes between the initial and follow-up essay results, while an independent-samples t-test was used to compare the control and experimental groups. Importantly, lower similarity scores were interpreted as evidence of improved textual originality, not as a complete measure of paraphrasing quality. The discussion therefore also considers students' perceptions of usefulness, ease of use, interest, and enjoyment as indicators of how Languafrasa supported the learning process.

Results and Discussion

SPSS was used to analyze the essay scores statistically. As shown in Table 3, both groups improved after the intervention, with the EG reaching a higher post-test mean score (M_{EG}=79.73) than the CG (M_{CG}=70.80). This pattern indicates stronger improvement in textual originality among students who used Languafrasa.

Because the essay score was calculated by converting Turnitin similarity into an originality score, higher post-test scores indicate lower textual similarity. The EG's post-test median increased to 79.00, while the CG reached 70.00, with standard deviations of 6.18 and 7.11, respectively. This pattern suggests that students using Languafrasa moved further away from copying source wording and toward more independent reformulation.

The Shapiro-Wilk tests indicated that the data were normally distributed (p_{EG}=0.974; p_{CG}=0.149). Levene's test was then used to examine variance between groups, and the subsequent independent-samples t-test showed a significant difference in post-test performance. The EG obtained higher originality scores than the CG, indicating lower Turnitin similarity and greater independence in wording. The post-test results for both groups also met the normality assumption, with p-values of 0.418 for the EG and 0.117 for the CG can be seen in Table 3, 4, and 5.

Table 3. Descriptive Statistics Analysis Results

Group	*Test*	*N*	*Mean*	*Median*	*Mode*	*SD*
1	*2*	*3*	*4*	*5*	*6*	*7*
EG	Pre-test	15	71.27	70.00	60.00	10.59
	Post-test	15	79.73	79.00	75.00	6.18
CG	Pre-test	15	61.27	63.00	69.00	6.42
	Post-test	15	70.80	70.00	70.00	7.11

Table 4. Normality and Homogeneity Test and Independent Samples T-Test

Group	*Test*	*Shapiro—Wilk*			*Levene's test*			*Independent samples t-test*	
		Statistic	*df*	*Sig.*	*F.*	*Sig.*	*t*	*df*	*Sig. (2- tailed)*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
EG	Pre-test	0.981	15	0.974	3.677	0.065	3.127	28	0.004
CG	Pre-test	0.913	15	0.149					
EG	Post-test	0.943	15	0.418	0.035	0.853	3.671	28	0.001
CG	Post-test	0.906	15	0.117					

Table 5. Normality Tests and Dependent Samples T-Test

Group	*Shapiro—Wilk*			*Paired samples t-test*		
	Statistic	*df*	*Sig.*	*t*	*df*	*Sig. (2- tailed)*
1	*2*	*3*	*4*	*5*	*6*	*7*
EG	0.964	30	0.390	-2.284	14	0.039
CG	0.954	30	0.219	-3.548	14	0.003

Table 5 confirms that both datasets met the normality assumption (p_{EG}=0.390>0.050; p_{CG}=0.219>0.050), allowing independent-sample *t*-tests to be conducted. The results show that both methods contributed to lower similarity scores (p_{EG}=0.039<0.050; p_{CG}=0.003<0.050), but the stronger improvement in the EG suggests that Languafrasa offered support beyond conventional paraphrasing practice.

Tables 3 and 4 show that Languafrasa was more effective than conventional methods in improving textual originality: the EG obtained a higher average post-test score than the CG (M_{EG}=79.73; M_{CG}=70.80), and the difference was statistically significant (p=0.001<0.050). This result answers RQ1 and RQ2, while still requiring careful interpretation. A lower similarity score does not automatically mean that every paraphrase is semantically stronger or stylistically better; it indicates more original wording, which becomes educationally meaningful when combined with attention to meaning, coherence, and academic style.

Questionnaire Analysis

After conducting the survey, SPSS was used to analyze students' responses and to understand how they experienced Languafrasa as a learning tool. The questionnaire results were interpreted across four dimensions: perceived effectiveness (RQ1-RQ2), enjoyment (RQ3), interest in learning (RQ4), and ease of use (RQ5). This analysis is important because the educational value of Languafrasa depends not only on statistical improvement but also on whether students find the tool understandable, engaging, and useful during the act of paraphrasing.

Interest in learning (RQ4)

As shown in Fig. 4, most students found paraphrasing with Languafrasa interesting. This response suggests that the application did more than automate rewriting; it made the paraphrasing process more visible and manageable for learners. Fig. 5 shows that 90% of students were willing to choose Languafrasa for paraphrasing, while Fig. 6 shows that 95% preferred the AI-assisted method over traditional manual paraphrasing. These responses indicate that students perceived the application as a practical learning companion, especially when they needed support in reformulating ideas without losing the intended meaning.

The questionnaire responses therefore support RQ4 by showing that Languafrasa increased students' interest in learning to paraphrase. The positive responses also suggest that students were more willing to engage with paraphrasing when they could receive immediate linguistic alternatives and then decide how to revise them can be seen in Figure 4 and 5.

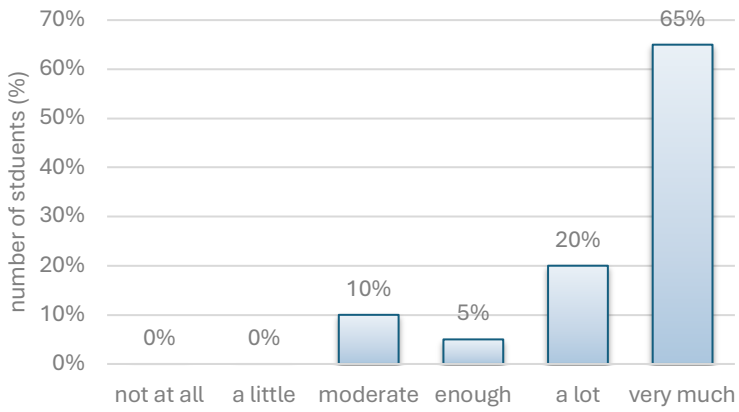

Fig. 4. How Interesting was Paraphrasing Using Languafrasa? (RQ4)

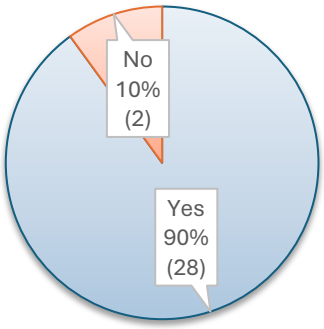

Fig. 5. Would You Choose to Paraphrase Using Languafrasa?

Effectiveness of the Application (RQ1—RQ2)

As shown in Fig. 7, most students (90%) reported that Languafrasa helped them paraphrase and reduce plagiarism. Table 6 further indicates that many students considered the application helpful or very helpful, especially when using the paraphrasing and spelling-support features. These responses complement the essay-score analysis by showing why the application may have been effective: it gave students concrete linguistic options, helped them notice errors, and supported revision decisions. The findings therefore support RQ1, while also showing that effectiveness should be understood as a combination of originality, meaning preservation, and learner control over the final text.

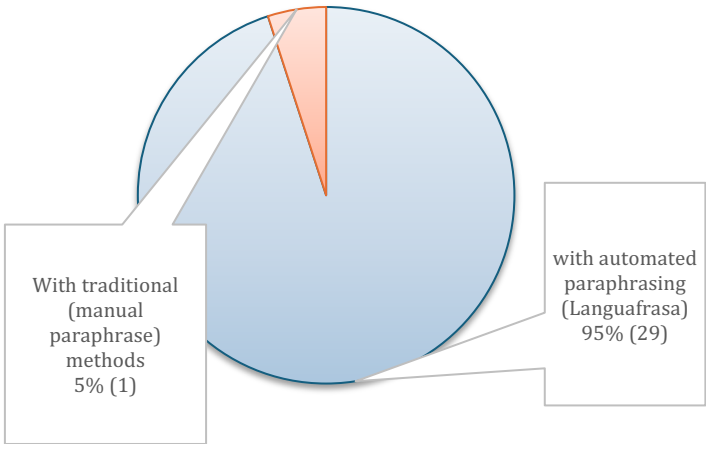

Fig. 6. How do You Prefer to Paraphrase Your Essay?

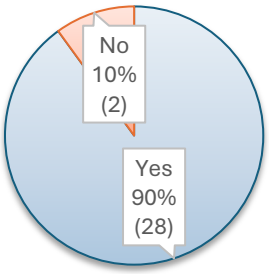

Fig. 7. Do You Think Languafrasa Has Helped You Paraphrase and Reduce Plagiarism? (RQ1)

Ease of Use (RQ5)

The students primarily used computers (60%) to access Languafrasa, as shown in Fig. 8. A substantial proportion also used phones (30%), while only 10% used tablets. Fig. 9 shows that most students experienced little difficulty navigating the application, and Fig. 10 indicates that 95% did not require assistance. These results answer RQ5 by showing that Languafrasa was accessible across devices and did not create a high technical barrier. This ease of use is pedagogically important because students can focus on comparing, revising, and improving paraphrases rather than struggling with the interface.

Enjoyment (RQ3)

As shown in Fig. 11, most students enjoyed using Languafrasa. The most appreciated features were paraphrasing and spell checking, which suggests that students valued tools that directly supported sentence reformulation and surface-level accuracy. Enjoyment is relevant to the learning process because students are more likely to practise paraphrasing repeatedly when the task feels manageable and useful. Students also indicated interest in a document-upload feature, suggesting that future development should support longer and more authentic academic-writing tasks can be seen in Table 6 and Figure 8.

Table 6. Students' Perceptions About Features in Languafrasa—Percentages (%)

Question (percent of cases)	*Transcription*	*Spell Check*	*Dictionary*	*Thesaurus*	*None*	*Total*
Which activity was the most helpful to you?	30%	20%	25%	15%	10%	135%
Which activity was the least helpful?	10%	20%	30%	25%	15%	130%
Which activity did you enjoy the most?	35%	25%	20%	10%	10%	145%
Which activity did you enjoy the least?	10%	15%	25%	35%	15%	115%
Which activity was the easiest?	40%	25%	15%	10%	10%	75%
Which activity was the most difficult?	10%	25%	30%	20%	15%	600%

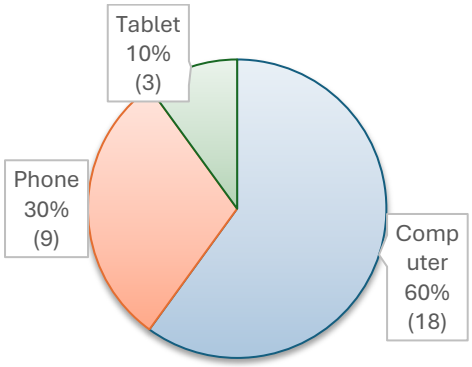

Fig. 8. Which Device did You Use to Navigate Languafrasa?

Tables 7 and 8 present the data on the four aspects that were studied as part of the questionnaire. These aspects were chosen by the students who were given the option to select from a scale ranging from 0 (not at all) to 5 (very much). The results answer the research questions by showing that Languafrasa was easy to use can be seen in Figure 9, Table 7, Table 8, Figure 10, and Figure 11.

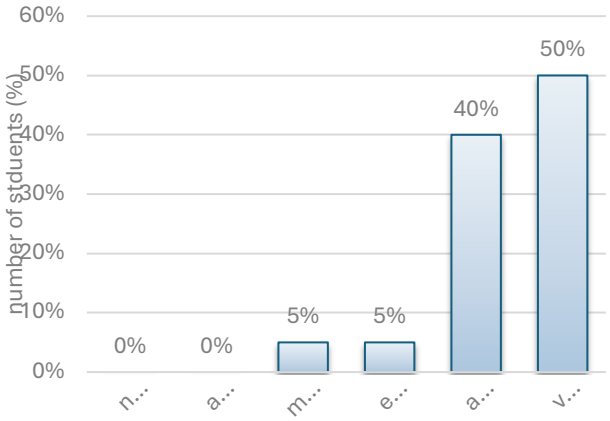

Fig. 9. How Easy is it to Use and Navigate Languafrasa on Your Device? (RQ5)

Table 7. Linear scale questions (0: not at all–5: very much)—percentages %

Question	*Not at all*	*A little*	*Moderate*	*Enough*	*A lot*	*Very much*
1. How interesting was paraphrasing using Languafrasa? (RQ4)	0%	0%	10%	5%	20%	65%
2. How much do you think this app helped you in paraphrasing in Indonesian? (RQ1)	0%	5%	5%	10%	30%	50%
3. How easy was it to use and navigate Languafrasa on your device? (RQ5)	0%	0%	5%	5%	40%	50%
4. Did you like all the features/AI in Languafrasa? (RQ3)	0%	0%	5%	5%	15%	65%

Table 8. Linear Scale Questions—Descriptive Statistics Analysis

Question	*N*	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
1. How interesting was paraphrasing using Languafrasa? (RQ4)	20	0	5	3.93	1.147
2. How much do you think this app helped you in paraphrasing in Indonesian? (RQ1)	20	1	5	4.01	1.236
3. How easy was it to use and navigate Languafrasa on your device? (RQ5)	20	0	5	4.13	1.368
4. Did you like all the features/AI in Languafrasa? (RQ3)	20	1	5	4.21	1.422

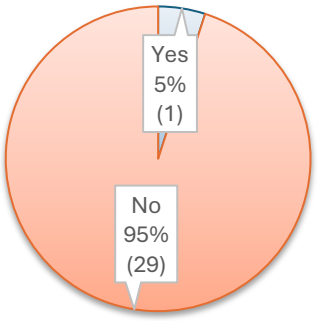

Fig. 10. Did You Need Assistance from Someone to Use Languafrasa?

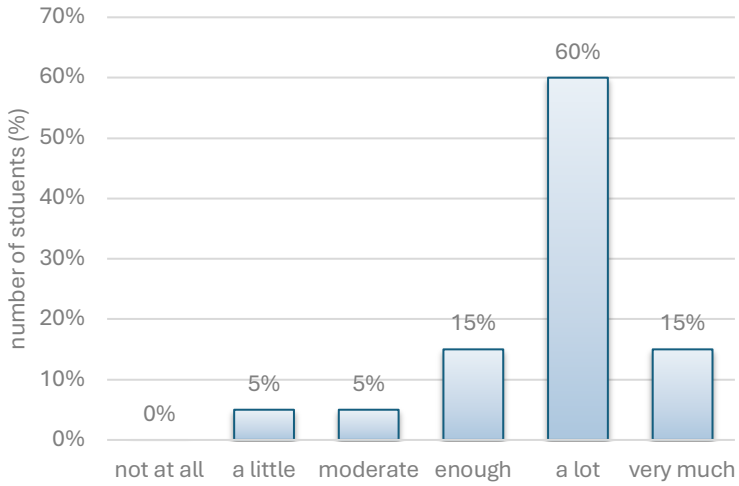

Fig. 11 Did You Like All the Features/AI in Languafrasa? (RQ3)

Taken together, the questionnaire and experimental results answer the research questions by showing that Languafrasa was effective, engaging, interesting, and easy to use. More importantly, the findings explain why the application was useful for students: it provided immediate language alternatives, helped students check wording choices, and encouraged revision rather than simple copying. This interpretation shifts the discussion from technology alone to the learning process supported by the technology. Languafrasa therefore appears to function best when it is used as a guided writing companion that helps students practise responsible paraphrasing while maintaining control over meaning and academic style.

Pedagogical implications and responsible AI use

The findings have several implications for academic writing instruction. First, Languafrasa can be integrated as a scaffolded learning tool rather than used as an automatic substitute for student writing. Teachers can ask students to compare the original sentence, the application output, and their own revised version so that students remain actively involved in meaning-making. Second, the results show that AI-assisted paraphrasing should be evaluated through more than similarity scores. A responsible classroom use of Languafrasa should also consider whether the paraphrase preserves meaning, improves coherence, uses appropriate academic vocabulary, and reflects the student's own control over the final text. Third, the positive student responses suggest that AI tools can increase motivation when they make difficult writing processes more visible and less intimidating. These implications respond to the need for AI-assisted writing tools that support learning rather than simply produce rewritten text.

Conclusion

This study developed and evaluated Languafrasa, an AI-powered paraphrasing application designed to support Indonesian students in academic writing. The findings show that Languafrasa improved textual originality and reduced plagiarism levels more effectively than conventional paraphrasing methods. Its contribution, however, lies not only in score improvement but also in the way it supports students as they compare alternatives, revise wording, and maintain control over meaning. Future development should include more explicit evaluation of semantic accuracy, coherence, and academic writing quality, as well as support for longer document-based paraphrasing tasks. In this way, Languafrasa can continue to develop as a responsible AI-assisted writing tool for academic literacy instruction.

Declarations

Author contribution : Nursaid Nursaid conceptualised the study, designed the experimental framework, supervised the project, provided resources (Turnitin and API access), and wrote the original draft of the manuscript. Yenni Hayati and Tressyalina Tressyalina contributed to the methodology, validated the research instruments and questionnaire, provided pedagogical insights, and assisted in reviewing and editing the manuscript. Ella

		Wulandari coordinated the investigation and fieldwork, recruited and assigned the 30 participants, managed the administration of essays and surveys, and contributed to formal data analysis. Bima Mhd Ghaluh led the software development of the Languafrasa application, performed formal statistical analysis (SPSS), curated experimental and survey data, and visualised the results. All authors read and approved the final version of the manuscript.
Funding statement	:	The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.
Conflict of interest	:	The authors declare that they have no conflicts of interest related to this study.
Ethics Approval	:	All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethical approval was granted by the Ethical Review Board of the author's university
Additional information	:	No additional information is available for this paper.

References

Al Braiki, B., Harous, S., Zaki, N., & Alnajjar, F. (2020). Artificial intelligence in education and assessment methods. *Bulletin of Electrical Engineering and Informatics, 9*(5), 1998–2007. https://doi.org/10.11591/eei.v9i5.1984

Almutairi, A., Gegov, A., Adda, M., & Arabikhan, F. (2020). Conceptual artificial intelligence framework to improving English as second language. *WSEAS Transactions on Advances in Engineering Education, 17*, 87–91. https://doi.org/10.37394/232010.2020.17.11

Androutsopoulos, I., & Malakasiotis, P. (2010). A survey of paraphrasing and textual entailment methods. *Journal of Artificial Intelligence Research, 38*, 135–187. https://doi.org/10.1613/jair.2985

Apidianaki, M. (2016). Vector-space models for PPDB paraphrase ranking in context. *Proceedings of the 2016 Conference on Empirical Methods in Natural Language Processing*, 2028–2034. https://doi.org/10.18653/v1/d16-1215

Awasthi, S. (2019). Plagiarism and academic misconduct: A systematic review. *DESIDOC Journal of Library & Information Technology, 39*(2), 94–100. https://doi.org/10.14429/djlit.39.2.13622

Babelghaith, S. D., Wajid, S., Al-Arifi, M., & Alotaibi, A. N. (2022). Exploring the attitudes of pharmacy students in Saudi Arabia towards plagiarism: Evidence from a cross-sectional study. *International Journal of Environmental Research and Public Health, 19*(22), 14811. https://doi.org/10.3390/ijerph192214811

Baran, W., & Halvoník, D. (2021). Frameworks for backend application development (NodeJS, Laravel). *Frameworks for Backend Application Development (NodeJS, Laravel).* https://doi.org/10.17846/fpvai-2021-25

Bhat, K. (2023). *Ultimate Tailwind CSS handbook*. Orange Education Pvt Ltd, AVA. https://www.kobo.com/us/en/ebook/ultimate-tailwind-css-handbook

Chen, H., Ji, Y., & Evans, D. (2020). Pointwise paraphrase appraisal is potentially problematic. *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics: Student Research Workshop*, 150–155. https://doi.org/10.18653/v1/2020.acl-srw.20

Cocos, A., & Callison-Burch, C. (2016). Clustering paraphrases by word sense. *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, 1463–1472. https://doi.org/10.18653/v1/n16-1172

Forgas, R. C., Lancaster, T., Marín, E. C., & Garma, C. T. (2023). Automatic paraphrasing tools: An unexpected consequence of addressing student plagiarism and the impact of COVID in distance education settings. *Praxis Educativa, 18*. https://doi.org/10.5212/praxeduc.v.18.21679.020

Cornelissen, B., Zaidman, A., Van Deursen, A., Moonen, L., & Koschke, R. (2009). A systematic survey of program comprehension through dynamic analysis. *IEEE Transactions on Software Engineering, 35*(5), 684–702. https://doi.org/10.1109/tse.2009.28

Curtis, G. J., Gouldthorp, B., Thomas, E. F., O'Brien, G. M., & Correia, H. M. (2013). Online academic-integrity mastery training may improve students' awareness of, and attitudes toward, plagiarism. *Psychology Learning & Teaching, 12*(3), 282–289. https://doi.org/10.2304/plat.2013.12.3.282

de Maio, C., Dixon, K., & Yeo, S. (2020). Responding to student plagiarism in Western Australian universities: The disconnect between policy and academic staff. *Journal of Higher Education Policy and Management, 42*(1), 102–116. https://doi.org/10.1080/1360080x.2019.1662927

Ding, C., Draffan, E. A., & Wald, M. (2020). AI and global AAC symbol communication. *Lecture Notes in Computer Science, 12376*, 59–66. https://doi.org/10.1007/978-3-030-58796-3_8

Farahian, M., Avarzamani, F., & Rezaee, M. (2022). Plagiarism in higher education across nations: A case of language students. *Journal of Applied Research in Higher Education, 14*(1), 223–239. https://doi.org/10.1108/jarhe-09-2020-0309

Fudge, A., Ulpen, T., Bilic, S., Picard, M., & Carter, C. (2022). Does an educative approach work? A reflective case study of how two Australian higher education Enabling programs support students and staff uphold a responsible culture of academic integrity. *International Journal for Educational Integrity, 18*(1), 5. https://doi.org/10.1007/s40979-021-00099-1

Gasparyan, A. Y., Nurmashev, B., Seksenbayev, B., Trukhachev, V. I., Kostyukova, E. I., & Kitas, G. D. (2017). Plagiarism in the context of education and evolving detection strategies. *Journal of Korean Medical Science, 32*(8), 1220–1227. https://doi.org/10.3346/jkms.2017.32.8.1220

Hasanah, Y. A., & Fatimah, S. (2020). Undergraduates' ability in writing paraphrase and their perceptions of plagiarism. *Proceedings of the 7th International Conference on English Language and Teaching (ICOELT 2019).* https://doi.org/10.2991/assehr.k.200306.019

Hayati, Y., Ghaluh, B. M., Wulandari, E., Nursaid, N., Rasyid, Y., Adek, M., & Pratama, B. (2024). Development of an automated message writing tool assisted by artificial intelligence to facilitate communication between students and lecturers. *International Journal of Information and Education Technology, 14*(2), 220–230. https://doi.org/10.18178/ijiet.2024.14.2.2043

Huang, R. (2023). Validating the paraphrasing task with the framework of AUA. *Advances in Education, Humanities and Social Science Research, 4*(1), 103. https://doi.org/10.56028/aehssr.4.1.103.2023

Kemendikbud. (2023). *Kamus besar Bahasa Indonesia edisi kelima daring.* Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia.

Khaled, F. E.-S., & Al-Tamimi, M. S. H. (2021). Plagiarism detection methods and tools: An overview. *Iraqi Journal of Science*, 2771–2783. https://doi.org/10.24996/ijs.2021.62.8.30

Khurana, D., Koli, A., Khatter, K., & Singh, S. (2023). Natural language processing: State of the art, current trends and challenges. *Multimedia Tools and Applications, 82*(3), 3713-3744. https://doi.org/10.1007/s11042-022-13428-4

Liu, X., Mou, L., Meng, F., Zhou, H., Zhou, J., & Song, S. (2020). Unsupervised paraphrasing by simulated annealing. In D. Jurafsky, J. Chai, N. Schluter, & J. Tetreault (Eds.), *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics* (pp. 302–312). Association for Computational Linguistics. https://doi.org/10.18653/v1/2020.acl-main.28

Luthfita, W., & Yanit, S. R. (2023). Digitalizing a local language dictionary: Challenges and opportunities. *Lexicography, 10*(1), 59-85. https://doi.org/10.1558/lexi.25076

Madnani, N., & Dorr, B. J. (2010). Generating phrasal and sentential paraphrases: A survey of data-driven methods. *Computational Linguistics, 36*(3), 341–387. https://doi.org/10.1162/coli_a_00002

Martinez, A. R. (2010). Natural language processing. *Wiley Interdisciplinary Reviews: Computational Statistics, 2*(3), 352–357. https://doi.org/10.1002/wics.76

Marton, Y. (2013). Distributional phrasal paraphrase generation for statistical machine translation. *ACM Transactions on Intelligent Systems and Technology, 4*(3), 1-32. https://doi.org/10.1145/2483669.2483672

Mavrinac, M., Brumini, G., Bilić-Zulle, L., & Petrovecki, M. (2010). Construction and validation of attitudes toward plagiarism questionnaire. *Croatian Medical Journal, 51*(3), 195–201. https://doi.org/10.3325/cmj.2010.51.195

McGrail, E., & McGrail, J. P. (2015). Exploring web-based university policy statements on plagiarism by research-intensive higher education institutions. *Journal of Academic Ethics, 13*(2), 167–196. https://doi.org/10.1007/s10805-015-9229-3

Michiels, P., Kessler, K., & Rogers, P. (2022). Paraphrase patterns of expert academic writers: Implications for writing development, writing pedagogy, and plagiarism policies. *Literatura y Lingüística, 46*, 153–189. https://doi.org/10.29344/0717621x.46.3133

Mira, A. S., & Fatimah, S. (2020). Students' paraphrased texts and their perceptions of paraphrasing in academic writing. *Lingua Didaktika: Jurnal Bahasa dan Pembelajaran Bahasa, 14*(1), 55-69. https://doi.org/10.24036/ld.v14i1.108732

Mirzaei-Alavijeh, M., Jalili, C., Rezaei-Zadeh, P., & Jalilian, F. (2021). Socio-cognitive determinants of plagiarism intention among Kermanshah University of Medical Sciences students: A cross-sectional

study in 2018. *Iranian Journal of Psychiatry and Behavioral Sciences, 15*(1). https://doi.org/10.5812/ijpbs.83796

Nabee, S. G., Mageto, J., & Pisa, N. (2020). Investigating predictors of academic plagiarism among university students. *International Journal of Learning, Teaching and Educational Research, 19*(12), 264–280. https://doi.org/10.26803/ijlter.19.12.14

Nursaid, N., Ghaluh, B. M., Hayati, Y., Nasution, M. I., Ningsih, A. G., Wulandari, E., & Harahap, A. T. (2024). Development of FonBi application: A phonetic transcription tool assisted by artificial intelligence for Indonesian language. *International Journal of Information and Education Technology, 14*(1), 50–58. https://doi.org/10.18178/ijiet.2024.14.1.2023

Parikh, S., Vohra, Q., & Tiwari, M. (2020). Automated utterance generation. *Proceedings of the AAAI Conference on Artificial Intelligence, 34*(8), 13344–13349. https://doi.org/10.1609/aaai.v34i08.7047

Patel, A., Bakhtiyari, K., & Taghavi, M. (2011). Evaluation of cheating detection methods in academic writings. *Library Hi Tech, 29*(4), 623–640. https://doi.org/10.1108/07378831111189732

Perera, P., & Lankathilake, M. (2023). Preparing to revolutionize education with the multi-model GenAI tool Google Gemini? A journey towards effective policy making. *Journal of Advances in Education and Philosophy, 7*(8). https://doi.org/10.36348/jaep.2023.v07i08.001

Plachouras, V., Petroni, F., Nugent, T., & Leidner, J. L. (2018). A comparison of two paraphrase models for taxonomy augmentation. *Proceedings of the 2018 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, 2*, 315–320. https://doi.org/10.18653/v1/n18-2051

Pratama, Y., Prawesti, A., & Fridolini. (2022). An analysis of students' writing skills in paraphrasing: A case study of the 5th-semester diploma students of English Language and Culture Department of Darma Persada University. *Getsempena English Education Journal, 9*(1), 13–28. https://doi.org/10.46244/geej.v9i1.1711

Qian, L., Qiu, L., Zhang, W., Jiang, X., & Yu, Y. (2019). Exploring diverse expressions for paraphrase generation. *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing*, 3173–3182. https://doi.org/10.18653/v1/d19-1313

Rathore, F. A., Fatima, N.-E., Farooq, F., & Mansoor, S. N. (2018). Combating scientific misconduct: The role of focused workshops in changing attitudes towards plagiarism. *Cureus, 10*(5). https://doi.org/10.7759/cureus.2698

Rossi, S. L. (2022). Revisioning paraphrasing instruction. In *Academic Integrity in Canada* (pp. 411–429). https://doi.org/10.1007/978-3-030-83255-1_21

Siddique, A. B., Oymak, S., & Hristidis, V. (2020). Unsupervised paraphrasing via deep reinforcement learning. *Proceedings of the 26th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining*, 1800–1809. https://doi.org/10.1145/3394486.3403231

Singh, N. (2017). Level of awareness among veterinary students of GADVASU towards plagiarism: A case study. *The Electronic Library, 35*(5), 899–915. https://doi.org/10.1108/el-06-2016-0132

Steinke, S. (2020). Hypertext markup language. In *Network Tutorial.* https://doi.org/10.1201/9781482280876-57

Taskin, Z., & Al, U. (2019). Natural language processing applications in library and information science. *Online Information Review, 43*(4), 676–690. https://doi.org/10.1108/oir-07-2018-0217

Tilton, L., & Arnold, T. B. (2019). An introduction natural language processing. *Recent Trends in Management and Commerce, 1*(1). https://doi.org/10.46632/rmc/1/1/014

Wirfs-Brock, A., & Eich, B. (2020). JavaScript: The first 20 years. *Proceedings of the ACM on Programming Languages, 4*(HOPL). https://doi.org/10.1145/3386327

Yağız, O. (2020). İkincil dilde akademik yazarların açımlama süreçlerinin incelenmesi. *Kafkas Üniversitesi Sosyal Bilimler Enstitüsü Dergisi.* https://doi.org/10.9775/kausbed.2019.046

Yuliani, T., Kurniawati, N., & Siswayani, P. (2023). Engaging Indonesian students in "read, reread, list, compose" strategy to enhance paraphrasing skill. *Journal of Education and Learning (EduLearn), 17*(2), 195–205. https://doi.org/10.11591/edulearn.v17i2.20438

Zafarghandi, A. M., Khoshroo, F., & Barkat, B. (2012). An investigation of Iranian EFL masters students' perceptions of plagiarism. *International Journal for Educational Integrity, 8*(2). https://doi.org/10.21913/ijei.v8i2.811