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Developing Academic Students' Writing Competence in the Generative AI Environment

Rozwijanie kompetencji pisania u studentów w środowisku sztucznej inteligencji

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Abstract. The current explosion of AI tools and the resulting popularity of AI aids in various aspects of life, opened up a myriad of chances for students to apply varied AI strategies to enhance the learning process. The paper focuses on tracing academic students' writing development in the generative AI environment. The purpose of the research was to verify the application of AI strategies in developing writing skills of a group of applied linguistics students to define what

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kind of writing assistance they seek and to what extent the application of AI-assisted writing strategies changes their way of learning and developing writing skills. The data for the scientific experiment was gathered through a one-group quasi-experimental treatment of undergraduate applied linguistics students with an English-Portuguese language combination. The results prove the applied linguistics students employ varied strategies in AI environments in order to develop their writing skills.

Keywords: generative artificial intelligence; learning strategies; adult learner autonomy; English for Academic Purposes; writing instruction

Abstrakt. Eksplozja narzędzi wykorzystujących sztuczną inteligencję (AI) i związana z nią popularność zastosowania AI w różnych sferach życia otworzyła przed uczniami niezliczone możliwości stosowania różnorodnych strategii w celu usprawnienia procesu uczenia się. W artykule skupiono się na prześledzeniu strategii pisania studentów akademickich w generatywnym środowisku sztucznej inteligencji. Celem badań naukowych była weryfikacja zastosowania strategii AI w rozwijaniu umiejętności pisania grupy studentów lingwistyki stosowanej w celu określenia, jakiego rodzaju strategii pisania używają oraz w jakim stopniu zastosowanie strategii pisania zmienia ich sposób uczenia się i wpływa na rozwój umiejętności pisania. Dane zebrano w ramach eksperymentu naukowego przeprowadzonego wśród studentów lingwistyki stosowanej pierwszego stopnia w kombinacji językowej angielsko-portugalskiej. Wyniki dowodzą, że studenci uczestniczący w badaniu wdrażają różne strategie w środowiskach AI, aby rozwijać umiejętność pisania akademickiego.

Słowa kluczowe: generatywna sztuczna inteligencja; strategie uczenia się; autonomia dorosłych uczniów; angielski dla celów akademickich; instrukcja pisania

INTRODUCTION

Given the pervasiveness of digital technologies in all spheres of life, it is not surprising that AI-powered tools should have a significant impact on the process of foreign language acquisition. Over the centuries, scholars and teachers have endeavoured to find the most efficient methods and techniques to teach writing skills to their foreign language learners. All recent improvements in AI technologies have brought new opportunities both for academic teachers and learners to apply the AI tools and strategies in the process of developing their writing competence.

Computer-Assisted Language Learning (CALL) with all the newest AI tools, such as ChatGPT, ChatDOC, Explainpaper, Perplexity or Lex.page have opened the floor for diverse exchanges in the ways of teaching language skills, including academic writing. Hence, the aim of this scientific paper is to examine AI-assisted tools and strategies that foster the development of academic students' writing competence in the generative AI environment. Additionally, the researchers focused on exploring the usefulness and potential drawbacks that arise from applying AI tools into the teaching environment of future translators.

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LITERATURE REVIEW

1. Computer tools in foreign language writing – from word processors to artificial intelligence

The use of computers in assisting second language writing has long been established, and much of the history of CALL has been dominated by seeking more effective ways of helping learners how to write better, more effectively and with greater accuracy. While it is impossible to cover all the technological developments in the current paper, greater attention will be devoted to the major landmarks: PC-based word processors, online collaborative environments, online multimedia, language corpora and automatic translation tools.

The first major breakthrough in using computers to assist second language writing instruction was brought about with the widespread dissemination of personal computers and graphic word processors in the 1980s and early 1990s. The provision of spell-checking and grammar verification facilities for multiple languages, also distinguishing between different language varieties (e.g. British English vs. American English) triggered a number of studies exploring the effectiveness of writing in the computer medium (see Krajka 2002, 2007a; Pennington 1993).

Alongside the developments in PC-based word processors foreign language publishers devoted greater attention to developing PC-based multimedia fostering development of varied language skills and subskills. Writing was no exception, and especially preparation for international examinations such as TOEFL (soon to be administered in a computer format) triggered the emergence of writing studios, software providing practice in the writing of selected genres, where the computer was used to give input, display models, enable exploration of grammar/lexical aspects on demand through hyperlinking. However, these writing-oriented multimedia did not offer automatic correction and grading, which was to come more than a decade later with such tools as Criterion (Pennington 2004). One such example worth mentioning was the Longman Preparation Course for the TOEFL Test: iBT Writing (Phillips 2007).

The beginning of the 21st century and the advent of so-called Web 2.0 phase introduced increased authoring and publishing opportunities as well as collaborative writing capacity into the second/foreign language classroom. Much classroom research was based on the use of blogs, wikis and online word processors as environments for developing foreign language writing skills (Elia 2009). Most importantly, the collaborative aspect joining all the three tools enabled exploitation of "writing as a collaborative activity" instructional approach, and

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Data: 28/11/2026 02:29:00

many studies proved a beneficial effect of writing and commenting on blogs, wikis and in online word processors for the development of higher-order thinking and metacognitive strategies (Krajka 2009, 2012).

Together with the development of machine translation, more and more hopes were expressed about the effect of automatic translation tools as assistance for second language writers. Initially applying word-for-word translation and ridiculed for creating language calques, over years MT tools started to resemble human translation more due to incorporation of neural networks and deep learning. Nowadays, Google Translate, Bing Microsoft Translator, DeepL or Reverso largely facilitate quick and rough translation through website translation widgets, real-time speech and images translation or app integration and offline translation.

A brief overview of most crucial tools for assisting second language writing would be incomplete without reference to language corpora, especially important due to the common feature of large amounts of text with AI. With easy-to-use Web interfaces popularized from the beginning of the 21st century, consultation of large masses of text compiled for a particular purpose (corpora) to seek clarification of language use or study collocations and co-occurrence started to be a vital element of the writing process, especially when coupled with do-it-yourself corpus compilation (Lee, Swales 2006). Looking up examples of usage via freely available concordancers such as Lextutor.ca or English-corpora.org is another strategy that can be employed by second language writers when composing texts (Krajka 2007b).

2. Large language models and artificial intelligence

Even though AI has been in use in various areas of life for a few years, it has only been due to the recent outbreak of interest in ChatGPT and the resulting proliferation of AI-powered tools that has attracted great attention to the usage of AI in the language classroom. Early definitions of AI see it as

> computer systems that have been designed to interact with the world through capabilities (for example, visual perception and speech recognition) and intelligent behaviours (for example, assessing the available information and then taking the most sensible action to achieve a stated goal) that we would think of as essentially human. (Luckin, Holmes, Griffiths, Forcier 2016: 14)

As Silvia Pokrivcakova (2019) notes, AI technologies, encompassing such approaches and tools as machine learning, adaptive learning, natural language

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processing, data mining, crowdsourcing, neural networks or algorithms, bring about significant change in applied linguistics, by facilitating creation of computer languages, improving the quality of machine translations, speech recognition and synthesis, thus leading to enhanced human-machine communication. Recent efforts lead to building models based on human reasoning, which are trained ("learning") based on large amount of input, "without the end goal of replicating complex human thinking" (Marr 2018).

Out of three groups of AI-powered tools isolated by Toby Baker and Laurie Smith (2019), namely learner-facing AI tools (specific software used by learners individually to acquire a specific subject knowledge), teacher-facing systems (techniques applied by teachers to minimize their burden and improve the output) and system-facing applications (technologies that provide institutional administrators and managers with information), the second language learner is most likely to benefit from the first two groups. On the one hand, there is a need for systems that could be used on one's own by second language writers, which would serve as teacher's replacement or substitution providing assistance and sustaining learner's motivation in writing when needed. On the other hand, teacher-facing systems may empower learners to do much more than they normally would with all other tools available – most importantly, train the AI model to provide answers, summaries, continuation of text or explanation, or difficult parts of input.

Artificial intelligence tools alone cannot be credited for all the opportunities that can be seen in educational use of ChatGPT, ChatDOC, Explainpaper or Perplexity. More importantly, as Terrence Sejnowski (2023) states, it is thanks to large language models (LLMs), "pre-trained foundational models that are self-supervised and can be adapted with fine-tuning to a wide range of natural language tasks", that end products such as GPT-3 can carry on dialogues with humans or, more frequently, humans can ask questions seeking answers to problems posed. Because LLMs are self-supervised, they do not need human programming (but only access to large amounts of text) to be trained to perform new language tasks or exhibit new skills. Based on massive datasets of written language, LLMs are trained to predict language and writing, learning what might be expected or predicted after a sequence of words (i.e. a prompt; see Qureshi et al. 2023). What is only needed is priming or providing the model with a few examples which it incorporates and is trained on (Sejnowski 2023; Zhao et al. 2023).

In terms of the writing process, LLMs are used by journalists to assist them in their daily work by preparing news articles faster, by advertisement writers to make more catchy slogans, by authors to help them write novels or by programmers to write spotless sequences of computer code. What needs to be

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Data: 28/11/2026 02:29:00

understood by learners, though, is that the output from LLMs typically is not suitable as final copy, but can be relatively good draft to edit, polish, add more content depth. Thus, rather than replace writers, AI and LLMs can make them smarter and more productive, and need to be controlled for final output.

However, even though the application of AI-powered tools can be an important step in improving learners' second language writing, they need to be made aware of the limitations and drawbacks of these state-of-the-art applications. While resembling interaction with humans, AI tools like ChatGPT or ChatDOC are not humans that remember previous conversations, which means that they start each new interaction afresh (Sejnowski 2023). The easiness of providing answers or input without proper verification and reflection may lead to spectacular failure of "intelligent" automation (Qureshi et al. 2023). Especially in the field of writing, problems with unclear authorship, unresolved copyright issues, unreferenced ideas and academic integrity have to be properly addressed in the writing classroom and have to be kept in mind by the second language teacher (Rillig, Ågerstrand, Bi, Gould, Sauerland 2023). Most importantly, new tools utilising LLMs in education require both teachers and learners to develop new sets of competencies and strategies to prevent misuse, take full advantage of the tools available and help establish proper balance between human and AI writing (Kasneci et al. 2023). As demonstrated by a recent study by Fryer, Ainley, Thompson, Gibson and Sherlock (2017), the provision of a simulated conversation partner such as a virtual bot does not guarantee increased motivation and enhanced learning, on the contrary, feelings of disillusionment and dissatisfaction may abound among students.

When harnessing modern AI tools to assist in teaching writing, language instructors can follow some of the paths outlined by Euan Bonner, Ryan Lege and Erin Frazier (2023):

- summarizing text in level-appropriate language;
- correcting grammar and mechanics;
- generating narrative prompts;
- creating presentation notes;
- generating lesson ideas;
- leveling texts for testing or reading practice.

Non-native language teachers will find appealing especially generating level-appropriate prompts, summarizing texts in level-appropriate language and choosing level-appropriate texts as input for writing tasks or tests are of particular importance. This is so because non-native instructors do not have a natural feel for language and their estimation of difficulty is more subjectively based on their prior learning.

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Data: 28/11/2026 02:29:00

More specific ideas for the application of generative AI in the writing classroom are given by Enkelejda Kasneci et al. (2023):

- teachers can utilize LLMs to examine student writing and replies and provide tailored comments and materials that match the student's learning needs for personalized learning;
- when preparing writing sessions, language models can be requested to provide questions and prompts that encourage involvement from people with varying levels of knowledge and ability, as well as elicit critical thinking and problem-solving;
- LLMs can be utilized to generate targeted and individualized practice problems and quizzes to maintain motivation and interest throughout the writing process;
- for learning how to apply specific phrases or structures, writing teachers can employ AI tools to highlight important phrases, generate summaries and translations, provide explanations of grammar and vocabulary, suggest grammatical or style improvements and assist in conversation practice;
- for most immediate assistance to second language learners while writing, LLMs can be used either at the syntactic level (to identify and correct typos), the semantic level (to highlight grammatical inconsistencies) or at the discourse level (to identify topic/style improvements, generate summaries and outlines of challenging texts, or elicit the main points of the text).

Quite unsurprisingly, with LLMs based on huge amounts of text, their greatest application can be expected in the realm of improving writing skills. Still, the pedagogical proposals given above need at least initial empirical verification through observation, survey and experimentation, which is why the current research was designed.

METHODOLOGY

1. The aim of the research

The current scientific study provides an exploration of academic students' learning strategies in the generative AI environment in the process of developing writing skills. The research concentrated on the types of learning strategies that academic students use, the opportunities that arise from the application of learning strategies in AI academic instruction and the changes that appear after the implementation of the AI tools in the process of developing writing

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Data: 28/11/2026 02:29:00

skills of advanced students. In particular, the current study strives to answer the following questions:

RQ1. What kinds of AI tools do academic students use as learning strategies in the generative AI environment in the process of developing their writing skills?

RQ2. How do advanced students use the implemented AI tools after the experimental treatment?

RQ3. How did the experimental treatment change the process of learning especially writing skills?

RQ4. What are the benefits of using AI tools when writing or translating in a foreign language?

With these research questions in mind, it was hoped that the research would inform further investigations about what training steps should be taken to enable students of academic writing to incorporate new AI tools in a teacher-recommended manner.

2. Participants and the teaching context

The quasi-experimental treatment took place between March and June 2023 in an undergraduate group of applied linguistic students at a middle-sized public university in Poland. The majority of participants were Polish (12), a few Ukrainians (3), and were largely female (9), with 6 males, all between the ages of 21 and 22. The participants enrolled in the double-language (English and Portuguese) language and translator training program, to earn a B.A. in translation and interpretation in both languages. However, we are aware that the small scale of the study, purposive selection of participants and the lack of a control group seriously limit the possibility for generalisability of results, making the current study a pilot one that seeks follow-up investigations in more controlled conditions.

The conducted research started with a pilot survey aimed at determining the level of theoretical knowledge of learning strategies used in the generative AI environment, and their practical application. The pilot survey consisted of four questions. The first two were closed and were supposed to elicit respondents' attitudes (presented on a Likert scale) regarding the use of AI tools in developing academic writing. The remaining two were open-ended and aimed at verifying the expectations of the research participants regarding the role and use of AI-powered tools in the process of writing and translating in a foreign language.

The results of the pre-study survey indicated that the students had very little understanding of and familiarity with AI tools and strategies that can be applied in the generative AI environment. The outcome of the preliminary

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Data: 28/11/2026 02:29:00

survey was a clear indication to the authors that the idea of the prepared empirical study could have very tangible effects and benefits both for the study participants themselves and for foreign language teachers conducting academic writing classes.

The quasi-experimental treatment consisted of face-to-face classes, with the instructor presenting input materials, sample texts or task solutions, and an individual computer-based component in which participants interacted independently with various AI-assisted tools as well as collaboratively with other students. The participants were assured about all the potential risks of the scientific experiment as well as all the benefits that arise from the participation, especially in terms of improving their writing skills. They were free to withdraw from the study at any time with no consequences for their grades, which would be based on the results of the products both created in class and outside it.

3. Artificial intelligence tools used to create the experimental learning environment

The researchers were concerned in the current study with ensuring equitable access to the study tools, therefore only publicly available services or those for which students might be granted free access to the full version were used in the procedure. As a result, every effort was made to source tools without any charge or secure complimentary licenses for participating learners. However, easiness of use and free-of-charge accessibility cannot be the sole criteria for the selection of research instruments. Hence, additionally, the researchers undertook a careful analysis of available AI applications to select those that would meet the criteria of simplicity, relevance to the foreign language writing process and versatility of use. While it would be unrealistic to expect freely available online demos to meet these criteria, one particular AI-assisted writing environment, Lex.page, could be safely selected as the target context for the study.

As a result, the following tools were selected for the current research:

1) Lex.page (https://lex.page): the major AI application used for the study, a word processor joining the standard document creation and editing features with functionalities of collaborative writing and AI operations of continuing writing, generating text from prompts, getting AI feedback on one's writing, and asking AI to insert a random word. Lex.page is generally available as a paid service, however, the researchers managed to obtain free fully-functional licenses for the participating students;
2) Perplexity (https://www.perplexity.ai): an online service enabling generating answers on different (known and unknown) sources;

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Data: 28/11/2026 02:29:00

3) Explainpaper (https://www.explainpaper.com/dashboard): an online tool with the functionality of uploading texts as PDFs to be later paraphrased or asked questions about;
4) ChatDOC (https://chatdoc.com): an application enabling "chatting with documents", i.e. a file-based reading assistant that can extract, locate and summarise information from documents.

In the study, we treat Lex.page as the target environment, which the participants are led to through a series of steps exposing them to different functionalities of text-based AI tools. These smaller steps are taken via the three other services (Perplexity, Explainpaper and ChatDOC), which are simple enough to provide one selected feature but not sufficiently comprehensive to be treated as full-scale writing environments.

4. Design and procedure

The applied linguistics students were given a chance to improve their writing skills by taking part in the quasi-experimental treatment. They were voluntarily engaged in the research with clear information about the whole treatment. Aside from the experimental treatment scenario (see Table 1), the study included a pre-survey to investigate the participating students' experience and knowledge of learning strategies used in the generative AI environment, and their practical application.

Table 1. Detailed specification of the quasi-experimental treatment

Week	Classwork	Homework
Week 1: AI introduction 17–21 April	1. Pre-test – writing a report – one topic to be chosen: a) a local travel agency has asked you to produce a report on various activities that adult visitors can participate in while in Poland; b) as an assistant in the Management Department of your company, you have been asked to submit a report on one of the department malls placed in your town. The report should include features crucial for the future inhabitants of your town. ORGANISATION: 1) Introduction: state the purpose and the content of your report. 2) Main body: paragraphs 2–3–4–5 presenting each aspect of the subject under separate subheadings, including the pros and cons of each aspect. 3) Conclusion: general assessment, opinion and/or suggestion/recommendation:	1. Distinguishing AI from human writing – four essays to be guessed (fully--AI, fully-human, half-AI/half-human with specific parts, AI based on human outline), highlighting areas of the essay that show human vs. AI input

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Data: 28/11/2026 02:29:00

Week	Classwork	Homework
	– CONTENT (up to the given topic); – LANGUAGE CONTROL (grammar); – LINGUISTIC RICHNESS. 2. Pre-study survey – checking Ss' experiences with and attitudes towards AI in language learning. The pre-study survey will be attached as a part of the in-class 1. 3. Discussion – what could be the distinguishing factor for human (learner) writing vs. AI (machine) writing. 4. Task explanation – distinguishing AI from human writing.	
Week 2: Paraphrasing 24–28 April	1. Homework check – giving Ss solutions, eliciting and highlighting in online documents (displayed on the projector) which areas they thought indicated AI/human – I will prepare the analysis of the homework (four essays) as present and submit the results to the students. 2. Activity – explain what burstiness and perplexity as two important concepts to evaluate AI vs. human writing are, give Ss examples below and ask them to mark them as high/low perplexity/burstiness. I will present the 1.6 Perplexity and Burstiness in AI and human writing. 3. Tool explanation – Explainpaper (https://www.explainpaper.com) – using AI to paraphrase difficult parts of the uploaded text. Show how to upload a scientific paper, ask AI to paraphrase highlighted parts and ask follow-up questions to those explanations. 4. AI task explanation – WRITING TASK 1. 5. Regular writing task.	WRITING TASK 2
Week 3: Generating answers and evaluating sources 8–12 May	1. Homework check – checking the WRITING TASK 2. 2. Activity – use a text on a well-known topic based on dubious sources (e.g. find such a source and use ChatDOC to generate answers to questions based on it). WRITING TASK 3. The attached text to be analysed. SUGGESTED QUESTIONS: – What is the main purpose of the text? – How are smartphones used in education? – What are the pros and cons of using smartphones in education? – What will be the role of smartphones in education in the future? 3. Tool explanation – Perplexity (https://www.perplexity.ai) – using AI to generate answers based on different (unknown and unauthorised) sources. Show how to ask a question, get a concise and detailed view of the generated answer, show sources, edit sources to remove some and add more (up to 5). 4. AI task explanation – put Ss into pairs, give them the same questions (e.g. https://www.perplexity.ai/search/f5d2430d-1002-4fb3-b91b-04fcd6d997d9?s=c), ask Student	WRITING TASK

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Data: 28/11/2026 02:29:00

Week	Classwork	Homework
	A to write a paragraph based on found sources and Student B to generate the answer from Perplexity, for other questions, change roles. 5. Writing task for homework.	
Week 4: Outlining and summarising 15–19 May	1. Homework check – WRITING TASK 4. 2. Activity. 3. Tool explanation – ChatDOC (https://chatdoc.com) – signing in, uploading a document, using predefined questions or asking ChatDOC one's question. 4. AI task explanation – WRITING TASK 5. The attached text to be analysed. 5. Writing task for homework.	WRITING TASK 6
Week 5: Students' reflection on AI application 22–26 May	1. Homework check – WRITING TASK 6. 2. Activity – introduction to proposal reports. 3. Tool explanation – Lex.page (https://lex.page) – signing in, writing a document, asking AI to continue writing, asking AI to generate text from prompt. 4. AI task explanation – WRITING TASK: The MAGIC drama company offers to rent an old disused theatre. Write a proposal report, presenting your plans and intentions. Include the following points: – lack of and need for theatre; – plans to renovate the interior and/or exterior of the building; – proposed programme for the season; – projected profits and suggested terms of payment. 5. Writing task for homework.	WRITING TASK 7
Week 6: Future recommendations on AI application 29 May – 2 June	1. Homework check – WRITING TASK 7. As attached. 2. Activity. 3. Tool explanation – additional features of Lex.page (https://lex.page) – asking AI to get feedback on your writing, asking AI to insert a random word, showing Ss how to collaborate on a text in pairs. 4. AI task explanation: The advertisement below recently appeared in a national newspaper. As a representative of an arts group interested in opening a small gallery, you have been asked to write a proposal to be sent to the foundation. ADVERTISEMENT Jensen Foundation We are offering grants to individuals or small groups interested in running arts-related projects. If you match this description, please forward your proposal, detailing location, running costs and cultural benefits, to Mrs Darly, Trustee Manager, Jensen Foundation 5. Writing task for homework.	WRITING TASK 8

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Data: 28/11/2026 02:29:00

Week	Classwork	Homework
Week 7: Summary 5–7 June	1. Homework check WRITING TASK 8. 2. Post-test (writing … in class) a report – one topic to be chosen: WRITING TASK 9. As attached. 3. Post-study questionnaire fill-in. 4. Reflection interview questions. 5. Open discussion about AI's potential for writers.	

Source: Authors' own study.

Finally, the students were interviewed after treatment to verify if and how they changed their learning in terms of mastering writing skills. The interview reflection questions scenario consisted of two parts, in the first one the students were to mark the given statements as YES or NO. The purpose of the statements was to verify if:

- their writing skills have improved after the experimental treatment;
- the introduced AI tools were helpful when improving my writing skills;
- foreign language students should apply AI tools when enhancing their writing skills;
- foreign language teachers should introduce AI tools when teaching writing skills to academic foreign language students;
- AI tools disrupt the process of developing writing skills;
- foreign language students prepare high-quality texts when writing in an AI-assisted environment;
- AI tools help students write quicker and easier;
- AI tools help students control their writing process in terms of vocabulary richness and grammar correctness;
- AI-enhanced tools have the potential to be used in the process of developing foreign language students' writing skills.

In the end, the participants were asked to answer the questions briefly:

1. How did your writing strategies change after the AI experimental treatment?
2. What kinds of new writing strategies do you use after the experimental treatment?
3. Which of the introduced AI tools do you find most useful in developing writing strategies and translating? Why? Why not?

Even though great care was put into designing the study to maintain the necessary experimental rigour and the whole treatment was planned to introduce innovative tools/procedures in a controlled manner, due to lack of randomized sampling, purposive selection of the research group, small scale of the study and subjectivity of findings it should be treated as a pilot examination of the

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Data: 28/11/2026 02:29:00

feasibility of the research procedure, without aspiring to reach generalisability of results. Hence, we use pre- and post-survey data for drawing conclusions about the perceived usefulness of the text-based AI tools in academic writing.

RESULTS AND FINDINGS

The analysis of the pre-survey answered the first research question concerning the kinds of AI tools academic students use as learning strategies in the generative AI environment in the process of developing their writing skills (RQ1). The results of the pre-study survey indicate that the students often use varied AI tools as learning strategies when they have problems in writing 66% (10 out of 15 students). Almost 50% (7 out of 15 participants) of the questioned think that supplementary tools should be applied by students when developing their writing skills to see grammatical and lexical suggestions. The results confirm the findings by Pokrivcakova (2019) who elaborates on the importance of various AI technologies, encompassing such approaches and tools as machine learning, adaptive learning, natural language processing, algorithms in the process of providing better quality machine translations, speech recognition and synthesis, thus leading to enhanced human-machine communication.

Quite interestingly, the results indicate that most of the AI tools are unknown to the study participants. More specifically, 74% (11 out of 15 students) do not know AI tools like language corpus (e.g. COCA or BNC), 87% (13 out of 15 students) are unfamiliar with language corpus–AI-assisted word processors (e.g. Lex.page), 87% (13 out of 15 students) rarely use AI-assisted summarising tool (e.g. chatDOC), 54% (8 out of 15 students) scarcely apply text-to-speech synthesiser (e.g. Ivona or Dragon) or computer-assisted translation tool (e.g. MemoQ or Trados). One-fifth (3 out of 15 respondents) admit that they only heard of indicated AI tools, like language corpus (e.g. COCA or BNC), Chatbot (e.g. ChatGPT), speech-to-text transcriber (e.g. Google Cloud) and computer-assisted translation tool (e.g. MemoQ or Trados).

Moreover, the results of the reflection interview questions after the quasi-experimental treatment show a significant growth in the knowledge of the AI tools that can be used to enhance writing skills and eagerness to apply them daily (RQ2). More specifically, the study participants state that they apply AI-assisted word processor (e.g. Lex.page) – 97% (14 out of 15 students), AI-assisted summarising tool (e.g. chatDOC) – 93% (13 out of 15 students) and Chatbot (e.g. ChatGPT) – 70% (10 out of 15 students). Moreover, the participants were positively surprised by the usefulness of AI-assisted paraphrasing tools (e.g. Explainpaper) – 70% (11 out of 15 respondents), AI tool generating answers based on different sources (e.g.

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Data: 28/11/2026 02:29:00

Perplexity) – up to 90% (13 out of 15 respondents) and highlighted that both tools seem to be significantly practical in developing writing skills.

Furthermore, the study participants claimed that the introduced experimental treatment slightly changed their process of developing writing skills (RQ3). To be more specific, almost 75% (11 out of 15 respondents) stated that they became more conscious about the process of developing their writing skills as well as strategies and AI tools that can be used in it. The study participants underlined the importance of applying varied strategies because they bring better results in the quality of written texts and shorten the time of learning how to write coherent and cohesive academic texts. The remaining 25% (4 out of 15 students) remained rather indifferent to the idea of application learning strategies and AI tools in the process of writing skills.

Finally, in terms of indicating the benefits of AI tools when writing and translating in a foreign language (RQ4), the results prove that there are a lot of positive aspects that foreign language students spot (see Table 2).

Table 2. Positive aspects of AI tools in writing and translating

Pros in writing	Pros in translating
Generate ideas when writing an article or a book	Help me with grammar issues and punctuation
Generate useful synonyms or phrases that would enrich my language skills	Give me alternative versions of the sentences translated, so that I can choose the best suitable option
Stick to the task given by me	Generate useful synonyms or phrases that would enrich my language skills
Help me write and think myself by giving new ideas or other possible solutions of how something could have been written	Help me when I get stuck in my translation
Provide important information	Show examples of sentences in a foreign language to learn the context of the word that is problematic
Give me some new ideas for writing	Help me translate and think myself by giving new ideas or other possible solutions of how something could have been translated
Show the meaning of unknown words	Give me some new ideas for translating
Provide examples of alternative grammar structures	Avoid word-by-word translation or tautology
Help me improve my writing skills in general	Show the meaning of unknown words
Indicate mistakes in terms of grammar and linguistics	Provide examples of alternative grammar structures
Spot grammar errors	Indicate mistakes in terms of grammar and linguistics

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Data: 28/11/2026 02:29:00

Pros in writing	Pros in translating
Give suggestions of paraphrasing of sentences	Provide more than one possible option of translation
Provide vocabulary suggestions with collocations	Provide vocabulary suggestions with collocations
Suggest new phrases and collocations	Correct any mistakes appearing in the translation
Correct grammatical mistakes	
Suggest various solutions for writing	
Help me write a flawless text	

Source: Authors' own study.

In summary, the results of the quasi-experimental study indicate that participants have enriched their writing skills by varied strategies. The AI tool introduced in the first writing task (Writing Task 1) which is Explainpaper (https://www.explainpaper.com/dashboard) proved to be beneficial to create texts quickly with specific responses to follow-up queries. In terms of lexis, the sentences seemed occasionally quite long but probably most likely due to the nature of the material. Additionally, the tool helped participants understand complicated texts and paraphrase them carefully providing related resources.

As regards ChatDOC (https://chatdoc.com) which was implemented in the second writing task (Writing Task 2), the study participants were given a chance to learn how to create and improve long complicated texts. The different options available in the AI tool enabled students to comprehend the texts accurately highlighting certain parts of the text and providing the follow-up questions, which made data searching easier.

Perplexity (https://www.perplexity.ai), which was applied in the third writing task (Writing Task 3), seemed to be similar to ChatGPT, sometimes giving limited answers based only on the text in question. The positive aspect was the option of searching particular sites (Wikipedia, YT, News, etc.), which helped to make connections between creating texts and enriching them with more resources.

Finally, the target writing environment, Lex.page (https://lex.page) applied in the fourth writing task (Writing Task 4), empowered the respondents to produce precise texts, make them follow all the criteria of a human and at the same time greatly facilitate writing. The students were highly satisfied with Lex.page as it effortlessly paraphrased the texts as well as helped to create texts that were completely accurate and even exceeded the students' expectations.

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Data: 28/11/2026 02:29:00

CONCLUSION

The article has presented evidence for the application of AI strategies in developing the writing competence of academic students, growth in their knowledge of strategies and AI tools that can be applied in developing writing skills. More than that, the results show that advanced academic students slightly changed their attitude towards applying varied strategies in their daily writing practice.

The conducted quasi-experimental treatment also reveals some vital advantages of AI tools in the process of writing and translating. It shows that students derive linguistic (generating ideas, finding synonyms or antonyms) and grammatical benefits (showing alternative structures, spotting and correcting mistakes). The results of the study confirm the findings of Jarosław Krajka (2002, 2007a) and Martha C. Pennington (1993) who highlighted numerous benefits (spell-checking and grammar verification facilities) of applying AI-assisted tools in teaching and learning foreign languages.

The study in question indicates that academic students find it troublesome to develop their writing competence. As the study proves AI-assisted tools constitute a new opportunity for fostering academic students' writing competence. Thus, foreign language teachers should constantly be in search of new ways to facilitate the process as underlined by Krajka (2009, 2012) who proposed to insert the collaborative aspect into the writing process, for instance, writing and commenting on blogs or wikis and online word processors to accelerate higher-order thinking as well as metacognitive strategies. Additionally, as highlighted by Riaz Qureshi et al. (2023), Sejnowski (2023) and Wayne X. Zhao et al. (2023) AI tools serve as a great help for teachers, students, journalists or authors in terms of performing new tasks, predicting language or writing based on large datasets of written language.

However, due to the lack of statistical processing of pre- and post-test data, small and purposive sample and possible bias of a survey as a data collection tool, the study does not aspire to purely experimental research that could prove without any doubt the increased effectiveness of AI-assisted academic writing instruction. It is strongly recommended to conduct the experimental treatment on a wider sample of academic students to validate the findings and to find more recommendations and practical implications for foreign language teachers.

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Data: 28/11/2026 02:29:00

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