

# ARTIFICIAL INTELLIGENCE IN L2 GRAMMAR LEARNING: PERCEPTIONS AND PRACTICES OF MACEDONIAN UNIVERSITY FOREIGN LANGUAGE LEARNERS

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**Abstract:** Grammar is often regarded as the least engaging aspect of foreign language learning. Traditional approaches to grammar instruction are increasingly failing to meet learners' expectations, as digital-native students perceive conventional grammar books as uninspiring and ineffective. Meanwhile, the rapid advancement of artificial intelligence (AI) is reshaping language learning environments. AI-powered tools such as Grammarly, Babbel, ChatGPT, ProWritingAid, etc. are redefining how learners engage with grammar. While recent studies suggest that AI can serve as a valuable aid for grammar learning, this area remains largely underexplored.

This study employs a mixed-methods design to investigate Macedonian university students' perceptions and experiences with AI as a feedback and correction mechanism in the context of L2 grammar mastery. A small-scale experiment was conducted among language- and non-language-oriented students, who were instructed first to identify and correct grammatical mistakes in an L2 text independently, and then to repeat the task with the aid of an AI tool of their choice. Participants subsequently completed a self-reflection questionnaire on their reliance on AI, the tools they used, and their perceptions of AI reliability.

The study's overall aim was to determine whether language and non-language students perform better individually or with AI assistance. Findings revealed that both groups achieved higher accuracy when supported by AI, though language-oriented students showed greater consistency, while non-language-oriented students displayed more variable outcomes. Overall, these results highlight AI's strong potential as a complementary tool for grammar learning, while underscoring the continued need for critical human oversight and further pedagogical innovation.

**Keywords:** AI, L2, grammar, language students, non-language students

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## Introduction

In foreign language learning, mastering grammar is widely recognised as one of the greatest challenges for learners. It requires not only memorizing countless rules and their exceptions, but also finding opportunities for real-life practice, which are often scarce (Selvi & Vaishnavi, 2024). These constraints, combined with the limitations of traditional grammar instruction, which are heavily reliant on intrinsic motivation and persistence, can hinder fluency and long-term mastery (Stevens Jr., 2025).

In recent years, however, the emergence of AI-driven tools has begun to transform grammar teaching and learning. Such tools offer adaptive, interactive, and responsive instruction, enabling learners to internalize grammar more effectively and gain confidence as language users (Stevens Jr., 2025; Priya & Vijayalakshmi, 2024). Although research on AI's role in grammar acquisition is still in its early stages (Norton & Buchanan, 2022), current findings point to significant potential for both learners and teachers.

The study at hand contributes to this growing body of research by examining Macedonian university students' grammar rule awareness and their experience with AI as a feedback and correction mechanism for L2 grammar mastery. The overarching aim is to determine whether students, from both linguistic and non-linguistic profiles, handle L2 grammar mistakes more effectively individually or with the assistance of AI tools.

## Theoretical Background

AI tools incorporate natural language processing (NLP) algorithms, allowing them to process vast amounts of data, imitate human intelligence, and generate language with increasing accuracy (Priya & Vijayalakshmi, 2024). They provide a range of advantages: instant error detection and correction; real-time explanations; personalized feedback; performance analysis; identification of problem areas; and continuous practice opportunities (Haleem et al., 2022; Hoang et al., 2021 in Katsarou et al., 2025; Priya & Vijayalakshmi, 2024). Gamification features enhance engagement, while scaffolding enables adaptation to learners' pace and proficiency levels (Stevens Jr., 2025). These elements improve linguistic performance, motivation, and confidence, leading to greater behavioural, emotional, and cognitive engagement (Nazari et al., 2021, in Tarhini, 2024). AI also supports lifelong learning by offering remote, self-paced access to high-quality resources (Priya & Vijayalakshmi, 2024) and aligns with broader educational goals, such as fostering critical thinking, problem-solving, and digital literacy (Kuznietsova & Kulakova, 2024).

Beyond aiding learners, AI supports teachers by processing large datasets, retrieving relevant, up-to-date resources, and tailoring lesson plans to students'

needs. It can also be used to create quizzes and other instructional materials, and to streamline student assessment, making it faster and more efficient (Stevens Jr., 2025).

Tarhini (2024) classifies AI tools for grammar instruction into four categories: **teaching aids** which generate gamified exercises and quizzes (e.g., Quizlet, Kahoot, Duolingo for Schools); **assessment tools** which provide formative and summative assessments in engaging formats (e.g., Edulastic, Classcraft Quests); **error-checking and feedback tools** which detect errors and offer explanations (e.g., Grammarly, NoRedInk, Hemingway Editor, Scribens), and **lesson preparation and design tools** (e.g., Teach AI, Lesson Up, Eduflow, Nearpod, Quizlet). Tarhini (2024) accentuates that all these AI tools are currently free to use and that their effectiveness in improving grammar mastery has been confirmed by other studies too (Anson & Straume, 2022; Dong, 2023; Alharbi, 2023; Vogt & Flindt, 2023; Kawashima, 2023). Selvi and Vaishnavi (2024) highlight popular free tools such as Grammarly and QuillBot (for grammar correction and paraphrasing) and speech-based AI chatbots like Speak and Improve or Deep English (for conversational grammar practice). Priya and Vijayalakshmi (2024) list ten leading AI grammar correction tools: Grammarly, ProWritingAid, Ginger Software, WhiteSmoke Features, Linguix Features, Slick Write Features, Hemingway Editor, LanguageTool, Sapling, and QuillBot, noting their advantages (user-friendly design, in-depth analysis, performance tracking, etc.) and disadvantages (limited free versions, restricted languages, inconsistent suggestions, privacy concerns, etc.). They conclude that learners using AI-powered tools make fewer grammatical errors and produce clearer writing.

Despite these benefits, recent studies underline that challenges in the implementation of AI in grammar instruction still remain. Selecting the most suitable tool for a given learner is not always straightforward; for example, gamification may be very efficient for younger learners but not adequate for advanced learners (Selvi & Vaishnavi, 2024). There are also concerns about over-reliance on AI, as students who use grammar checkers without understanding the grammar rule underlying those corrections run the risk of not internalizing the grammar rules in question (Stevens Jr., 2025).

Due to these challenges and concerns, scholars agree that AI should complement, not replace, teacher-led instruction. A blended learning approach, combining the strengths of both traditional and AI-enhanced methods, appears to be optimal. Stevens Jr. (2025) emphasizes that AI should be seen as a complementary tool rather than an independent solution. He argues that its success relies on human involvement, institutional backing, and systemic equity. According to him, only through a coordinated, inclusive, and adequately resourced effort can AI fully

contribute to advancing English grammar instruction and, more broadly, the educational field.

## Research Methodology

### Research Aim, Hypotheses, and Questions

For the purposes of this study, we conducted an experiment aimed at shedding light on the **grammar rule awareness** of two profiles of Macedonian university students – **language-oriented (LO)** and **non-language-oriented (NLO)** as well as on their **interaction with AI as a feedback and correction mechanism**. More precisely, this research sought to test two general hypotheses and to provide answers to six research questions:

**H1:** There is a significant difference in the number of correct corrections made by LO and NLO students without the assistance of AI.

**H2:** Both profiles of students produce a substantially higher percentage of correct corrections when assisted by AI.

**RQ1:** What patterns emerge in students' responses during the grammar correction task?

**RQ2:** To what extent are LO and NLO students able to identify and correct grammatical mistakes in a written text, both independently and with the help of AI?

**RQ3:** What types of grammatical mistakes are most frequently successfully corrected and what mistakes are overlooked or miscorrected by students, and how does this relate to their academic profile?

**RQ4:** What AI tools do students use to assist them in identifying and correcting grammatical mistakes in a written text?

**RQ5:** What are students' attitudes toward AI's grammar corrections and explanations?

**RQ6:** How accurate is AI in confirming, rejecting, or correcting student-provided grammatical revisions?

### *Participants in the experiment*

A total of **67** students participated in the survey: **30** from the Faculty of Education in Bitola, **25** from the Faculty of Information and Communication Technologies in Bitola, and **12** from the Faculty of Philology in Skopje. The participants were enrolled in different study programs and were in different years of study, ranging from the first to the fourth year of undergraduate programs. This diverse sample was purposefully selected to obtain more comprehensive insights into the use

of AI tools for grammar-related purposes, primarily between two profiles of students – students with a language-focused academic background and students in non-language-oriented study programs who have studied a foreign language as part of their university curriculum. The students with the language-focused academic background were majoring in English (Faculty of Education – Bitola) and French (Faculty of Philology – Skopje); whereas, the students with non-linguistic background were majoring in ICT (Faculty of Information and Communication Technologies – Bitola).

### *The three phases of the experiment*

The experiment was conducted in three phases. During the first phase (P1) the students were instructed to read and analyse a short text on the topic of travelling (“A Traveller’s Tale”) so that they detect and correct the grammar mistakes scattered randomly at different points in the text. The text was generated by ChatGPT 3.5 both in English and French (see Appendix 1 and Appendix 2), based on prompts that instructed the AI tool to include a range of specific grammar mistakes. The text contains a total of 25 grammatical mistakes. However, the first two mistakes were presented as examples in the instructions, intended to guide students on how to approach the experiment. Therefore, the actual number of mistakes students worked with during the experiment was 23. The experiment was done in class and lasted 45 minutes<sup>1</sup>.

The grammatical mistakes selected were approximately aligned with the B2 level of the Common European Framework of Reference for Languages (CEFR), ensuring that all participants had comparable exposure to the relevant grammar structures. The selection aimed to include a wide range of grammatical issues, ranging from verb tenses (M7, M8, M13, M22), to articles (M4, M11, M14), habitual past tense (Eng)/ conditional (Fr) (10)<sup>2</sup>, prepositions (M15), gerund (Eng)/ past participle (past participle) (Fr) (M20), singular/ plural form of nouns (M12, M25), adjectives vs. adverbs (M16), pronouns (M17, M23), subject–verb agreement (M3, M21), double negation (M5), collocations (M6), perfect infinitive (M9), embedded questions (M18), conditional sentences (M19), and bare infinitive (M24).

In the second phase of the experiment (P2), the students were allowed to use their mobile phones and employ an AI tool of their choosing, in order to verify

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1. For the French language students, the experiment was conducted online, as it was not possible to organize a joint live session due to some participants being on Erasmus mobility exchange at the time of the experiment. Although direct monitoring of their actions during the experiment was limited, the students were given clear instructions to follow the established rules and to complete the three phases of the experiment systematically, in good faith, and with integrity.

2. English and French differ in certain grammatical aspects, which has led to differences in a few error types in the French version of the text generated with ChatGPT.

their corrections but also to make sure that they have not disregarded other mistakes present in the text.

Finally, in the last phase (P3), they were instructed to reflect on their experience using AI to assist them in identifying and correcting the mistakes in the text, by filling in a self-reflection questionnaire composed of eight open-ended questions and a space for an additional comment (see Appendix 3).

## Results

### *Results from the experiment (P1 and P2)*

The close analysis of students' responses revealed six recurring patterns of response types (RT) with respect to the grammar mistakes in the text (see Table 1 and Table 2):

**RT1.** The student identified and corrected the mistake (P1), and, AI approved of their correction (P2) ( $\checkmark \checkmark$ );

**RT2.** The student failed to identify and correct the mistake (P1), and, AI offered no correction (P2) ( $/ \ /$ )<sup>3</sup>;

**RT3.** The student failed to identify and correct the mistake (P1), but, AI offered an appropriate correction (P2) ( $/ \checkmark$ )<sup>4</sup>;

**RT4.** The student identified the mistake but offered an incorrect correction (P1), and, AI did not approve of it and offered an appropriate correction (P2) ( $\checkmark X \checkmark$ ),

**RT5.** The student identified the mistake but offered an incorrect correction (P1), and AI offered no correction (P2) ( $\checkmark X \ /$ )<sup>5</sup>, and

**RT6.** The student identified and corrected the mistake adequately (P1), but, AI did not approve of the correction (P2) ( $\checkmark \checkmark X$ ).

The analysis of 966 LO students' responses across two university units (690 responses from the Faculty of Education – Bitola and 276 responses from the Faculty of Philology – Skopje) revealed similar recurring patterns in students' engagement with grammar mistakes in the given text (Table 1).

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3. In this case, it remains unclear whether the students prompted AI to inspect the text for mistakes. However, since no comments were provided in the column designated for AI suggestions, comments, or corrections, we simply noted that AI did not correct the mistake in question.

4. In this case, it is evident that the student, although failing to notice the mistake independently, did consult an AI tool to check for grammatical mistakes. As a result, the AI tool identified and corrected the mistake at the relevant point in the text.

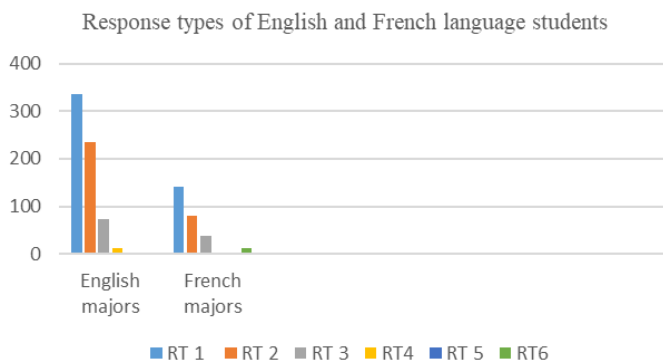
5. In this case too, we cannot be sure if the students consulted AI or not. We assume that they felt sufficiently confident in their corrections and, as a result, did not seek confirmation from AI. This likely explains the absence of comments in the column designated for AI's corrections and suggestions.

Table 1. Response types of LO students

|     | English language students<br>(23 mistakes x 30 students =<br>690 responses) |                 |                |               |               |               | French language students<br>(23 mistakes x 12 students =<br>276 responses) |                |                |               |               |               |
|-----|-----------------------------------------------------------------------------|-----------------|----------------|---------------|---------------|---------------|----------------------------------------------------------------------------|----------------|----------------|---------------|---------------|---------------|
|     | RT1<br>(✓)                                                                  | RT2<br>(/)      | RT3<br>(✓)     | RT4<br>(✓X ✓) | RT5<br>(✓X /) | RT6<br>(✓X X) | RT1<br>(✓✓)                                                                | RT2<br>(/ /)   | RT3<br>(✓✓)    | RT4<br>(✓X ✓) | RT5<br>(✓X /) | RT6<br>(✓X X) |
| M3  | 22                                                                          | 8               | /              | /             | /             | /             | 10                                                                         | 1              | 1              | /             | /             | /             |
| M4  | 11                                                                          | 14              | 2              | 2             | 1             | /             | 4                                                                          | 6              | 2              | /             | /             | /             |
| M5  | 21                                                                          | 4               | /              | 5             | /             | /             | 10                                                                         | /              | /              | 1             |               | 1             |
| M6  | 27                                                                          | 3               | /              | /             | /             | /             | 7                                                                          | 3              | 2              | /             | /             | /             |
| M7  | 4                                                                           | 22              | 3              | 1             | /             | /             | 3                                                                          | 5              | 2              | /             | /             | 2             |
| M8  | 27                                                                          | 1               | 2              | /             | /             | /             | 7                                                                          | /              | 2              | 1             |               | 2             |
| M9  | 5                                                                           | 11              | 12             | 2             | /             | /             | /                                                                          | 7              | 4              | /             | /             | 1             |
| M10 | 19                                                                          | 10              | 1              | /             | /             | /             | 2                                                                          | 3              | 3              | /             | 1             | 3             |
| M11 | 6                                                                           | 15              | 8              | /             | 1             | /             | 7                                                                          | 2              | 3              | /             | /             | /             |
| M12 | 5                                                                           | 17              | 8              | /             | /             | /             | 12                                                                         | /              | /              | /             | /             | /             |
| M13 | 22                                                                          | 3               | 5              | /             | /             | /             | 5                                                                          | 5              | 2              | /             | /             | /             |
| M14 | 3                                                                           | 22              | 4              | /             | 1             | /             | 5                                                                          | 5              | 2              | /             | /             | /             |
| M15 | 5                                                                           | 22              | 2              | /             | 1             | /             | /                                                                          | 10             | 2              | /             | /             | /             |
| M16 | 25                                                                          | 5               | /              | /             | /             | /             | 9                                                                          | 2              | 1              | /             | /             | /             |
| M17 | 17                                                                          | 11              | 2              | /             | /             | /             | 9                                                                          | 2              | 1              | /             | /             | /             |
| M18 | 12                                                                          | 15              | 3              | /             | /             | /             | 5                                                                          | 6              | 1              | /             | /             | /             |
| M19 | 9                                                                           | 10              | 9              | 2             | /             | /             | 5                                                                          | 3              | 4              | /             | /             | /             |
| M20 | 6                                                                           | 18              | 6              | /             | /             | /             | 10                                                                         | 2              | /              | /             | /             | /             |
| M21 | 27                                                                          | 3               | /              | /             | /             | /             | 10                                                                         | 2              | /              | /             | /             | /             |
| M22 | 22                                                                          | 6               | 2              | /             | /             | /             | 12                                                                         | /              | /              | /             | /             | /             |
| M23 | 19                                                                          | 10              | 1              | /             | /             | /             | 2                                                                          | 7              | 3              | /             | /             | /             |
| M24 | 24                                                                          | 4               | 2              | /             | /             | /             | 6                                                                          | 5              | /              | /             | /             | 1             |
| M25 | 19                                                                          | 10              | 1              | /             | /             | /             | 2                                                                          | 4              | 3              | /             | /             | 3             |
|     | 357<br>(51.73%)                                                             | 244<br>(35.36%) | 73<br>(10.57%) | 12<br>(1.73%) | 4<br>(0.57%)  | /             | 142<br>(51.44%)                                                            | 80<br>(28.98%) | 38<br>(13.76%) | 2<br>(0.72%)  | 1<br>(0.36%)  | 13<br>(4.71%) |

The distribution of the response types in the LO group indicates clear similarities between English and French majors in how they engaged with error correction and AI feedback (Chart 1).

More specifically, the English students (51.73%) and the French students (51.44%) mostly identified and corrected the grammatical mistakes successfully, and then received confirmation from the AI tool for their corrections.



**Chart 1.** *The response types of the LO students*

The LO students were most successful in detecting and correcting the following mistakes: subject-verb agreement (M3, M21) (1); double negation (M5) (2), verb tenses (M8, M13, M22) (3), and singular/plural of nouns (M25) (4). In addition, the English majors did very well with correcting the mistakes related to collocations (M6) (5), and adjectives vs. adverbs (M16) (6); whereas, the French majors with the participle form (M20) (7).

(1) *Travelling are* [...] corrected as, *Travelling is* [...]

*La météo étaient* [...] corrected as, *La météo était* [...]

(2) *I have never seen **nothing*** [...] corrected as, *I have never seen **anything*** [...]

*Je n'ai pas jamais vu* [...] corrected as, *Je n'ai jamais vu* [...]

(3) *One day, he **take*** [...] corrected as, *One day, he **took*** [...]

*Il nous **prend*** [...] corrected as, *Il nous **a pris*** [...]

(4) [...] *and meeting **peoples** from different backgrounds* corrected as [...] *and meeting **people** from different backgrounds*

[...] ***les campagne*** corrected as, [...] ***les campagnes***

(5) [...] ***were got sick*** corrected as, [...] ***got sick***

(6) *The canals in Amsterdam were **beautifully*** [...] corrected as *The canals in Amsterdam were **beautiful*** [...]

(7) *Je me réjouis déjà à l'idée de **planifié** [...]* corrected as, *Je me réjouis déjà à l'idée de **planifier** [...]*

However, it is important to note that a significant portion of their responses, approximately one-third (English – 35.36% vs. French – 28.98%), fell under Response Type 2 (RT2), indicating that the students did not detect the mistakes and, consequently, did not consult AI to verify the grammatical correctness of those sentences. Both groups of language-oriented students were least successful with the following mistakes: articles (M14) (8), and prepositions (M15) (9). The English language students had some issues with the detection and correction of the mistakes related to gerund (M20) (10), and some verb tenses too (M7) (11); whereas, the French language students with the perfect infinitive (M9) (12).

(8) *I didn't knew that **Dutch** are [...]* should have been corrected as, *I didn't know that **the Dutch** are [...]*

*Je ne savais pas que **Néerlandais** [...]* should have been corrected as, *Je ne savais pas que **les Néerlandais** [...]*

(9) *[...] are so good **with** cycling [...]* should have been corrected as, *[...] are so good **at** cycling [...]*

*[...] sont si doués **avec** le vélo [...]* should have been corrected as *[...] sont si doués **pour** le vélo [...]*

(10) *[...] looking forward to **plan**...* should have been corrected as, *... looking forward to **planning** [...]*

(11) *[...] a family friend who **is living** in Munich [...]* should have been corrected as, *[...] a family friend who **lives** in Munich [...]*

(12) *[...] au château de Neuschwanstein, qui est **dit d'avoir eu** inspiré [...]* should have been corrected as, *[...] au château de Neuschwanstein, **qui aurait inspiré** [...]*

Interestingly, a small but significant portion of their responses were classified as Response Type 3 (RT3), meaning that although the students did not perceive any grammatical errors, they still chose to consult AI for confirmation. In these cases, the AI tools identified and corrected the previously unnoticed mistakes (English – 10.57% vs. French – 13.76%). Notably, the AI tools most frequently intervened in correcting the following mistakes: perfect infinitive use (M9) (13), and conditional sentences (M19) (14). With the English majors this was also the case with the use of the articles (M11) (15).

(13) *[...] which is said to **had inspired** Disney's castle [...]* was corrected by AI as *[...] which is said to **have inspired** Disney's castle [...]*

*[...] qui est **dit d'avoir eu** inspiré [...]* was corrected by AI as *[...] **qui aurait inspiré** [...]*

(14) *If I would travel again next year* [...] was corrected by AI as, *If I travel again next year* [...]

*Si je voyagerais l'été prochain* [...] was corrected by AI as, *Si je voyageais/si je voyage* [...]

(15) *Netherlands* [...] was corrected by AI as, *The Netherland* [...]

The next two response types (RT4 and RT5), although less frequent in both groups, are still noteworthy. Only 1.73% of the responses of the English majors and 0.72% of the French majors' responses fell under Response Type 4 (RT4), where students provided incorrect corrections, which were subsequently revised more accurately by AI. Though rare, such instances indicate meaningful student involvement and emphasize the AI's contribution to improving correction quality. In the case of the English majors, the analysis revealed one to two such occurrences for the following mistakes: articles (M4, M11), verb tenses (M7), perfect infinitive (M9), and conditional sentences (M19); whereas, in the case of the French majors, such instances were noted in relation to double negation (M5) and verb tenses (M8). Then, 0.57% of the English majors' responses and 0.36% of the French majors' responses were categorized as Response Type 5 (RT5), where students suggested incorrect corrections that were, surprisingly, not challenged by AI. In the English group, instances of this type of response were related to the use of the articles, where the students would not add the definite article *the* to nouns such as *Dutch* (when it refers to nationality) and *Netherland*, and AI would not correct them. In the French group, the only mistake recorded in RT5 was with respect to the use of the present conditional form (M10) (16):

(16) *Sur le chemin du retour, on s'arrêterait dans un petit village* [...] corrected by the student as, *on s'arrêtes dans un petit village* [...]

Finally, in the English group of language students, no instances were spotted of RT6, where students made accurate corrections that were not acknowledged by AI. Conversely, in the French group, 4.71% of responses fell under RT6. This percentage suggests occasional inconsistencies in the AI's evaluative capabilities. The most frequent mistakes in RT6 were with respect to the use of the present conditional form (M10) (17) and the singular/plural of nouns (M25) (18):

(17) *Sur le chemin du retour, on s'arrêterait dans un petit village* [...] corrected by the student as, *on s'est arrêté dans un petit village* [...] but disapproved from AI and rectified as [...] *nous nous sommes arrêtés*

(18) [...] *et rencontrer un peuple de cultures différentes* [...] corrected as, [...] *des peuples de cultures différentes*, but disapproved from AI and rectified as [...] *des gens de cultures différentes* [...]

Regarding RT6, the corrections proposed by the AI for the French examples do not constitute the rectification of an incorrect answer but rather offer an alternative, equally valid formulation of the student’s response. Since both the student’s and the AI-generated answers are grammatically correct, the AI’s rejection of the student’s correction can be considered unfounded and unjustified.

Similarly, the analysis of 575 responses of NLO students from the Faculty of Information and Communication Technologies – Bitola showcased similar recurring patterns in students’ responses.

**Table 2.** *Response types of NLO students*  
**Students of Information and Communication Technologies**  
(23 mistakes x 25 students = 575 responses)

|       | RT1<br>(✓)     | RT2<br>(/)      | RT3<br>(✓)   | RT4<br>(✓X)   | RT5<br>(X/)  | RT6<br>(X/X) |
|-------|----------------|-----------------|--------------|---------------|--------------|--------------|
| M3    | 6              | 19              | /            | /             | /            | /            |
| M4    | 11             | 14              | /            | /             | /            | /            |
| M5    | 17             | 6               | 2            | /             | /            | /            |
| M6    | 24             | 1               | /            | /             | /            | /            |
| M7    | 2              | 22              | 1            | /             | /            | /            |
| M8    | 21             | 2               | 2            | /             | /            | /            |
| M9    | 10             | 12              | 1            | 1             | 1            | /            |
| M10   | 11             | 12              | 1            | 1             | /            | /            |
| M11   | 3              | 21              | 1            | /             | /            | /            |
| M12   | 4              | 20              | 1            | /             | /            | /            |
| M13   | 21             | 3               | 1            | /             | /            | /            |
| M14   | 5              | 19              | 1            | /             | /            | /            |
| M15   | 5              | 18              | /            | 1             | 1            | /            |
| M16   | 18             | 7               | /            | /             | /            | /            |
| M17   | 17             | 8               | /            | /             | /            | /            |
| M18   | 9              | 16              | /            | /             | /            | /            |
| M19   | 7              | 8               | 2            | 6             | 2            | /            |
| M20   | 9              | 14              | 1            | 1             | /            | /            |
| M21   | 23             | 1               | 1            | /             | /            | /            |
| M22   | 18             | 7               | /            | /             | /            | /            |
| M23   | 18             | 7               | /            | /             | /            | /            |
| M24   | 17             | 8               | /            | /             | /            | /            |
| M25   | 15             | 10              | /            | /             | /            | /            |
| Total | 291<br>(50.6%) | 255<br>(44.34%) | 15<br>(2.6%) | 10<br>(1.73%) | 4<br>(0.69%) | /            |

The most frequent response type within this group of respondents was RT1 **(50.6%) as well**. This means that these *students too, for the most part, correctly identified and corrected the mistakes, and obtained AI approval of their corrections*. Put differently, this finding indicates that half of all responses of NLO students demonstrated student competence both in recognizing grammatical errors and in independently producing valid corrections, which were then confirmed by AI. This, in turn, might serve as a strong indicator of grammatical awareness and skill among these participants, despite the fact that their university studies were not language-focused. They were most successful in identifying and correcting the following mistakes: collocations (M6) (5), verb tense (M13) (19), and subject-verb agreement (M21) (1) (Chart 2).

(19) *I didn't knew* [...] was corrected as *I didn't know* [...]

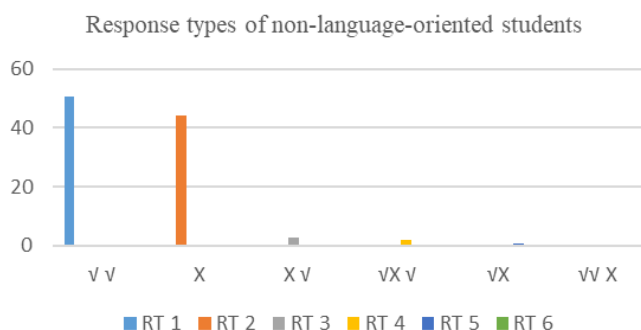


Chart 2. Response types of NLO students

Nevertheless, a significant number of student responses **(44.34%)** fell into the RT2 category, meaning *students failed to identify or correct some of the mistakes consistently, and then failed to consult AI to offer suggestions*. The students were least successful in identifying and correcting mistakes related to: the use of articles (M11, M14) (8), verb tenses (M7) (11), and singular/plural of nouns (M12) (20).

(20) [...] we explored the *counttrysides* [...], should have been corrected as, [...] we explored the *counttryside* [...]

**A considerably smaller number of NLO students failed to identify or correct the mistake, but AI offered an appropriate correction (2.6%) (RT3).** A few instances of this response type were noticed in relation to half of the mistakes present in the text.

An insignificant portion of these students **(1.73%)** demonstrated a partial success as they were able to spot the mistake but were unable to provide an appropriate correction (RT4). However, AI helped steer them toward the accurate solution, and this was the case with regards to the following mistakes: perfect infinitive (M9) (13), past habitual actions (M10) (21), prepositions (M15, M20) (9) and conditional clauses (M19) (14). **RT5** pattern, where *students identified the mistake and tried*

to correct it with an incorrect solution, and failed to consult AI, most probably, because they were sure that their correction was appropriate, was noted in a **few responses (0.69%)** related to the following mistakes: perfect infinitive (M9) (13), prepositions (M15) (9), and conditional sentences (M19) (14).

(21) [...] *we **would stop** at a small village [...]*, was corrected by AI as, [...] *we **stopped** at a small village [...]*

Interestingly, the analysis revealed **no responses in this group of students in the RT6** (*the students corrected the mistake, but AI didn't accept it*).

When comparing the performance of LO and NLO students, several striking parallels and distinctions emerge. Both groups showed a similar overall pattern: approximately half of their responses fell into RT1, where students successfully detected and corrected the errors, and their solutions were confirmed by AI. This finding suggests that grammatical awareness is not the exclusive domain of language majors; students from information technology studies also demonstrated a solid command of L2 grammar in many instances. The only difference here was that the range of mistakes that LO students handled well (verb tenses, subject-verb agreement, double negation, adjective vs. adverbs, participle, collocations, singular/plural of nouns) was wider than the range of mistakes that their NLO counterparts handled with a great deal of accuracy (verb tenses, subject-verb agreement, collocations). At the same time, RT2 responses (where neither the students nor AI corrected the errors) were frequent in both groups, but they were more frequent among the NLO group (about 44%), indicating a sharper sensitivity to grammatical detail on the part of the LO group (about 30% of their answers fell under this category). A comparison of the results with respect to RT2, reveals a common blind spots in both groups of students, especially with respect to the use of articles and prepositions. It is very likely that the students were convinced that there were no grammar mistakes at some points in the text, and, consequently, did not ask AI to validate their assumptions.

Where the groups differed most clearly was in their use of AI as a supportive tool. LO students were more inclined to seek confirmation when uncertain, which is reflected in their higher proportion of RT3 responses (12%), especially with respect to the use of perfect infinitive and conditional sentences. In these cases, AI often stepped in to supply the correction students had overlooked. As to the NLO students, the finding that only a small percentage (2.6%) asked for help when uncertain, suggests that while they have the grammatical competence to perform well, they may lack the habit of second-guessing their answers or actively engaging with AI to refine them.

A similar, small percentage of the students from both groups produced invalid corrections to different mistakes in the text (RT4 and RT5) (about 1-2%) but the comparison shows that this percentage was still slightly smaller in the case of the LO students, which reaffirms their tendency for more acute identification and correction of grammar mistakes.

Finally, the occasional instances of RT6 (valid student corrections rejected by AI), observed only in the LO group, highlight the limitations of technology as a learning partner. These mismatches, though rare, show that AI may sometimes classify a correct response as incorrect while suggesting an alternative that is equally acceptable. Such cases remind us that AI cannot fully replace human judgment and that students must learn to engage with it critically.

### *Results from students' self-reflection questionnaire (P3 of the experiment)*

The most immediately evident finding that came out of the analysis of the students' self-reflection questionnaire was that nearly all students irrespective of their academic profiles rely on the same AI-driven tool for grammar assistance – ChatGPT. Occasionally, however, some of them mentioned using other tools such as Gemini, Perplexity, Deepseek, Copilot, Google Chat, Free AI, and GrammarCheck (see Table 3).

**Table 3.** *AI tool/s used by students for grammar assistance during the experiment*

|                 | Language-oriented students    |                               | Non-language-oriented students                                 |
|-----------------|-------------------------------|-------------------------------|----------------------------------------------------------------|
|                 | Faculty of Education - Bitola | Faculty of Philology - Skopje | Faculty of Information and Communication Technologies - Bitola |
| ChatGPT         | 25<br>(83.3%)                 | 9<br>(75%)                    | 20<br>(80%)                                                    |
| Gemini          | 3                             | 2                             | 1                                                              |
| Free AI         | 1                             | /                             | /                                                              |
| Google Chat     | 1                             | /                             | /                                                              |
| Deepseek        | /                             | /                             | 1                                                              |
| Perplexity      | /                             | /                             | 2                                                              |
| GrammarCheck.ai | /                             | /                             | 1                                                              |
| Copilot         | /                             | 1                             | /                                                              |
| total           | 30                            | 12                            | 25                                                             |

More precisely, 79.2% of the LO students (the average percentage of LO students from the Faculty of Education – Bitola and the Faculty of Philology – Skopje) reported using ChatGPT, compared to 80% of the NLO students. Other AI tools were considerably less common, used by 20.8% of the LO and 20% of NLO students. Prior experience with AI tools was also widespread in both groups, though more pronounced in the group of NLO students (100%) than the group of their LO peers (90.5%). When asked about the reliability of AI-generated responses, levels of trust varied. Only 40.5% of LO students expressed full confidence in AI accuracy, while the majority (59.5%) remained skeptical or uncertain. In contrast, over half, i.e. 60% of NLO students reported full trust, and 40% expressed doubts (Table 4).

**Table 4.** *Students' responses in the self-reflection questionnaire*

|                                                     | Language-oriented students (total 42) |                         | Non-language-oriented students (total 25) |                        |
|-----------------------------------------------------|---------------------------------------|-------------------------|-------------------------------------------|------------------------|
|                                                     | Yes                                   | No or Yes/No            | Yes                                       | No or Yes/No           |
| 1.AI tool used                                      | ChatGPT<br>35                         | Others AI<br>tools<br>7 | ChatGpt<br>21                             | Other AI<br>tools<br>4 |
| 2. Previous experience with this tool               | 38                                    | 4                       | 25                                        | /                      |
| 3. Reliability of this AI tool                      | 17                                    | 25                      | 15                                        | 10                     |
| 4. Acceptance of the AI's corrections               | 33                                    | 9                       | 17                                        | 8                      |
| 5. Accessibility of the explanations provided by AI | 38                                    | 4                       | 23                                        | 2                      |
| 6. Mistakes students noted only thanks to AI        | 33                                    | 9                       | 11                                        | 14                     |
| 7. Acquisition of new rules thanks to AI            | 16                                    | 26                      | 11                                        | 14                     |
| 8. Additional explanations from AI                  | 8                                     | 34                      | 3                                         | 22                     |

In terms of acceptance of AI's corrections, the two groups were closely aligned: 78.6% of the LO and 68% of the NLO students accepted all AI suggestions, while the rest accepted them only partially, reflecting an attempt to strike the right balance between openness to AI support and critical judgment. Both groups also found the explanations provided by AI accessible and clear, i.e., 90.5% of the LO and 92% of the NLO students agreed that the explanations were helpful. When asked about recognizing mistakes with AI assistance, the LO students reported a higher degree of discovery: 78.6% acknowledged noticing mistakes they would not have identified independently, compared to 44% of the NLO students.

Perceptions of learning new grammar rules through AI intervention differed only slightly in both groups – 38.1% of the LO students and 44% of the NLO students felt they had acquired new rules thanks to AI. Finally, both groups reported very low levels of requesting additional explanations from AI tools. A striking 81% of the LO and an even larger 88% of the NLO students stated they did not ask AI for further clarification of grammar rules. Only a few students from both groups offered additional comments at the end of the questionnaire, stating that AI tools are very useful in the context of grammar, but that still caution should be exercised in their usage, as they are sometimes prone to mistakes.

Overall, the findings reveal both convergences and divergences between the two groups. In many respects, the LO and the NLO students behaved similarly, particularly in their choice of AI tools for grammar support, their previous experience with AI tools, then, their tendency to accept most AI-generated

corrections as well as their shared appreciation of the clarity of AI explanations. Also, both groups rarely asked AI for additional explanations, which may point either to satisfaction with the initial feedback or to underdeveloped strategies for engaging in deeper interaction with AI tools. As to the differences, the LO students appeared more critical and cautious, as reflected in their lower trust in AI reliability. Interestingly, at the same time, this same cohort of LO students reported a higher rate of noticing previously overlooked mistakes thanks to AI's assistance. This finding suggests that their stronger grammatical background may make them more attentive to nuanced feedback from AI tools. Taken together, these results indicate that while AI feedback benefits all learners, its perceived value and impact may vary depending on learners' prior linguistic training and confidence with grammar.

## Conclusion

The findings of this study confirmed that the LO students only slightly outperformed their NLO peers in independently identifying and correcting grammatical mistakes, thereby refuting H1. Furthermore, although in both groups improvement in accuracy was spotted when assisted by AI, still the improvement was much more substantial in the group of LO students. While this finding highlights the tool's value as a supportive aid in grammar learning, it validates H2 only partially, as the LO students, probably due to their slightly more acute focus on grammar learning, showed that they can use AI in grammar correction more persistently and strategically.

In response to the research questions, six recurring response patterns (RT1–RT6) were identified (RQ1), with RT1 (student correction approved by AI) being dominant, and RT2 (errors missed by both student and AI) being quite frequent in both groups. This indicates that both the LO and NLO students are capable of achieving a considerable degree of accuracy independently, which can then be improved as a result of consulting AI in both profiles of students. However, as already stated, more significantly in the LO group (RQ2), understandably, as they are by default language-oriented and that entails mastering L2 grammar, among other aspects of the foreign language. The experiment also reveals the existence of some blind spots in the grammar knowledge of both groups of students. Namely, while articles, prepositions, verb tenses, and perfect infinitive were the categories of mistakes most often overlooked or miscorrected (though specific error types varied slightly between groups), both groups did very well mainly with subject-verb agreement, some of the verb tenses and the use of collocations (RQ3).

Regarding AI usage (RQ4), students primarily employed widely available grammar-checking tools to support their work, with a clear predominance in that respect on the part of ChatGPT. Their attitudes toward AI's corrections and explanations were generally positive, with the majority of students from both groups unequivocally confirming that in their responses (RQ5). Finally, while AI

was largely accurate in confirming or correcting students' revisions, occasional mismatches were noted, which points to the tool's limitations and underscores the necessity of combining technological assistance with human oversight (RQ6).

Taken together, these results suggest that AI can serve as a powerful pedagogical partner for students across disciplines, enhancing their grammatical accuracy and awareness when thoughtfully integrated into the learning process. Consequently, further research is imperative to develop innovative pedagogical strategies that can fully harness AI's potential in supporting L2 grammar learning not just within the Macedonian higher educational context but on a global scale.

### **Declaration of Generative AI and AI-assisted technologies in the writing process**

During the preparation of this manuscript, ChatGPT (OpenAI) was used solely in the final stage of the writing process to review sentence structure and make minor linguistic refinements in order to improve clarity, coherence, and academic style. The prompts used included requests such as “*check and polish*”, “*refine academic style*”, and “*improve sentence structure*”. The AI tool was not used to generate the study's ideas, research design, data analysis, interpretation of findings, or conclusions. The authors accept full responsibility for the final content of the manuscript.

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Appendix 1

| A Traveler's Tale<br>(*For the convenience of readers, the grammar mistakes are marked in the text; however, this was not the case during the actual experiment)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Phase 1<br>(Find and correct the grammatical mistakes without using any resources)                                                                                                                                                                                                                                                                                                  | Phase 2<br>(Check your corrections by using AI tool/s)                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Last summer, I <b>have travelled</b> (M1) to several countries in Europe with my cousins. We visited France, Germany, and <b>Netherlands</b> (M2), and it was an unforgettable experience. <b>The weather</b> in all these countries <b>were</b> (M3) perfect most of the time, except a few rainy days in Berlin. In France, we went to the top of <b>Eiffel Tower</b> (M4) and took a lot of photos. The view from there was absolutely stunning. I have <b>never seen nothing</b> (M5) like it before. We also tried many delicious local dishes, including escargots and different types of cheese.</p> <p>Surprisingly, none of us <b>were got sick</b> (M6) from trying unfamiliar food. While in Germany, we stayed with a family friend who <b>is living</b> (M7) in Munich. He was very kind and showed us around the city. One day, he <b>take</b> (M8) us to Neuschwanstein Castle, which is said <b>to had inspired</b> (M9) Disney's castles. On the way back, we <b>would stop</b> (M10) at a small village to try traditional German pastries.</p> <p><b>Netherlands</b> (M11) was our final destination. We rented bikes and explored the <b>countrysides</b> (M12). I <b>didn't knew</b> (M13) that <b>Dutch</b> (M14) are so good <b>with</b> (M15) cycling! The canals in Amsterdam were <b>beautifully</b> (M16), and we even took a boat tour. Everyone in the group <b>were</b> (M17) impressed by how clean and organized <b>was the city</b> (M18). <b>If I would travel</b> (M19) again next summer, I'll probably choose to visit Spain or Portugal. I am already looking forward <b>to plan</b> (M20) the next adventure. My cousin said that she wants to go somewhere more exotic, like Morocco or Thailand, but I am not sure if we can afford it. <b>Traveling are</b> (M21) one of the best ways to learn about the world and meet new people. It allows you to step outside your comfort zone and experience different cultures. <b>I thinks</b> (M22) everyone should try to travel abroad at least once in their life. By the end of the trip, we had learned more than we expected — not only about other countries, but about <b>ourselves</b> (M23), too. I <b>would definitely recommended</b> (M24) this kind of experience to anyone who loves adventure, learning, and meeting <b>peoples</b> (M25) from different backgrounds.</p> | <p>Ex.1<br/>Mistake: have travelled<br/>Correction: travelled<br/>Explanation: tense</p> <p>Ex.2<br/>Mistake: Netherlands<br/>Correction: the Netherlands<br/>Explanation: the article <i>the</i> should be used</p> <p>Ex.3<br/>Mistake: an unforgettable experience<br/>Correction: unforgettable experience<br/>Explanation: the article <i>an</i> should not be used before</p> | <p>Ex.1<br/>AI's response: Correct</p> <p>Ex.2<br/>AI's response: Correct.</p> <p>Ex.3<br/>AI's response: Incorrect. The article should be used because experience is a countable noun.</p> |

## Appendix 2

| Titre du texte<br>Récit d'un voyageur                                                                                                                                                                                                                                                                                                                                                                                                                                   | Étape 1<br>(Identifiez et corrigez les erreurs grammaticales sans utiliser d'autres ressources)                                                                                 | Étape 2<br>(Vérifiez les erreurs que vous avez identifiées en utilisant des outils d'intelligence artificielle) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <p>L'été dernier, <b>j'avais voyagé (M1)</b> dans plusieurs pays d'Europe avec mes cousins. Nous avons visité la France, l'Allemagne et <b>Pays-Bas (M2)</b>, et c'était une expérience inoubliable. La météo dans tous ces pays <b>étaient (M3)</b> parfaite la plupart du temps, sauf quelques jours de pluie à Berlin.</p>                                                                                                                                           | <p>Exemple 1:<br/>Erreur: j'avais voyagé<br/>Correction: j'ai voyagé<br/>Explication: temps verbal incorrect</p>                                                                | <p>Correct</p>                                                                                                  |
| <p>En France, nous sommes montés en haut <b>de Tour Eiffel (M4)</b> et nous avons pris beaucoup de photos. La vue de là-haut était absolument magnifique. Je <b>n'ai pas jamais vu de (M5)</b> pareil avant. Nous avons aussi goûté de nombreux plats locaux délicieux, y compris des escargots et différents types de fromages. Étonnamment, personne <b>n'a été tombé (M6)</b> malade en essayant de la nourriture inconnue.</p>                                      | <p>Exemple 2: Erreur: Pays-Bas<br/>Correction: Les Pays-Bas</p>                                                                                                                 | <p>Correct</p>                                                                                                  |
| <p>Pendant notre séjour en Allemagne, nous avons logé chez un ami de la famille <b>qui est en train de vivre (M7)</b> à Munich. Il était très gentil et nous a montré la ville. Un jour, <b>il nous prend (M8)</b> au château de Neuschwanstein, <b>qui est dit d'avoir eu inspiré (M9)</b> les châteaux de Disney. Sur le chemin du retour, on <b>s'arrêterait (M10)</b> dans un petit village pour goûter aux pâtisseries allemandes.</p>                             | <p>Exemple 3: Erreur: beaucoup de photos<br/>Correction: <i>beaucoup des photos</i><br/>Explication: Il ne faut pas utiliser l'article <i>de</i> mais l'article <i>des</i>.</p> | <p>Incorrect. Il faut utiliser l'article <i>de</i> à cause de l'emploi de l'adverbe <i>beaucoup</i></p>         |
| <p><b>Pays-Bas (M11)</b> étaient notre dernière destination. Nous avons loué des vélos et exploré <b>les campagne. (M12)</b>. Je n'ai pas <b>sû (M13)</b> que <b>Néerlandais (M14)</b> sont si doués <b>avec (M15)</b> le vélo ! Les canaux d'Amsterdam étaient <b>magnifiquement (16)</b>, et nous avons même fait un tour en bateau. Tout le monde dans le groupe <b>étaient (M17)</b> impressionnés à quel point <b>était la ville propre (M18)</b> et organisé.</p> | <p>Explication: Il ne faut pas utiliser l'article <i>de</i> mais l'article <i>des</i>.</p>                                                                                      |                                                                                                                 |

| Titre du texte<br>Récit d'un voyageur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Étape 1<br>(Identifiez et corrigez les erreurs grammaticales sans utiliser d'autres ressources) | Étape 2<br>(Vérifiez les erreurs que vous avez identifiées en utilisant des outils d'intelligence artificielle) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <p>Si je <b>voyagerais</b> (M19) l'été prochain, je choisirais probablement de visiter l'Espagne ou le Portugal. Je me réjouis déjà à l'idée de <b>planifié</b> (M20) la prochaine aventure.</p> <p>Voyager <b>sont</b> (M21) une des meilleures façons d'apprendre sur le monde et de rencontrer de nouvelles personnes. Cela vous permet de sortir de votre zone de confort et d'expérimenter différentes cultures. Je <b>penses</b> (M22) que tout le monde devrait voyager à l'étranger au moins une fois dans leur vie.</p> <p>À la fin du voyage, nous avons appris plus que nous l'avions prévu — non seulement sur les autres pays, mais aussi sur <b>nous-même</b> (M23). Je <b>recommandais</b> (M24) certainement ce genre d'expérience à toute personne qui aime l'aventure, apprendre, et rencontrer <b>un peuple</b> (M25) de cultures différentes.</p> |                                                                                                 |                                                                                                                 |

Appendix 3

*Self-reflection questionnaire:*

1. Which AI tool/tools did you use for this assignment?
2. Why did you choose this AI tool/tools? Have you used it/them before?
3. Do you find this AI tool/tools reliable for grammar? Does it always give correct answers and explanations?
4. Did you accept all AI's corrections or just some of them in the text you analysed?
5. Did AI explain the grammar rules clearly for the corrections it proposed? If not, what was unclear?
6. Were there any mistakes in the text that you detected only because of AI's help?
7. Did you learn any new grammar rules because of this activity and the help of AI?
8. Did you ask AI for additional explanations about some of the mistakes detected in the text?

Other comments:

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