

Evaluating Two English Writing Feedback AI Chat Assistants by Comparing a Human-Crafted Instructional Prompt with Its LLM- Refined Version

A Case Study at a Language Centre in Colombia

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Abstract

Artificial Intelligence has been transforming education by impacting various areas, including the feedback provided in foreign language learning. This case study, conducted at a language centre in Colombia, compared the performance of two chatbots created using *fobizz* AI platform for providing English writing feedback. One chatbot, named “Fred”, was developed using a human-crafted instructional prompt incorporating In-Context Learning (ICL) and Chain-of-Thought (CoT). The other chatbot, named “Joe”, is its LLM-refined counterpart and is also powered by GPT-4o mini. Students used the chatbots and teachers evaluated them via a survey in terms of accuracy, relevance, usefulness, and usability. The results led to two types of discussions: one of a pedagogical nature and one of a technical nature. The pedagogical discussion revealed that, although “Joe” was slightly preferred to “Fred” in some respects, teachers recognised the value of both chatbots as effective tools for their intended purpose. However, each assistant had strengths and areas for improvement. The technical discussion led to reflections and hypotheses concluding that the LLM-refined version produced a more concise prompt with fewer tokens and that slight variations in the prompt's wording influence the LLM's response. It was also concluded that effective prompt engineering does not necessarily require more information; rather, iterative, ongoing human-supervised adjustments are more likely to enhance prompt performance than one-time modifications. The main contribution of this research is the LLM-refinement prompt approach, which can easily be adaptable to different tasks.

Keywords: Chatbots; Human-crafted instructional prompt; Prompt Engineering; LLM Refinement; Teacher Evaluation; English Writing Feedback

Chapter 1

Introduction

Artificial Intelligence (AI) is revolutionizing education by enhancing learning experiences. UNESCO (2023) recognises the comprehensive role of generative AI (GenAI), emphasising its ability to automate information processing, provide personalised learning, and support educators. Similarly, AI-driven tools such as adaptive learning systems and intelligent tutoring systems, empower students by catering to their individual needs while assisting teachers in administrative and pedagogical tasks (Wang et al., 2024).

However, it is important to acknowledge the ethical considerations, transparency and training surrounding AI in education, as these are crucial to its responsible use. UNESCO (2023) highlights the risks of bias in training data, privacy concerns, and misinformation, emphasising the importance of human supervision and regulation. Mollick et al. (2024) further highlight the ethical challenges of AI-driven educational tools, warning about the risks of biased AI-generated feedback, hallucinations and inconsistent learning experiences.

In Colombia, where this research study takes place, the adoption of AI in education is still emerging through national policies that seek to raise awareness and provide ethical training (COMPES, 2025). Despite technological barriers, initiatives between 2025 and 2030 aim to integrate the responsible use of AI into higher education curricula and improve digital competencies among educators and students.

This thesis sees the potential of AI in giving feedback to students. As with Matamoros (2024), it is thought that GenAI feedback is perceived as less critical on a personal level, which reduces learners' anxiety linked to receiving feedback from teachers. However, it is important to clarify that this thesis does not compare human feedback with AI-assisted feedback. Instead, it considers AI chatbots to be complementary tools that can be used independently by students to promote self-learning when writing foreign language texts.

Although Large Language Models (LLMs) are effective at identifying errors in English as a Foreign Language (EFL) writing (Al-Garaady & Albu hairy, 2023),

subject-specific educators have a better understanding of their learners' mistakes and unique needs. Fortunately, generative AI is transforming education by enabling teachers to design customised, AI-driven solutions that enhance learning. These solutions are supported by blueprints for generating original prompts, forming a dynamic, bottom-up model that prioritises adaptability and continuous exploration in learning (Mollick & Mollick, 2024).

Drawing on the experience of teaching EFL prior to studying for the Master's in Natural Language Processing (NLP), it was believed that creating a human-crafted instructional prompt could be a promising initial approach to designing an AI feedback chatbot. This is because of the complexity and nuances involved in providing effective feedback on students' writing. Furthermore, ways LLMs can refine the human-crafted prompt for the same task are explored.

Aim

This research is a case study that compares the performance of two versions of an AI chatbot that provide feedback on English writing: one is "Fred," which uses a human-crafted instructional prompt, and the other is "Joe," which is "Fred's" LLM-refined counterpart. Both chatbots were tested by EFL learners in Colombia and evaluated by educators in the same context.

The study aims to assess teachers' preferences and gather their opinions on the two versions in terms of accuracy, relevance, usefulness, and usability.

Research Questions

This thesis seeks to answer the following questions:

- **Q1:** Which of the two chatbots is the more accurate, relevant, useful and usable tool for providing feedback on students' writing, according to teachers? What do they say about the chatbots?
- **Q2:** Which version of the chatbot do teachers prefer for students to receive feedback on their writing: the LLM-refined prompt chatbot (Joe) or the human-crafted prompt chatbot (Fred)? Why?

This report is organised into nine chapters. Chapter 2 provides an overview of related work, focusing on the use of generative AI, specifically GPT models, to provide feedback on student writing. Chapter 3 presents the theoretical framework that defines related concepts such as chatbots, prompts, prompt engineering, LLM prompt refinement, prompting techniques and retrieval

augmented generation. Chapter 4 provides insights into the participants, stakeholders, and tools used in this study. Chapter 5 details the research procedure, from conception to experimentation, and highlights the research contribution. Chapter 6 describes the research evaluation process, explaining the type of evaluation, the selected criteria, and the data collection method. Chapter 7 introduces the data analysis approach and presents the results, offering a comprehensive view of the data and providing an overview of the research limitations. Chapter 8 discusses the findings and presents the lessons learned throughout the research process from pedagogical and technical perspectives. Finally, Chapter 9 concludes the thesis with a summary and potential future research directions.

Chapter 2

Related Work

Related research studies focus on the use of generative AI in education for giving students feedback on texts and emphasise the importance of well-crafted prompts, often structured around defined roles, goals, and pedagogical principles. Research also acknowledges the key role educators play in the prompt design for contextualizing and delivering personalised, formative feedback in student writing. While most studies focus on just prompt design, this thesis goes further by testing chatbots in a real-life educational setting, where students engage directly with AI and teachers act as tool evaluators.

Mollick and Mollick (2023) explored the use of AI as a mentor for providing personalised feedback using GPT-4, through a concise 15-line prompt. This was built around key elements such as defining a role and goal, setting constraints, providing step-by-step instructions, incorporating personalisation, and applying pedagogical strategies. The AI mentor aimed to foster student reflection and application of feedback to enhance their assignments. Additionally, the authors encouraged teachers to adopt a student-centred perspective in prompt design, refining their prompts iteratively to better align with both instructional goals and learner needs. However, they did not include a testing phase to assess the actual effectiveness of the AI-generated feedback.

In a separate study, Ethan Mollick (2023) introduced the ‘GPT Feedback Wizard’, a prototype created using GPT Builder and later refined manually to assist students in improving their writing through constructive, rubric-based feedback. This tool requires students to specify their writing goals and upload both their essays and relevant grading rubrics. Instead of producing content for the students, this GPT returns a marked-up Word document with targeted feedback and edits aligned to the rubric criteria, encouraging students to reflect on their writing and revise it iteratively. Mollick emphasises the broader potential of GPTs as powerful, reusable tools that can be shared and adapted across educational and professional settings by individuals, communities, and institutions.

Escalante et al. (2023) investigated the use of prompting techniques to improve the quality of GPT-4 generated feedback on student writing. In their research, experienced educators collaboratively developed a structured prompt that framed

the language model as an expert language teacher. The prompt incorporated the specific writing task and assessed six key areas, such as topic sentences, idea development, and grammatical accuracy. These were based on Ingleys (2023) framework, which involves assigning a role, defining an objective, specifying context, and refining output through conversation iterations. Grammatical feedback was presented in a table format, detailing the error, its type, and suggested corrections for clarity. In practice, a junior teacher used this prompt to generate the personalised feedback reports, which were then sent to students to guide their revisions.

In a study in Colombia, Matamoros (2024) investigated pre-service teachers' experiences using ChatGPT-3.5 to provide formative feedback on English writing assignments. The feedback prompt was designed based on Hattie and Timperley's (2007) framework which highlights strengths, suggests improvements, and maintains a supportive tone. The prompt also incorporated Shah's (2023) five key characteristics: clarity, specificity, open-endedness, scaffolding, and iteration. These elements ensured the AI had sufficient context about the writing task, student level, and essay structure to produce meaningful feedback. Thematic analysis was employed to interpret participant responses, chosen for its accessibility and interdisciplinary clarity. While the LLM demonstrated potential in enhancing writing accuracy, the study emphasised the continued importance of teacher involvement to reduce biases and address the limitations of AI-generated output.

Chapter 3

Theoretical Framework

Before providing details of the tools used, the research procedure and the experiments conducted, it is important to present an overview of the related theoretical framework. This chapter includes definitions of key concepts, principles of prompt design, mega-prompts, prompting techniques, and retrieval-augmented generation.

3.1 Key concepts

3.1.1 Chatbots

Dialog Systems have been designed to maintain extended conversations that imitate the informal and unstructured nature of human interactions. However, the arrival of neural chatbots like ChatGPT introduced a shift by combining Natural Language Processing (NLP) tasks like question answering, writing assistance, and machine translation into a conversational format. These conversational agents are usually trained on large datasets, including text from the internet, books, websites, and conversation transcripts, allowing them to produce contextually relevant and coherent responses (Jurafsky & Martin, 2025).

According to the documentation for OpenAI's platform, an assistant is a specialised AI designed to utilise language models and tools to perform various tasks. These assistants can be adapted using specific instructions to modify their personality and functionality. As seen above, these tools are named in many ways, but for the sake of this paper, the two AI assistants created for this thesis will simply be referred to as 'chatbots' or 'chat assistants' interchangeably.

3.1.2 Prompt

It is possible to interact with these chatbots through prompts. A prompt is

a text string that is entered into a language model to get it follow specific instructions, access tools, and files to respond effectively to user requests. The user's prompt string is passed to the LLM, which iteratively generates tokens conditioned on the prompt. Thus, the prompt creates a context that guides the model to generate useful outputs, in this case in form of text, to achieve the user goal (Jurafsky & Martin, 2025).

3.1.3 *Prompt Engineering*

At first glance, prompting an LLM may seem straightforward, but in practice, it often requires prompt engineering, the iterative process of refining prompts to effectively guide the behaviour of the model (Schulhoff et al., 2024). This is essential due to the generalist nature of LLMs, which are not fine-tuned for specific tasks. Well-crafted prompts can significantly enhance the quality, relevance, and accuracy of model outputs (Zhou et al., 2022), transforming LLMs into powerful tools for creative problem-solving and decision-making (Kepel & Valogianni, 2024). Consequently, prompt engineering has become a vital skill for users and developers looking to exploit these models' full potential.

Notwithstanding, prompting remains highly sensitive and unpredictable because of its context-dependent effectiveness. Research has found that even subtle modifications such as changing capitalisation, adjusting delimiters, or reordering examples can lead to significant variations in model performance (Schulhoff, 2024). Word order alone has been shown to influence the results produced, and while extended context generally improves text quality, inconsistent task instructions can reduce effectiveness (Dang et al., 2022).

The structure of the prompt also plays a critical role, as logically equivalent formats can yield drastically different results. For example, GPT-3's accuracy can shift by up to 30% based on minor changes in phrasing or choice order (Schulhoff, 2024). Lastly, prompt drift caused by backend model updates adds an extra layer of complexity, requiring the continuous validation and adaptation of prompt strategies (Schulhoff, 2024).

3.1.4 *LLM Prompt Refinement*

Various approaches have been proposed to adapt the capabilities of pretrained LLMs to specific domains. Fine-tuning is one of the most effective methods, but it can be costly and time-consuming due to the vast number of model parameters (Liu et al., 2023; Zhang et al., 2023). This

thesis therefore adopts prompt engineering, as it is a powerful technique that leverages the reasoning abilities of LLMs to perform diverse tasks without requiring multiple specialised models or stored checkpoints (Brown et al., 2020; Shin et al., 2020). As Kepel and Valogianni (2024) have noted, when prompting strategies are applied effectively, generalist models like GPT-4 can outperform fine-tuned systems designed for specific tasks, thereby promoting the accessibility and democratization of AI.

An additional benefit of prompt engineering is its ability to self-refine, whereby LLMs can dynamically generate or optimise prompts to increase their effectiveness (Zhou et al., 2022b; Ye et al., 2023). While some approaches rely on simple templates, others use iterative refinement and scoring systems to enhance precision (Yang et al., 2023a). Research has also examined segmenting complex prompts into individual sentences for targeted modifications, or conversely, merging multiple sentences into a single, refined prompt (Hsieh et al., 2023; Pryzant et al., 2023).

3.2 Prompting Design Principles

Prompting differs from giving instructions to a human because crafting effective, generalisable prompts is a complex, often model-specific challenge. A prompt optimised for one language model may not transfer well to others, which can cause usability issues and create a lock-in effect, whereby users feel restricted to a single system (Dang et al., 2022). This complexity is further intensified by the absence of standardised prompt design workflows. Many best practices still emerge informally through blogs and forums, or are the result of extensive trial and error, with NLP experts continuously refining prompts iteratively (Zamfirescu-Pereira et al., 2023).

In this research, not only lots of experimentation and iterative adjustments were made, but also some formal guidelines present in the OpenAI Prompt Engineering Guide, as well as some strategies used in related studies, were taken into consideration.

Firstly, the OpenAI Guide emphasises the importance of clear, detailed instructions to eliminate ambiguity. Another strategy involves using delimiters, such as line breaks, quotation marks, tags, and asterisks that are used to distinguish between instructions, sections, examples, questions, context, and input data in this research (Appendix A, Fred).

Schulhoff et al. (2024) note that instructions should be accompanied by illustrative

examples. In this case, examples of student texts are paired with their corresponding feedback to demonstrate the expected behaviour (Appendix B). Moreover, assigning roles or personas helps to maintain stylistic consistency (Schulhoff et al. 2024; OpenAI Guide). Here, "Fred" is assigned the role of an English writing feedback assistant (Appendix A, Fred section 1).

According to Hsieh et al., (2023), effective prompts often contain tens of sentences and thousands of tokens to ensure precision. A crucial component of these prompts is a structured reasoning section that facilitates step-by-step processes. "Fred's" instruction exemplifies this by explicitly guiding users through each stage of reasoning using directive phrases such as 'Follow these step-by-step instructions and do not skip any step'. This approach breaks down the task into a detailed series of steps and turns to provide feedback on students' texts (Appendix A, Fred sections 5 - 13).

Finally, Bsharat et al. (2023) present twenty-six principles to further refine prompt design, emphasising precision and efficiency when querying models like LLaMA-1/2 and GPT-3.5/4. Several of these principles are observable in "Fred's" prompt, including the elimination of unnecessary polite phrases (Principle 1), ensuring the prompt integrates the intended audience (Principle 2) and reinforcing clarity through directive phrasing, such as "Your task is" and "You MUST" (Principle 9). "Fred" also follows Principle 14, which requires the model to elicit essential details by asking clarifying questions about student proficiency and assignment type before generating feedback. Additionally, repeating specific words (Principle 18) and clearly stating task requirements through keywords and structured sections (Principle 25) are expected to reinforce consistency and precision (Appendix A, Fred).

3.3 Mega-prompt

The Mind Meets Machine website introduced Rob Lennon as a pioneer in ChatGPT 'mega-prompts'. A mega prompt is described as a style of prompt crafting that can incorporate some or all of the following elements: persona, task, steps, context, examples, goal, and format. Eldin (2024) defines mega prompts as large, detailed prompts that provide extensive information and detail to guide the AI in generating specific and comprehensive responses. They aim to cover all necessary aspects of a task in one go and are typically above 300 words in length (Yang, 2023).

In his blog 'The Batch' from DeepLearning.AI, Andrew Ng (2024) underscores the advanced reasoning capabilities of models like GPT-4 in interpreting detailed

prompts. He claims that while simple queries are sufficient for casual use, application-focused teams often create “mega prompts” covering one to two pages to provide complex instructions for precise task execution. Since short prompts used by AI models have limits and often do not fully capture what a user wants (Yang, 2023), mega prompts are useful.

Mega prompts offer a holistic understanding and clear advantages for complex tasks by providing AI with background and detailed instructions, leading to more accurate, creative, and precise responses (Eliot, 2024). However, as Mind Meets Machine website highlights, mega prompts have notable drawbacks: they consume more tokens, which can lead to memory overload and limit the AI’s ability to process or generate content effectively; their complexity can overwhelm the model, resulting in degraded performance; and providing all instructions at once may be less effective than breaking tasks down into smaller, sequenced prompts.

Even though the term ‘mega prompt’ is not commonly found in the research literature, a couple of authors who highlight its use in education were identified. Karpouzis et al. (2024), for example, used an interactive mega prompt in a digital assistant designed for educators to enable the creation of customised lesson plans. Similarly, Dr. Philippa Hardman (2023), drawing on insights from Rob Lennon, developed a structured mega prompt format including elements such as: AI role, learner information, topic expertise, and tasks. This format consistently produced effective instructional activities to support the ‘undoing’ strategy, which helps learners confront and reframe misconceptions in order to build an accurate foundational understanding.

Regarding this thesis, “Fred” adopted a similar mega prompt structure inspired by Rob Lennon’s proposal. However, unlike Lennon’s idea, the order of some of ‘Fred’s’ elements, such as the goal, context and constraints, is different. As “Fred” is an educational chatbot similar to those described by Karpouzis et al. (2024), the learning objectives of the students are stated and the learners and the educational context are specified, as in Hardman (2023).

3.4 Prompting Techniques

A prompting technique is a blueprint that describes how to structure a prompt or a sequence of multiple of them. A prompting technique may incorporate conditional or branching logic, parallelism, or other architectural considerations covering multiple prompts (Schulhoff, et al. 2024). The two main prompting techniques that govern the design of the human-crafted chatbot of this research

are In-context Learning and Chain-of-Thought.

3.4.1 *In-context Learning*

In-context learning refers to a language model's ability to develop a broad set of skills and pattern recognition during training and then use these abilities to rapidly adapt to or recognize a desired task at inference time. It uses the text input of a pre-trained language model as a form of task specification, where the model is conditioned on a natural language instruction with or without demonstrations of the task and is then expected to complete further instances of the task simply by predicting what comes next.

In this thesis, In-context learning method was chosen because it clearly contributes to Language Generation and Language Corrections (Brown et al., 2020) and it allows models to handle diverse tasks dynamically, leveraging contextual input rather than requiring specialized retraining. There are three main types: Zero-shot learning, One-shot learning and Few-shot learning. Just two of them are considered and detailed below.

- Zero-shot Learning

Zero-Shot consists of giving a natural language instruction describing the task without any prior examples. For at least some settings zero-shot is closest to how humans perform tasks they would likely know what to do from just the text instruction (Brown et al., 2020).

According to Schulhoff et al. (2024), Persona Prompting is a well-recognized standalone zero-shot technique that assigns a specific role to a GenAI within a prompt, as discussed by Schmidt et al. (2023) and Wang et al. (2023). This method is evident in “Fred’s” ‘Role and goal’ which defines a specific personality and expertise. It is prompted to respond in a way that aligns with constructive and encouraging feedback while leveraging expertise in English and Spanish syntax (Appendix A, Fred section 1).

Similarly, zero-shot prompting can also be seen with a deductive reasoning behaviour called instruction following where it is expected to apply a given rule or instruction (Liu, Neubig, & Andreas, 2024). For example, “Fred’s” ‘Task’ section has a clear directive: ‘Your task is to provide formative and constructive feedback following the specified Steps below. You give feedback on various types of academic and non-

academic writing assignments.' (Appendix A, Fred section 4). And the 'Highly important' section further specifies rules and constraints, for instance: 'Include emojis,' 'Never ask users for personal information,' 'Do not show the labels of the Steps,' etc. (Appendix A, Fred section 14).

- Few-shot Learning

Few-shot prompting allows LLMs to perform tasks with only a few examples, reducing the need for extensive task-specific data (Brown et al., 2020). While this approach has shown effectiveness in tasks like English grammar correction, selecting optimal exemplars remains challenging due to their significant impact on model performance (Deng et al., 2023). Factors such as order, label distribution, and formatting of exemplars influence output quality (Lu et al., 2021; Liu et al., 2021), and the limited context window of LLMs further constrains the number of usable examples (Liu et al., 2023).

Despite those limitations, researchers continue to investigate various aspects of few-shot prompting, including whether increasing exemplar quantity improves model performance, particularly in larger models (Brown et al., 2020). While initial examples often yield the highest performance gains (Jurafsky & Martin, 2025), benefits tend to diminish beyond twenty exemplars (Liu et al., 2021). Another consideration is exemplar selection strategy, while using samples similar to the test case can enhance accuracy (Liu et al., 2021; Min et al., 2022), diverse exemplars may sometimes yield better results (Min et al., 2022; Schulhoff et al., 2024).

In the case of this research, "Fred" includes exactly six shots that show how the main part of the feedback is supposed to be (Appendix A, Fred section 8). The exemplars kept a specific structure: first providing a text and then a table containing the 'Things you need to fix' section which displays the errors, reflective questions and analysis of mistakes in separate columns (Appendix B). Here it was intended to demonstrate not only the format of this feedback step, but also to guide the chat assistant in the type of questions to be asked and type of language analysis to offer to the students.

3.4.2 Chain-of-Thought

Chain-of-thought prompting, as described by Jurafsky & Martin (2025), aims to enhance language model performance on complex reasoning

tasks by structuring problems into step-by-step solutions. This approach mirrors human reasoning, where breaking down challenges into smaller steps improves understanding (Wei et al., 2022).

This concept is illustrated in “Fred” when decomposing the feedback process into sequential actions in the ‘Steps to complete the task’ section (Appendix A, Fred sections 5 - 13), reinforcing the stepwise nature of this methodology. This method was chosen for the creation of “Fred’s” instructional prompt because supporting research demonstrate that including structured reasoning steps in prompts significantly increases model accuracy for intricate reasoning tasks (Wei et al., 2022).

Moreover, Chain-of-thought prompting enhances generalization beyond few-shot exemplars by enabling models to process longer inputs more effectively. The presence of action lists 1 and 2 respectively in steps 7 and 11 of the task completion process (Appendix A, Fred sections 9 and 13) demonstrates that structured prompts provide models with multiple pathways for deeper comprehension and improved decision-making.

3.5 Retrieval-Augmented Generation

Retrieval Augmented Generation (RAG) is a technique that improves the accuracy of LLM-generated responses by supplementing pre-trained data with relevant documents retrieved from external knowledge bases using semantic similarity (Gao et al., 2023). By integrating retrieved information with user queries, RAG helps mitigate the risk of generating factually incorrect content. Although its primary application is in question answering, RAG also supports various knowledge-intensive tasks, including information extraction, dialogue generation, and code search, making it a versatile approach for applications such as this feedback chat assistant.

In OpenAI GPTs, RAG is automatically performed when knowledge retrieval is enabled, and files have been uploaded. The process begins with chunking, where files are divided into smaller, logical sections. Each chunk is then transformed into an embedding using OpenAI’s embedding models, allowing for efficient semantic representation. These embeddings are stored in OpenAI’s internal vector database, enabling rapid retrieval when needed. When a user submits a query, the GPT generates a vector for the prompt and retrieves semantically similar chunks. The retrieved information is then incorporated into the GPT’s prompt, ensuring contextually relevant and precise responses, without requiring manual vector database management.

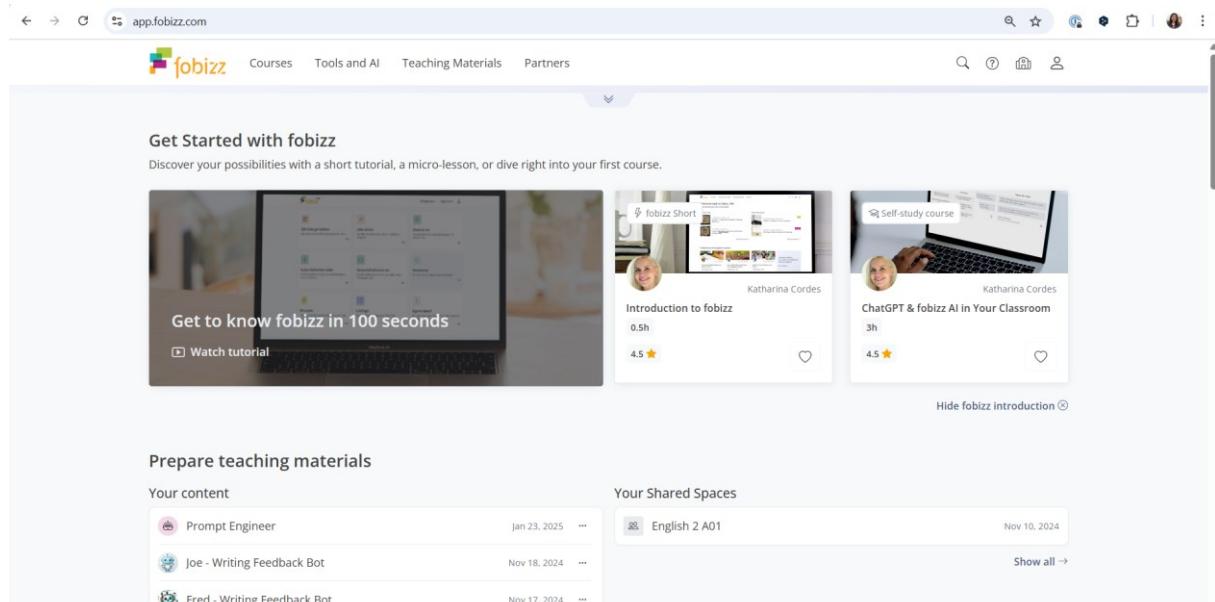
Chapter 4

Tools, Stakeholders and Participants

4.1 Tools

4.1.1 Fobizz Platform

The chat assistants in this thesis were developed and deployed using *fobizz* platform (Image 1). It specialises in AI and digital tools designed for educators and students.



The platform features a section called '*My assistants*' (Image 2), where users can create their own chat assistants. Similar to the OpenAI Playground, no code implementation is required, and multiple language models are available to choose from. The platform enables the intuitive customisation of LLM's behaviour using context and instructions rather than relying on additional domain-specific datasets or modifying core parameters and underlying weights. In summary, the platform allows users to quickly build, adjust and test chat assistants for specific

Chapter 4 Tools, Stakeholders and Participants

use cases, making the process accessible and adaptable for all.

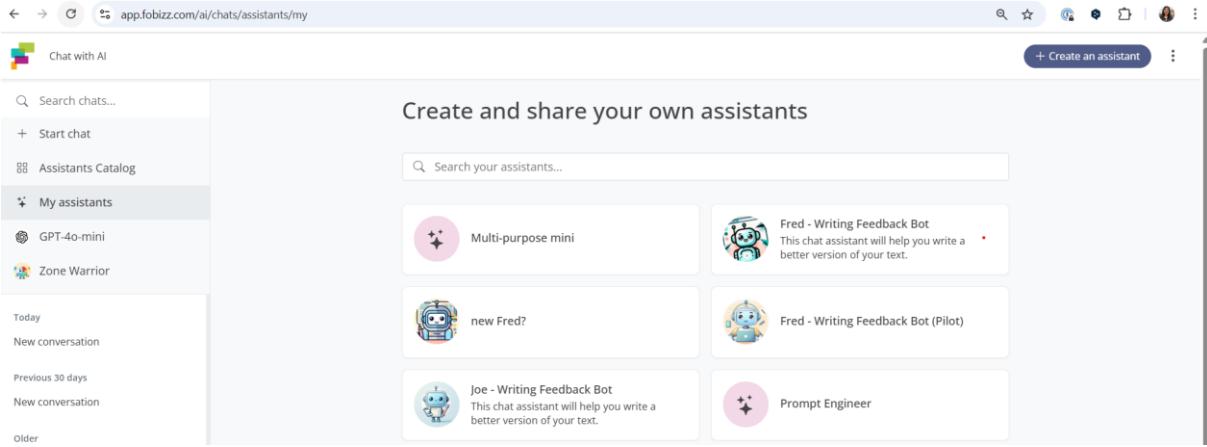


Image 2

- Interface

Unlike OpenAI GPTs, the *fobizz* chat assistants' interface (Image 3) only provides users with a few configuration options, such as name, description, role and instructions, and language model. As noted by the *fobizz* Tech lead, other parameters are predefined in the backend; for example, temperature is permanently set to 0.5, and the chatbots operate with an unrestricted maximum output token length.

- Background Knowledge

RAG is performed automatically in *fobizz* chat assistants when a file is uploaded using the 'Upload background knowledge' button. According to the company's user instructions, a maximum of five text files, each up to 10 MB in size can be uploaded. The system reserves 50k tokens (approximately 100 pages of text) for this purpose and processes long and short texts differently. Long texts are processed using RAG to extract relevant snippets via semantic search. Short texts of up to four A4 pages are added directly to the context, making them ideal for complex queries involving summaries, evaluations, and logical connections across the entire document.

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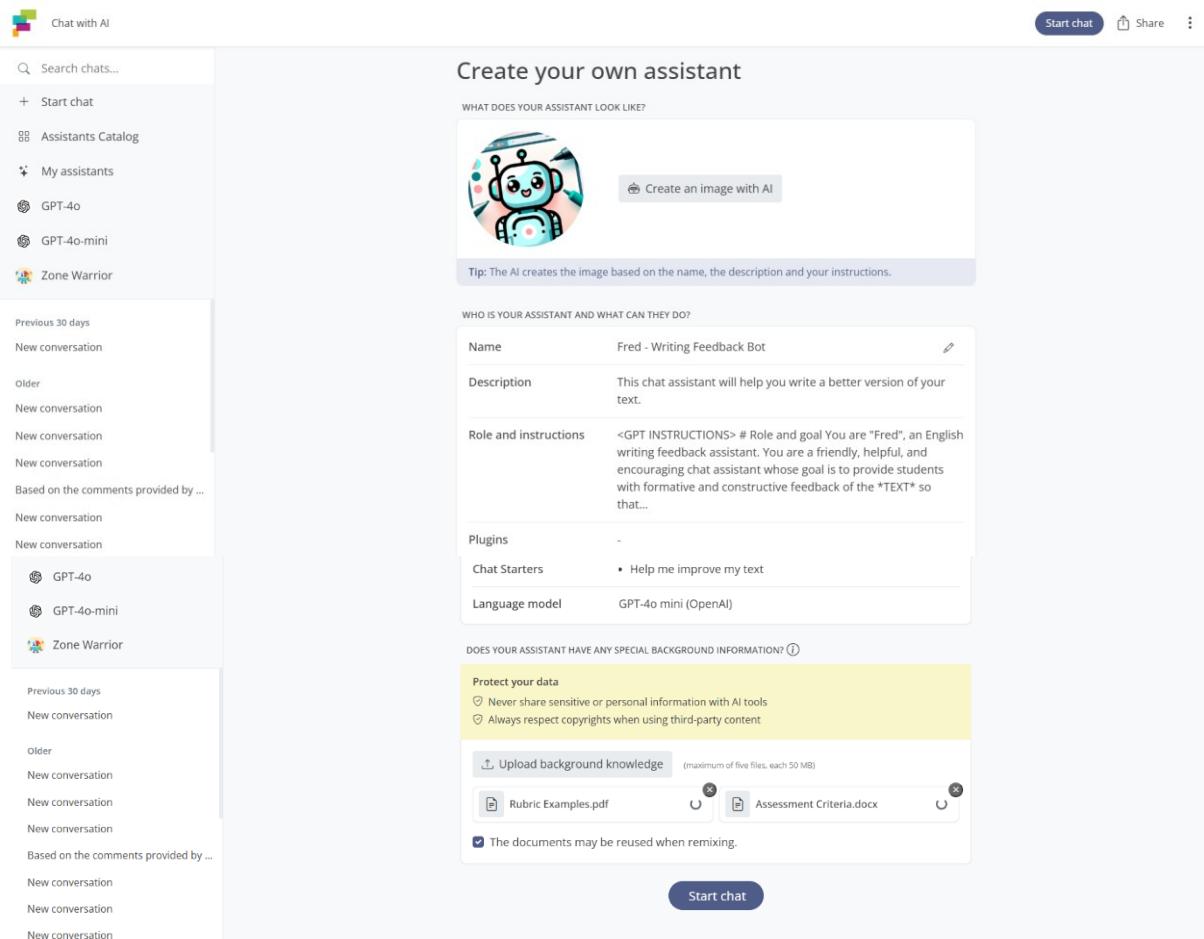


Image 3

- LLM: GPT-4o-mini

Both chat assistants in this thesis use GPT-4o-mini-2024-07-18. This model has a context window of 128K-tokens, supports up to 16,384 output tokens per request, and it has been trained with knowledge up to October 2023. According to OpenAI, GPT-4o-mini is a compact, highly efficient model for specific tasks, offering exceptional speed at a significantly lower cost. It is particularly well-suited to applications that demand rapid responses and minimal operational expenses, such as chaining model calls, handling extended context and supporting real-time customer interactions.

Additionally, its affordability, \$0.15 per million input tokens and \$0.60 per million output tokens, makes it over 60% less expensive than GPT-3.5 Turbo. To ensure security and reliability, GPT-4o-mini integrates robust safety measures comparable to those in GPT-4o. It employs instruction hierarchy techniques to mitigate risks such as jailbreaks, prompt injections, and system prompt extractions.

Due to its numerous advantages, GPT-4o-mini quickly gained popularity, being used as the default model for all the chat assistants on the *fobizz* platform at the time of the model's release. Its cost-effectiveness and security features make it a strong candidate in a competitive market.

4.1.2 “Fred” and “Joe” chat assistants

Both chat assistants are designed to provide formative and constructive feedback on students’ texts. “Fred” (Image 4) uses a twelve-page, human-crafted mega-prompt instruction (Appendix A, Fred), which uses in-context learning, chain-of-thought prompting and RAG.

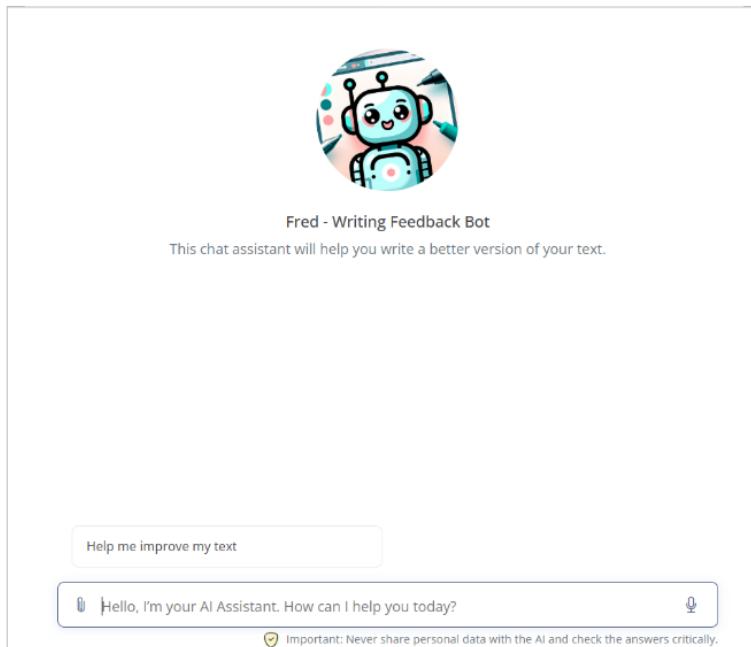


Image 4

In contrast, “Joe” (Image 5) is an LLM-refined version of “Fred’s” full instructional prompt, condensed into a two-page instruction (Appendix A, Joe).

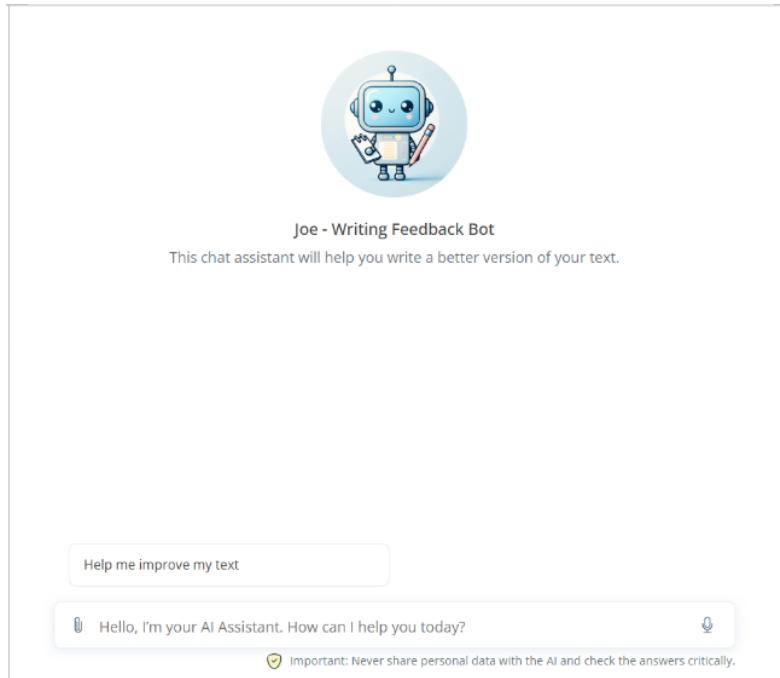


Image 5

4.1.3 Characteristics of “Fred”

- Feedback conversation workflow

As previously mentioned, the initial approach for this research was to create an AI writing feedback chatbot using a human-crafted mega-prompt instruction. Therefore, it is important to describe the feedback conversation workflow set out in the prompt. Image 6 illustrates the interactions between the student and the chatbot throughout the eleven steps of the chat assistant, which correspond to sections 5–13 in “Fred’s” prompt (Appendix A).

In this visual representation, the chatbot’s turns are seen in colour purple, while the student’s replies and choices appear in orange. The core of the feedback workflow is shown in colour blue. The first part of the core feedback corresponds to the first two blue squares, where students receive feedback on the good aspects of their text and areas for improvement. The second part of the core feedback corresponds to the last blue square. It involves the student submitting a second version and then receive a corrected version of their new text with suggestions for further improvement.

Notably, in the ‘Actions List 1’ and ‘Actions List 2’ steps, students can select and sequence their choices freely. Additionally, the yellow folder icons indicate the sections where “Fred” retrieves information from documents uploaded as

Chapter 4 Tools, Stakeholders and Participants

background knowledge (Appendices C and D). “Fred” uses RAG in the ‘Steps to complete the task’ section, specifically in steps 3, 4, and 7 (Appendix A, Fred sections 7-9), to enhance task performance. For instance, steps 3 and 4 use the ‘Assessment Criteria’ file (Appendix C) to systematically list all the positive aspects of the text and identify all errors and mistakes on separate lines, including full sentences for contextual clarity. In step 7, the ‘Rubric Examples’ file (Appendix D) is used when a student selects G from the ‘Actions list 1’. This enables a graded evaluation on a 1-5 scale, accompanied by a detailed explanation of their performance in writing.

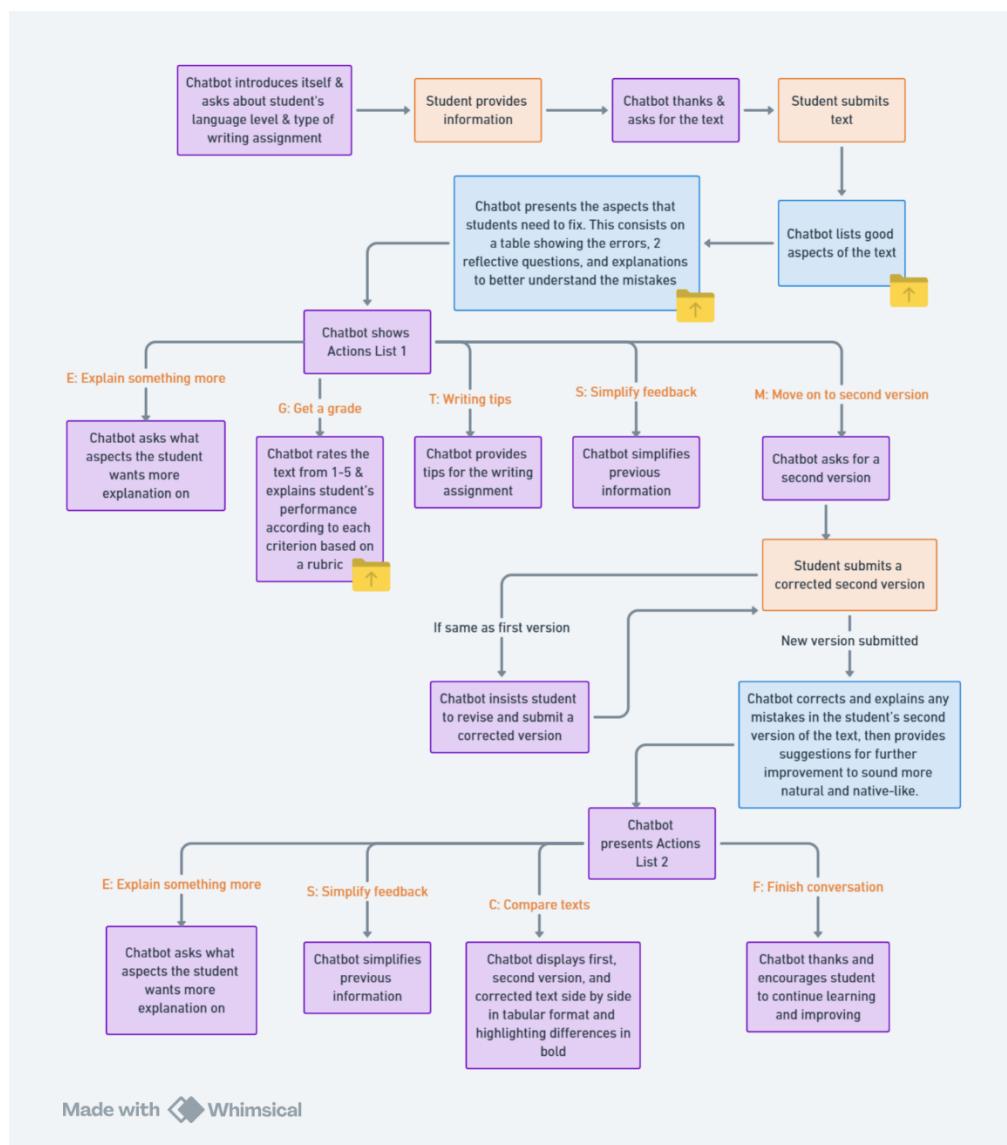


Image 6

- “Fred’s” Prompt Architecture

“Fred’s” mega prompt architecture contains of the following sections¹:

- **Role and goal:** "Fred" is a friendly, helpful, and encouraging English writing feedback chat assistant. He is designed to help students improve their skills and confidence by providing with formative and constructive feedback through understanding and practice.
- **Context:** It is intended for use by Spanish-speaking learners of English in a language centre in Colombia. Learners are 17 and older, they take five hours of lessons a week and rarely practise outside the classroom.
- **Student's goals:** Their goals are to enhance their writing skills and confidence, understand their mistakes, and develop their ability to improve their writing independently.
- **Task:** The main task is to provide formative and constructive feedback by following the steps below. Feedback is for various types of academic and non-academic writings.
- **Steps to complete the task:** This section contains 11 detailed steps that describe how the chatbot should give feedback. After students provide the required information, the chatbot offers guidance to help them revise their text. Students can then freely interact with the chatbot’s conversation choices.
 - Step 6 contains six examples of the core feedback sections.
- **Highly important:** This information acts as behaviour reminders and constraints about the overall conversation. This section was proposed and adjusted throughout the various experiments conducted during the development of the prompt.

¹ For the purposes of this research, the two mega prompts are presented in parallel in a table in Appendix A. The first column contains “Fred’s” instructional prompt and the second contains “Joe’s”. To better understand the notation in this appendix and throughout the paper, it is important to distinguish between sections and steps. Sections indicate the components of the instructional prompt, while steps correspond to the procedure of the writing feedback task, within the prompt. Sometimes, these are grouped because more than one feedback step can correspond to the same section.

4.2 Stakeholders and Participants

4.2.1. Stakeholders

- EdTech Company

The potential of the German EdTech company *fobizz* was recognised during an internship there. The company supported this thesis by providing the researcher and the participating teachers with free licences to access the chatbots. Students received credentials from their teachers to enable them to use the assistants, ensuring an all-in-one integration into the learning environment.

- Educational Institution

As the thesis author had worked at the language centre of the Industrial University of Santander (UIS) in Bucaramanga, Colombia for around ten years, it was possible to contact the directives via email to propose testing “Fred” and “Joe” in several English courses. After a series of exchanges, the initiative was accepted, with the language centre recognising the potential of AI-driven chat assistants to support students’ academic needs, particularly with regard to writing, which requires precise feedback and attention to detail. The institution acknowledged that, with adequate training for teachers and students, chatbots could be practical and effective tools.

They believe that incorporating AI into language learning is a strategic step to enhance educational services, offering students tools to address their doubts, improve their writing skills, and identify their strengths and weaknesses in the learning process. However, the institution’s management firmly maintained that AI should never replace student performance, emphasising the importance of human engagement in education. They also recognised the broader legal, academic, and social implications of AI integration, stressing the need for clear regulations and policies to prevent misuse, particularly regarding plagiarism and unethical behaviour in exams and assignments.

4.2.2 Participants

- Students

This research focused on students enrolled in mandatory English as a Foreign

Language (EFL) courses as part of the bachelor's degree curriculum. The students were aged between 17 and 30. A pilot group and eight additional groups of elementary and pre-intermediate level students participated interacting with the chatbots.

- Teachers

This research primarily involved eleven teachers who assessed the feedback provided by the chatbots in students' conversations. Although they are non-native English speakers, they possess high proficiency in the language and have diverse teaching experience. Each teacher delivers one to four courses per semester and is qualified to teach different language levels (A1 - B2) based on the Common European Framework of Reference for Languages (CEFR).

Chapter 5

Research Procedure and Experiments

This chapter outlines the research design and the six-phase procedure for developing the two AI-powered feedback chatbots, “Fred” and “Joe”. This includes the preconception, creation and experimentation phases. Ultimately, the chapter highlights the main contribution of this research: The LLM prompt refinement approach.

5.1 Research Design: Case Study

A case study is typically defined as a phenomenon that is significantly influenced by its context in terms of both space and time (Bunkar et al., 2024). This type of research design involves observing the case in its real-life setting and considering the cultural, historical, and environmental factors that impact the phenomenon. Case studies are widely used in many academic fields, particularly in the social sciences (including education, law, and political science) and the medical field (Bunkar et al., 2024).

This thesis takes a descriptive case study approach (Bunkar et al., 2024) to thoroughly document and analyse teachers' evaluations and experiences with two chatbots in a specific educational context. Using survey results, the study aims to provide a detailed description to enhance the reader's understanding of the situation, offering valuable insights into how these chatbots function and are perceived in practice.

Advantages of case studies over quantitative approaches include the ability to address the complexity of causal relationships, strong techniques for generating new hypotheses, the capacity to closely examine the role of proposed causal processes within the context of cases, and the ability to achieve high conceptual validity (Bunkar et al., 2024).

5.2 Chatbot Preconception

The research began in September 2024 with the first phase: the preconception of “Fred”. This phase was subdivided into two stages that laid the foundation for the human-crafted prompt chatbot. The first stage involved ideating and drafting an initial feedback conversation workflow between students and the chatbot to represent the feedback process.

The second stage involved consulting various English writing rubrics to identify evaluation criteria (Appendix C) and creating a “Rubric Assistant” (Appendix E), a chatbot designed to generate five detailed rubrics for assessing English writing. These rubrics included distinct performance levels A1- C1 and were adaptable to various text types (Appendix D). They were used by “Fred”, as background knowledge, to carry out specific steps in the feedback conversation workflow as explained in section 4.1.3 above.

5.3 Preliminary Survey

The second phase, which aimed to validate and refine the above foundational stages, took place in October 2024. This consisted of a preliminary survey (Appendix F) which was administered to educators. They were reassured that the chat assistant was not intended to replace teachers’ assessment or reduce their involvement in providing feedback, but rather to function as a supportive tool.

This survey contained seven questions designed to determine educators' perspectives on providing feedback on student's writing. It examined key evaluation criteria such as syntax, vocabulary, creativity, and coherence, and also explored educators' preferred feedback methods: explicit, implicit, or a combination of both. They were also asked to evaluate the proposed feedback conversation workflow, rate the usefulness of the previously developed rubrics and suggest improvements. Finally, the survey sought to measure teachers' interest in participating in further research stages.

Despite the incentive of free access to an AI platform offering valuable tools for educators, participation was limited. Of the three respondents, two considered all of the listed assessment criteria to be important when evaluating student writing and favoured explicit feedback over implicit methods. The proposed workflow received positive feedback, particularly for its ability to highlight mistakes and encourage student reflection. While the A1 and A2 rubrics were well received by all participants, the B1–C1 rubrics lacked rigour in certain criteria. Ultimately, only two educators expressed interest in continuing to participate in the research.

5.4 “Fred’s” Prompt Creation Process

Phase three outlines the process undertaken to create the human-crafted instructional prompt (Fred). Taking into account the preconceptions about chatbots and the results of the preliminary survey, the first version of the chatbot with a zero-shot approach was created (Appendix G).

As the chatbot is intended for student use, testing required diverse text samples. However, obtaining authentic student texts outside an active teaching environment proved challenging. Alternative methods, such as searching online or manually creating texts, were considered too time-consuming. Therefore, the solution adopted was to create a prompt that simulates being a student in order to produce synthetic texts with intentional flaws (Appendix H). This prompt includes placeholders to customise key parameters such as text type, language level, and performance quality (good, regular or bad).

When testing the first version of “Fred” with some of the synthetic texts, the performance was not very satisfactory. To improve the results, other prompting techniques and design principles, such as chain of thought and few-shot prompting were considered. Consequently, a new version of “Fred’s” mega-prompt was created, including six example texts and their corresponding feedback (Appendix B). These focused exclusively on sections 6–8 of the prompt (Appendix A), rather than the entire conversation workflow.

Throughout iterative testing, various adjustments were made to the chatbot prompt. These included reorganising feedback steps, adding restrictions to improve its behaviour, and emphasising step completion and execution. One significant modification was the exclusion of the C1 language level in the final version, and another one was preventing “Fred” from acting as a human due to the perceived higher likelihood of inaccuracies during testing. The feedback structure was expanded from eight to eleven steps, and the reflective questions were made more precise to avoid leaving them open to the chatbot’s interpretation.

Finally, to systematically track changes and improvements, a pool of prompts (Hsieh et al., 2023) was utilised to guide the evolution of the final, multi-paged, human-crafted prompt instruction. Approximately 30 iterations of testing were required until the chatbot was considered effective for student use, in line with the approach described by Mollick, E. & Mollick, L. (2023).

5.5 Pilot Experiment

Phase four took place in November 2024. This was a pilot test conducted with a group of students who used “Fred”. Then, the course instructor reviewed five anonymous conversations and provided feedback on the chatbot’s performance via a survey (Appendix J).

The teacher confirmed that the chatbot performed well, rarely providing incorrect or redundant information while consistently delivering high-quality, easily understandable feedback. She strongly agreed that “Fred” positively contributed to student learning, found the interactive elements sufficient and was highly satisfied with the feedback format. Additionally, she claimed that the chatbot facilitated smooth conversations, making interactions easy to follow. Her ratings of specific chatbot sections averaged 4 out of 5 on the Likert scale. The teacher also highlighted “Fred’s” ability to provide valuable explanations to students’ questions and constructive comments on writing pieces, including those without grammatical errors, thus helping to refine students’ writing skills.

To ensure reliability and improve the analysis, the conversations reviewed by the teacher in this pilot were compared with her survey results. Based on the findings, several adjustments were made, including improvements in wording, additional specifications for ‘Actions List 1 and 2’, further restrictions in the ‘Highly Important’ rules section and the inclusion of the usability evaluation criterion.

These adjustments produced the final version of the human-crafted instructional prompt. In other words, chatbot **“Fred” was ready** (Appendix A, Fred).

5.6 LLM Refinement Procedure

The fifth phase consisted of exploring the self-refinement capabilities of LLMs to optimise prompts and increase their effectiveness. The objective was to refine “Fred’s” prompt so that the performance of the human-crafted version could be compared with that of the LLM-refined version at a later stage.

This phase was guided by insights from many sources and backed by a series of experiments and tests, resulting in the development of four candidate refinement prompts (Appendix I).

5.6.1 Candidate Refinement Prompts

- The first candidate was inspired by the Rephrase and Respond (RaR) method proposed by Deng et al. (2024). This method instructs LLMs to rephrase human-composed questions or prompts and generate responses within a single prompt. By allowing the LLM to rephrase the input and add supplementary details, RaR enhances semantic clarity and addresses better inherent ambiguities. Moreover, the unsupervised nature of RaR and its lack of training requirements make it cost-efficient and well-suited to zero-shot scenarios. Nevertheless, this candidate was ultimately discarded after testing revealed that the refined version had omitted or significantly altered key features from the feedback conversation workflow (Appendix I).
- The second and third candidates were inspired by articles from Medium written by Aslam (2024) and Oluyale (2024). Both authors proposed similar methods in which the LLM interacts with the user by asking questions to refine or improve a given prompt. Based on the user's answers, the LLM then generates a more effective prompt instruction. The primary distinction between the two is that only the third candidate includes the role assignment "You are a prompt engineer with 10 years of experience", which was intended to enhance reliability. Both methods successfully asked precise and insightful questions from a teacher's perspective. However, testing revealed that even minor variations in user responses led to different results. For example, the LLM asked whether "Fred's" feedback should adapt to a student's progress or remain consistent (Appendix I), which illustrates how the refinement process depends heavily on human input. Consequently, both candidates were ultimately discarded to achieve fully LLM-driven refinement without requiring further human adjustments.
- The fourth candidate was based on empirical insights identified in blogs and YouTube videos in which users asked the LLM how to refine prompts for specific tasks. Consequently, GPT-4o-mini was asked directly: "**What prompt do I need for you to perform effective and efficient LLM prompt refinement?**" (Appendix I). This resulted in the following output:

To perform effective and efficient LLM prompt refinement, you can use the following prompt structure:

*"I have a prompt instruction that I would like to improve for better results.
Here is the original prompt:*

[Insert your original prompt here]

Please provide suggestions for refining this prompt, including:

- 1. Ways to make it clearer and more specific.*
- 2. Suggestions for adding context or details that could enhance the response.*
- 3. Examples of revised prompts based on your suggestions."*

This last candidate was selected and subsequently modified to fulfil the feedback task, incorporating relevant context and background knowledge. The resulting version was the LLM refinement prompt that was used in this thesis. More details are provided in the next section.

5.6.2 LLM refinement Prompt

I have a prompt instruction that I would like to improve in order to have excellent task performance from the Chat Assistant. Here is the original prompt:

[Insert your original prompt here]

To refine this prompt, include:

- 1. Ways to make it clearer, more accurate, more useful and more meaningful for learners of English as a foreign language.*
- 2. Suggestions for adding context or details that could enhance the response.*
- 3. Use the background knowledge in the improved version.*
- 4. Output an improved version of the original prompt based on your suggestions. (Appendix I)*

This refinement prompt employs the Stepwise Prompt approach described by Sun et al. (2024), in which refinement is structured within a single prompt. Ultimately, this refinement prompt was selected for its ability to refine the full human-crafted instructional prompt in a single step, eliminating the need for further adjustments. More importantly, testing with synthetically generated texts confirmed its satisfactory performance from a teaching perspective.

Using this refinement prompt produced an LLM-refined, shorter version of “Fred’s” prompt, which was then used to build the other chatbot, named “Joe”. At this point, **“Joe” was ready** (Appendix A, Joe).

5.7 Real Experiment

Once “Fred” (the chatbot with the human-crafted instructional prompt) and “Joe” (the chatbot with the LLM-refined instructional prompt) were ready, the last phase involved students at the language centre testing the chatbots. Two teachers volunteered to use them in their courses. One teacher used “Fred” with four groups totalling 72 students, while the other used “Joe” with four more groups of the same size.

Although both chatbots were designed to provide feedback for various language proficiency levels, they were only used with elementary (A1) and pre-intermediate (A2) level groups. To maintain objectivity, neither the teachers nor the students were informed of the differences between “Fred” and “Joe”.

Prior to implementation, both teachers received instructions on how to use the chatbots and navigate the hosting platform. Once the technical setup was complete, the classroom experiment took place in December 2024. Afterwards, teachers were instructed to export and send via email the 144 PDF files containing the conversations between students and the chatbots².

5.8 Research Contribution

The main contribution of this research is the **LLM prompt refinement approach** used, which can be easily adapted to different tasks. The method consists of the following steps:

1. Write a human-crafted prompt instruction.
2. Conduct initial testing.
3. Make adjustments (if necessary).
4. Ask an LLM to generate a prompt for prompt refinement. For example, pose a straightforward question such as: *“What prompt do I need for you to perform effective and efficient LLM prompt refinement?”*
5. Edit and customise the obtained refinement prompt to meet specific needs and context. Then, refine the prompt in step 1.
6. Perform tests to compare the output of the human-crafted instructional prompt with that of its LLM-refined version.

² Find a sample of a student-chatbot conversation in this GitHub repository:
https://github.com/MACely-Ed-tech/Master_Thesis_MariaCely.git

Chapter 6

Research Evaluation

6.1 Human Evaluation

Human evaluation was selected for this study due to the absence of a standardised LLM benchmark for assessing English language writing feedback, as well as the lack of a reference corpus, as in Zeinalipour et al, (2025). Additionally, limitations inherent to LLM-generated evaluators often result in them replicating the same errors as the models they assess (Shankar et al., 2024). Human evaluation is sometimes preferable to automated metrics because some studies have found weak correlations between automated assessments and human judgements in dialogue systems. For this reason, researchers warn against relying on automated metrics for linguistic analysis (Li et al., 2019; Lee et al., 2019). Furthermore, automated assessments can be manipulated to produce artificially high scores. For example, Clarke and Dietz (2024) reported a case in which a submission received a significantly higher score through automatic evaluation than manual review.

Human evaluation is widely regarded as the gold standard for assessing LLM-generated outputs and is indispensable for measuring relevance in ways that align with real-world applications (Reprint et al., 2023; Clarke & Dietz, 2024). In this thesis, the human evaluators were educators whose subject-matter expertise enabled them to assess chatbot performance more effectively. Although human evaluation is resource-intensive and challenging to replicate under identical conditions, it remains the preferred approach for ensuring meaningful and reliable assessment (Clarke & Dietz, 2024).

6.1.1 *Type of Human Evaluation*

Although “Fred” and “Joe” are tools designed for students, it is important to note that the purpose of this research is not to have students assess the chatbots or measure how much they learn by using them. Instead, the focus is on gathering teachers’ judgements about this feedback tool based on student-chatbot interactions. This human evaluation is considered multi-turn, pair-wise, preferential and intrinsic, as explained below.

Various methods of human evaluation are employed to assess dialogue systems, each with specific strengths and limitations in capturing human judgement (Li et al., 2019). Reference-based approaches, for example, compare system outputs to predefined ground truths, but these binary judgements rely heavily on the quality of the references used (Cheung, 2024). Multi-turn Likert scoring provides more accurate assessments of entire conversations, but it is resource-intensive and susceptible to annotator bias (Li et al., 2019).

Therefore, this study uses a side-by-side comparison of two multi-turn dialogues, A and B (Li et al., 2019), for teachers to assess whether “Fred’s” feedback is better than “Joe’s”, eliminating the need for ground-truth references. This preferential evaluation method (Abeysinghe & Circi, 2024) permits evaluators to express their preferences based on four specific criteria, which are detailed in the next section. As there are no universal guidelines, the evaluation criteria must be task-specific and carefully disambiguated to ensure consistency and reliability in the assessment process (Lee et al., 2019).

Human evaluation of natural language generation (NLG) systems can follow intrinsic or extrinsic methods (Lee et al., 2019). Intrinsic evaluation focuses on the quality of the generated text itself, assessing aspects such as fluency, coherence, and correctness, typically through questionnaires or comparative tasks (Celikyilmaz et al., 2020). In contrast, extrinsic evaluation examines how well the system supports the broader task it was designed for, such as improving user performance (Lee et al., 2019). This research adopts an intrinsic evaluation approach, emphasising text quality based on how effectively the NLG system conveys its intended message to the reader.

6.2 Evaluation Criteria

Several studies have identified some key criteria by which humans can evaluate responses generated by LLMs. Reprint et al. (2023) emphasise that responses must be accurate, complete and well-structured. Celikyilmaz et al. (2020), meanwhile, highlight additional dimensions such as factuality, grammaticality, style, typicality, and redundancy. They address the importance of truthfulness, fluency, appropriateness and efficiency in AI-generated text. Abeysinghe & Circi (2024) focus on chatbot-specific qualities such as answering queries completely, using language effectively, and recalling information. Other study, Seo et al., 2025, analysed the strengths and limitations of LLMs as evaluators in the

educational domain. They proposed five essential feedback criteria: correctness (combining relevance and accuracy); non-disclosure of answers; guidance towards correct responses; diagnostic insights into errors; and encouragement to foster a positive learning environment.

The evaluation criteria used in this study were not only selected based on insights from previous research to achieve comprehensive yet focused coverage but were also grounded in a teaching-oriented perspective. In the absence of an established baseline for comparing chatbot responses, teachers relied on their professional judgement and pedagogical experience to assess the feedback. They evaluated the responses based on four criteria, interpreting them through the lens of student improvement and their overall learning process.

These were the selected criteria:

- **Accuracy:** Feedback is correct, complete and not redundant.
- **Relevance:** The feedback is relevant to improving students' writing skills.
- **Usefulness:** The quality of feedback is useful to students in their learning process.
- **Usability:** The feedback is easy to understand and the interaction with the chat assistant is intuitive to follow, allowing for smooth conversations.

6.3 Data Collection Method

This research employed a semi-structured survey (Appendix K) to collect data instead of the more traditional qualitative tools of interviews, focus groups, and participant observation, which are typically used to generate hypotheses and analyse complex phenomena (Tenny, Brannan, & Brannan, 2022, Sept 18). The survey was designed to compare and evaluate the feedback provided by the two chat assistants, "Fred" and "Joe," on a same student's text.

For creating the survey, ten anonymous student–chatbot conversations were selected from the 144 exported files of the real experiment mentioned in Section 5.6. When selecting the sample, a variety of text lengths, topics, proficiency levels and numbers of interactive elements in each conversation were ensured. Although each student only chatted with one chatbot, each conversation needed to be replicated with the other chatbot to enable direct comparison of the outputs. To maintain consistency, the researcher decided to recreate the selected conversations herself using the students' original responses, as there was no guarantee that the students would interact in the same way if they replicated their own conversations with the other chatbot. Consequently, each teacher received

a unique survey featuring a distinct sample of student–chatbot interactions.

To accommodate participants' availability and address logistical challenges arising from time zone differences between Colombia and Germany, a convenience sample was taken to provide flexibility while ensuring that relevant insights were collected. Volunteer teachers were contacted individually and offered the option of receiving the survey via email or WhatsApp, guaranteeing accessibility according to their preferences. The survey was distributed as a restricted Word file, enabling teachers to select responses and add comments in designated sections.

6.3.1 Survey structure

To promote clear decision-making and uncover genuine preferences, teachers were restricted to selecting a single response option, using categorical data to avoid the ambiguity common in rating scales. This format was also chosen for its simplicity and speed, increasing the likelihood of survey completion.

The survey was divided into three parts:

- The first part gathered information about teachers' years of experience, ranging from two or fewer years to ten or more.
- The second part consisted of a binary comparison of "Fred" and "Joe", where teachers reviewed each chatbot's feedback and selected their preferred option based on accuracy, relevance, usefulness, and usability. This part assessed the sections of the student-chatbot conversation.
- The third part explored teachers' overall perceptions of feedback quality. Teachers were required to select among "Fred," "Joe," "Both," or "Neither" based on the aforementioned criteria. They were also asked to assess whether the chat assistants met their own professional standards for providing feedback on student writing. To capture deeper insights, an open-ended section was included, allowing teachers to provide comments.

Chapter 7

Data Analysis and Results

This chapter presents the results through a combination of descriptive statistical analysis and qualitative thematic analysis, providing a thorough overview of the data. Descriptive statistics are supported by tables and graphs to highlight trends and preferences, while the thematic analysis includes excerpts from teachers' survey responses to provide deeper context.

7.1 Descriptive Statistics Analysis and Results

Between February and March 2025, eleven³ teachers from the same institution participated in the survey. To ensure an unbiased evaluation, they were not informed of the differences between "Fred" and "Joe." The results from the three parts of the survey are presented here and provide a clear overview of teachers' preferences and responses.

Figure 1 shows the results of part 1 of the survey, which focused on participants' teaching experience. Respondent's experience ranges from three years to over a decade. Notably, around half of the participants are highly experienced educators with over 10 years' experience in education.

³ Although ten conversation samples were selected, only one of them contained the 'Explain more' option from Actions List 1, so it was evaluated by two different teachers to ensure a fairer evaluation of this aspect.

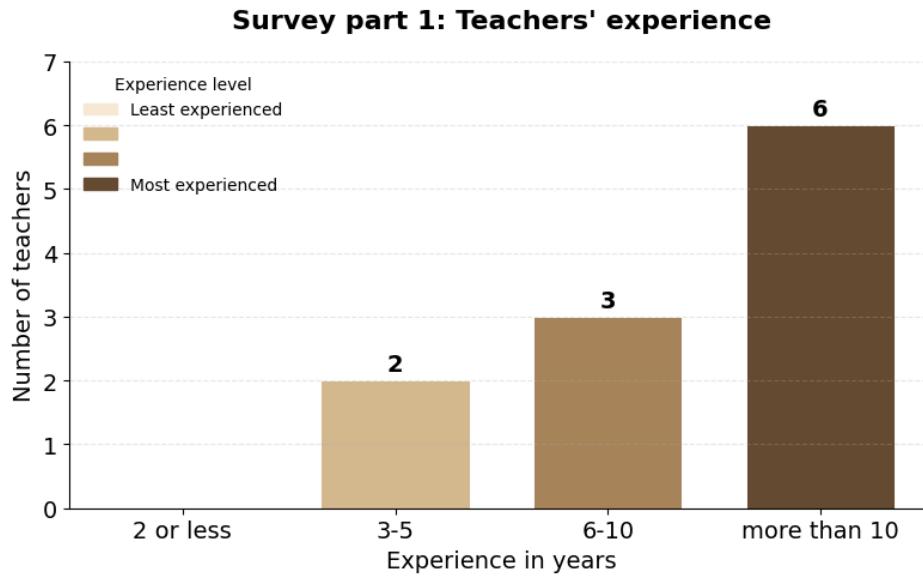


Figure 1.

Part 2 of the survey focused on teachers' evaluations of which chatbot, "Fred" or "Joe", performed better in each section of the student-chatbot conversations. It is important to note that not all sampled conversations followed the same structure, meaning not all sections of the chatbot's workflow appeared consistently across the data. This is because students could freely choose which sections they wanted to explore when interacting with the chatbots. The three core sections, 'Good things about your text,' 'Things you need to fix,' and 'Second version correction,' were present in all eleven conversations. However, the reliability and generalisability of the findings for the other sections that occurred fewer times are more difficult to determine, see Table 1.

Student-chatbot conversation sections	N° of conversations in which each appears
Good things	11
Need to fix	11
Get a grade (G)	5
Explain more (E)	1
Writing tips (T)	2
Compare texts (C)	6
Simplify language (S)	2
Second version	11

Table 1. shows how many conversations each section was present in.

Furthermore, Figure 2 and Table 2 show the frequencies of teachers' preferences for the sections of the student-chatbot interactions. It is observed that a larger number of teachers preferred "Joe" in the sections 'Good things about your text' (81.8%), 'Things you need to fix' (72.7%), 'Get a grade (G)' (80%), and 'Simplify language (S)' (100%). Meanwhile, "Fred" was preferred in 'Explain more (E)' (100%), 'Compare texts (C)' (66.7%), and 'Second version correction' (81.8%). And 'Writing tips (T)' resulted in a tie (50%).

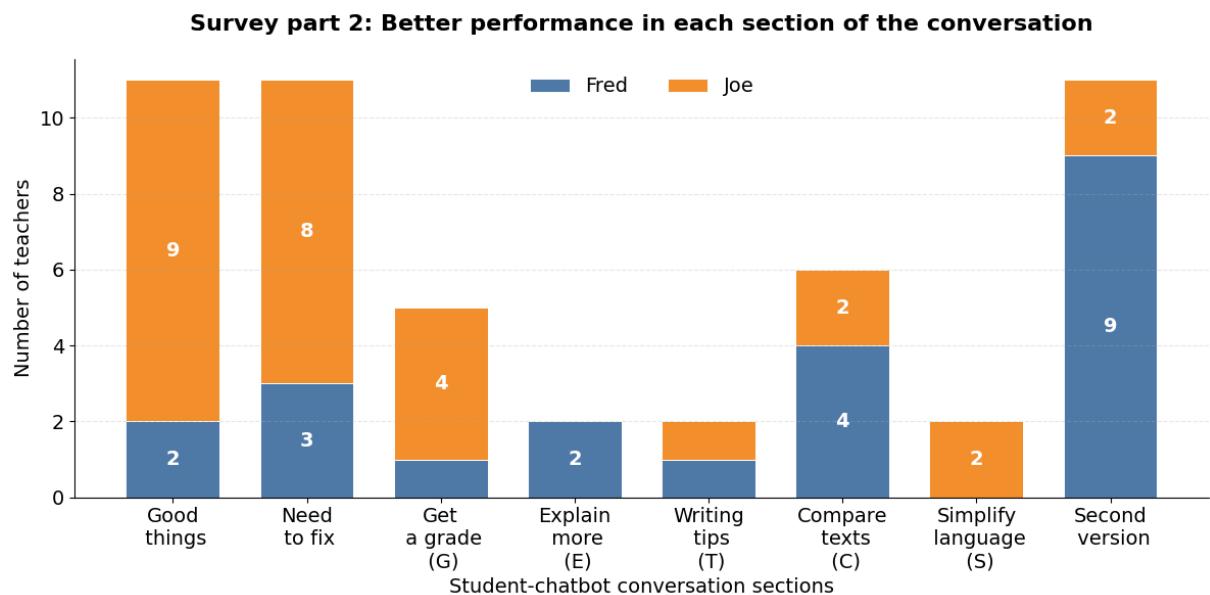


Figure 2.

Student-chatbot conversation sections	Nº of teachers who preferred Fred	Nº of teachers who preferred Joe
Good things	2	9
Need to fix	3	8
Get a grade (G)	1	4
Explain more (E)	2	0
Writing tips (T)	1	1
Compare texts (C)	4	2
Simplify language (S)	0	2
Second version	9	2

Table 2.

Based on Table 2, in Table 3 it was determined that “Fred” was the preferred option in 3.5 out of 8 sections, corresponding to 43.75%. Meanwhile, “Joe” was the preferred option in 4.5 out of 8 sections of the conversation, achieving a slightly higher preference of 56.25%. This is illustrated in Figure 3.

Chatbot	Sections with the highest N° of teachers who preferred them in each chatbot	Sections preferred by the same N° of teachers
Fred	<ul style="list-style-type: none"> • Explain more (E) • Compare texts (C) • Second version 	<ul style="list-style-type: none"> • Writing tips (T)
Joe	<ul style="list-style-type: none"> • Good things • Need to fix • Get a grade (G) • Simplify language (S) 	

Table 3.

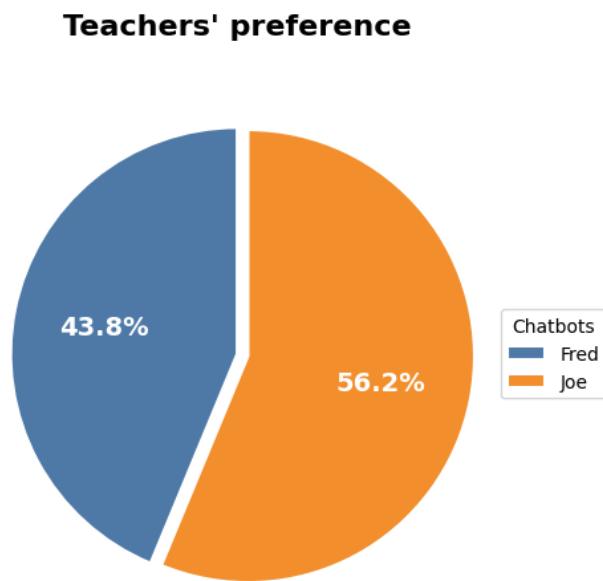


Figure 3.

Part 3 of the survey presents teachers' overall perceptions of the chatbots' feedback, evaluated against the four defined criteria. As shown in figure 4 and table 4, most teachers chose the option that both chatbots performed best across all criteria. This suggests that, despite differences in specific sections of the student-chatbot conversations, both assistants were perceived as equally effective at delivering feedback overall.

Survey part 3: Overall teachers' perceptions of the chatbots' feedback based on 4 criteria

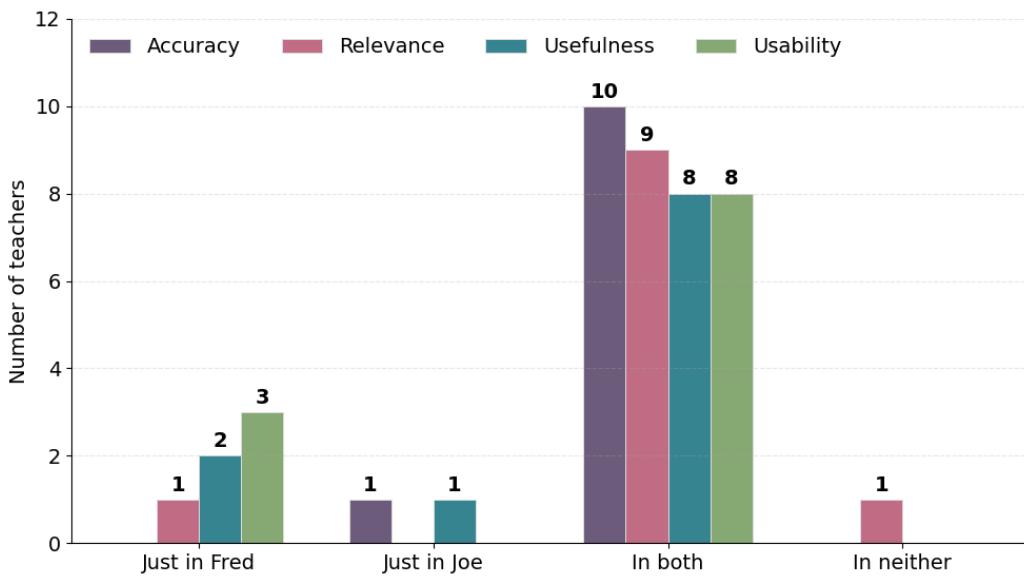


Figure 4.

Options/Criteria	Accuracy	Relevance	Usefulness	Usability
Just in Fred	0	1	2	3
Just in Joe	1	0	1	0
In both	10	9	8	8
In neither	0	1	0	0

Table 4.

Figure 5 shows that, of the four evaluation criteria, teachers agreed most with the accuracy of the chatbots' feedback, at 91%. This was followed by relevance, and finally usefulness and usability. The next section provides further insights into the criteria by investigating teachers' interpretations and experiences in more depth.

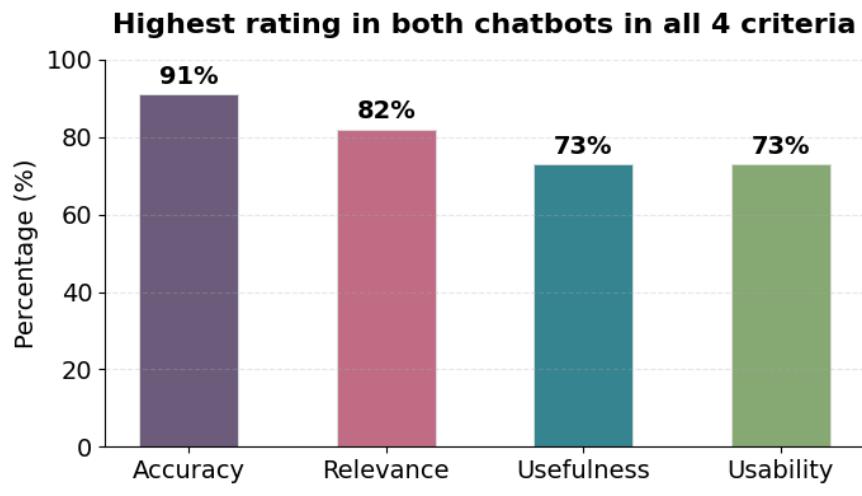


Figure 5.

Finally, figure 6 shows the responses from teachers regarding which chatbot best met their professional criteria in part 3 of the survey. The most frequently selected options were “Just Joe” and “Both.” However, interpreting these results is complex as they are influenced not only by the chatbots’ performance, but also by subjective factors such as each teacher’s level of experience, educational philosophy, and individual expectations. These factors extend beyond the scope of this study.

Meeting teachers' professional criteria

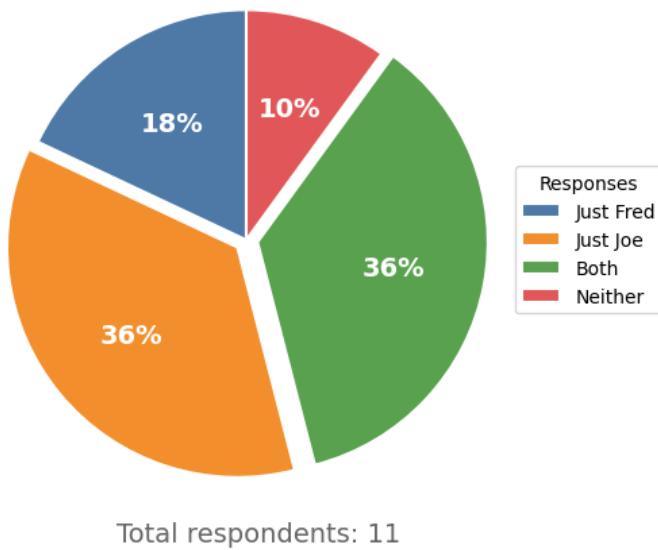


Figure 6.

7.2 Qualitative Thematic Analysis

Qualitative research is a powerful method for exploring complex real-world problems by gathering participants' experiences, perceptions, and behaviours (Tenny, Brannan, & Brannan, 2022, Sept 18). Unlike quantitative research, the design of qualitative research is often non-linear due to its reliance on open-ended questions, which allow for deeper insights into processes and human behaviour that are difficult to quantify. Themes and patterns can be identified within qualitative data, which aims to provide a more comprehensive understanding by preserving contextual richness and narrative depth (Tenny, Brannan, & Brannan, 2022, Sept 18).

Thematic analysis (TA) is a widely adaptable qualitative research approach that involves identifying and clustering codes, which are small analytical units reflecting patterns of shared meaning among participants. These codes are then

analysed and organised into themes. This approach enables researchers to detect patterns of meaning and structure the data in alignment with the research question, thereby supporting categorisation and interpretation (Curelaru et al., 2022; Boyatzis, 1998; Nowell et al., 2017).

This study adopted an inductive approach to TA, allowing themes to emerge directly from the data rather than being based on predetermined categories (Boyatzis, 1998). This method is particularly valuable because it is 'unbounded by theoretical commitments', making it well-suited for capturing nuanced insights directly from participants' feedback (Curelaru et al., 2022).

Furthermore, thematic analysis can be adapted to various research contexts, epistemologies and scientific disciplines (Boyatzis, 1998; Nowell et al., 2017). This versatility enables researchers to effectively identify and interpret participants' experiences, extending its application far beyond traditional fields such as healthcare (Nowell et al., 2017). For instance, Kurt and Kurt (2024) employed TA to examine Turkish pre-service English teachers' perceptions of ChatGPT as an L2 writing course a feedback tool. Their study compared AI-generated feedback with feedback from peers and teachers on student essays using focus-group interviews, thereby highlighting the utility of TA in educational technology research.

7.3 Thematic Analysis Results

During familiarisation with the survey responses, it was noted that not all teachers provided comments and that, of those who did, many addressed multiple evaluation criteria within a single remark. Consequently, the comments frequently overlapped and were interrelated, meaning the themes presented here may span more than one evaluation criterion. In the thematic analysis similar codes were extracted from the comments in the third part of the survey, which could then be categorised systematically into themes (Appendix L). This process also distinguished whether comments on each chat assistant were positive or negative. The identified themes are as follows:

1. Accuracy, Completeness, and Relevance of Feedback

This theme relates to the accuracy and relevance evaluation criteria. It highlights how both chat assistants provide feedback that is correct, complete, meaningful, and not redundant to help students genuinely improve their writing.

"Fred's" feedback stands out for its depth, accuracy, relevance and completeness. He identifies mistakes and provides thorough explanations,

suggesting specific improvements and offering examples or alternatives that students can apply immediately. This is confirmed in the second part of the survey, in which the ‘Second version correction’ section was preferred by 9 out of 11 teachers (81.8%) (Figure 2, Table 2). As one teacher highlights:

"Fred's feedback is more complete, gives clear suggestions to improve the text and make it more complex and in the second piece of feedback highlighted the specific words or phrases that were successfully corrected or that still need improvement."

Additionally, teachers praised “Fred” for offering “*a more specific feedback by pointing one by one the mistakes*” and “*a complete, yet simple, description of the appropriate parts of the text,*” while immediately adding “*examples or alternatives for the student to use*” for incorrect sections.

Similarly, “Joe” provides students with accurate and relevant feedback to help them improve their writing. In teachers’ words:

"Joe chat assistant provides accurate and relevant feedback that helps students improve their writing effectively," and "Joe is the best option out of the two because the feedback and comments he gives are accurate."

Moreover, “Joe’s” feedback is described as more practical and direct, as reflected in this comment:

"While both assistants had their strengths, to me Joe was more practical, and specific."

Other comments revealed that both chatbots consistently provide correct, complete, detailed and meaningful feedback. This is further supported by the second part of the survey, in which accuracy and relevance were rated at 91% and 82%, respectively (Figure 5). These findings were reinforced by comments such as:

"Feedback is correct and complete in both", "both assistants give meaningful and detailed feedback" and "without doubt, both assistants give accurate feedback."

Furthermore, it is emphasised that both chat assistants provide accurate, sentence-level feedback that clearly identifies and explains language errors. Two comments that support this view are:

"The feedback in both chat assistants focuses on how the words or

expressions are used within the sentences, which is the ultimate goal of these tools. In general, the identified mistakes are adequate and can be labeled as errors in conjugation, form or use of the written language, which in turn is what can help students to improve their writing skills.”

“The positive and negative aspects found within the text by both chat assistants comfort to reality, they both isolate the sentences or phrases which need to be worked on, and present in detail exactly why they need to be changed.”

However, there is a slight preference for “Joe” regarding the “*The positive and negative aspects found within the text*”, as it was mostly preferred in the sections “Good things of your text” (81.8%), and “Things you need to fix” (72.7%) (Figure 2, Table 2).

2. Usefulness of Feedback in Supporting Student Learning

This theme is related to the usefulness criterion. It conveys the overall idea that both assistants provide helpful guidance, despite some limitations.

“Fred’s” feedback is particularly valuable for the learners’ learning process because the chatbot provides concrete examples and suggestions for extending students’ language skills. According to one teacher:

“I consider Fred's feedback specially useful for the students' learning process due to the provided examples or suggestions that fit directly into the original text so they have immediately alternatives to both improve the text, and learn formulaic phrases which help them to extend their language skills.”

However, “Fred’s” feedback is not without criticism. While he is helpful in providing practical examples, he sometimes misses opportunities to foster deeper critical thinking in writing. In teachers’ words:

“Fred tends to go around the main points without guiding the student toward meaningful reflection.”

Similarly, “Joe” is recognised for giving useful, effective feedback that helps students improve their writing. As one teacher stated:

“Joe chat assistant provides useful feedback that helps students improve their writing effectively”.

Both chatbots offer valuable contributions to student learning, such as promoting autonomy and improvement through feedback. According to another teacher:

"Without doubt, both assistants give useful explanations to the learners," and they are "capable of providing feedback that ensures the student to correct themselves their own mistakes and get to write a second version."

This notion is also supported by the survey results, which show that 73% of respondents found both chat assistants useful (Figure 5). However, one teacher offered a different perspective, noting that chat assistants are not yet capable of providing the same level of insight and feedback as a human. As one teacher explained:

"The chat assistants were both able to provide limited feedback to the student and with 'practice' will get better."

3. Clarity and Conciseness in Feedback Delivery

This theme is related to the usability criterion. It captures the idea of using simple, clear language; being precise; providing understandable corrections; and offering helpful examples.

“Fred” is valued for providing feedback in a simpler and clearer way that is particularly accessible to students. As a couple of teachers note:

"Fred tends to provide the feedback in a slightly more simple way," and "In most cases, Fred was more concise and provided clear examples and explanations."

However, another teacher disagrees, mentioning that the excessively wordy language occasionally runs the risk of overwhelming the student:

"The only weakness or aspect that I consider that should be improved on Fred, corresponds to the concision or the language that the assistant used during the interaction with the user since the beginning."

Regarding “Joe’s” feedback, it is highly valued for its clarity, intuitiveness, and specificity in its comments. Many teachers have praise it, commenting that:

"Joe's corrections are clear, intuitive, and easy to follow, ensuring smooth interaction"

"Joe identifies mistakes concisely, making corrections precise and meaningful."

"Joe is the best option out of the two because the feedback and comments he gives are accurate and easy to understand," emphasizing that "students at this stage need feedback that is helpful and specific."

Finally, when considering the feedback on both chatbots, teachers agree that they offer clarity and ease of interaction, which benefit learners. They describe the responses as 'smooth' and consider both versions 'easy to understand'. This suggests that, regardless of which assistant is used, students are likely to receive accessible feedback that promotes learning without unnecessary complexity. This is supported by teachers' ratings of usability at 73% (Figure 5).

4. Depth and Effectiveness of Reflective Questions

This theme aligns with the relevance criterion, emphasising the role of feedback in promoting meaningful student reflection by using guiding questions. However, this aspect has generated controversy, with differing opinions ultimately giving rise to a subtheme focused on recommendations for optimising the reflective process.

On the one hand, 'Fred's' feedback is considered to be less effective at promoting meaningful student reflection. Although it uses reflective questioning, the questions often lack clarity or depth and therefore fail to encourage students to engage critically with their writing. A couple of comments refer to this:

"I believe Fred tends to go around the main points without guiding the student toward meaningful reflection."

"In my opinion, the reflective questions are somewhat general and do not encourage the student to think more deeply."

Conversely, "Joe's" feedback is valued for encouraging deeper reflection through more targeted and thoughtful questions. This chatbot fosters critical thinking and enables students to correct their mistakes by engaging meaningfully with the revision process. As one teacher stated:

"I prefer Joe's feedback since it focuses on providing deeper questions with alternatives, most of the questions being open-ended for the student themselves to reflect more on the correction."

Other comments on both chatbots emphasise their use of reflective questions and remark on its potential to support students in assessing themselves:

"Both of them provide guiding questions that might take the student to reflect on their own writing process in order to improve for future tasks."

However, another teacher also identified significant shortcomings in this area, noting that such feedback can be confusing, especially for learners with limited exposure to the language. This raises the idea that reflective questions alone may not effectively support meaningful learning without adequate scaffolding. One

critical comment stated as follows:

"In my view, the reflective questions were often not helpful," and this teacher also doubted the effectiveness of questions like: *"What expression can you use to express this idea more naturally?"* or *"Does all around sound natural in this context?"*

One identified **subtheme** is 'Recommendations that encourage a better mistake analysis and a more reflective process for writing'. Some teachers suggest that both chat assistants should refine the structure and focus of the feedback process. One recommendation is to reorder the feedback to prioritise the analysis of mistakes before encouraging reflection. In other words, alternative examples should be offered at the beginning, while broader reflective questions should be suggested at the end of the assignment. This allows students to address errors before exploring alternative revisions. Finally, it is recommended that reflective questions and mistake analysis focus more on developing advanced and precise vocabulary to improve students' writing quality.

5. Organisation and Structure of Feedback for Student Comprehension

This theme relates to the usability criterion. The main focus is on presenting feedback clearly, systematically and accessibly, to help students better understand and act on it.

"Fred" is recognised for providing feedback in a structured and detailed manner, which enhances its clarity and usefulness for students. It was praised for presenting corrections "in an organized and concrete way," as it ensures that students clearly understand the specific revisions needed in their writing. The following comments highlight this strength:

"Fred organized mistakes in a chart, this makes the information better to be read and understood."

"Although Fred is quite complex, it organizes the feedback better than Joe."

Similarly, "Joe" is also valued for providing feedback in an accessible format. One teacher commented specifically:

"Joe presents feedback in a way that is easier for students to classify and highlight."

Comments about both chatbots point out their ability to provide structured, helpful feedback, which reinforces the idea that they can organise information effectively to support student comprehension. One comment summarises this, stating that:

"Feedback is presented in a very organized and comprehensible way for students in both. This is demonstrated in all responses allowing student to take it as a structured process to improve writing."

Although both chatbots were instructed to use a three-column table in the "Things You Need to Fix" section, the formatting varied in other sections where no formatting specifications were provided in the prompt. This inconsistency may explain comments such as the following:

"At times I preferred Joe's organization and at times I preferred Fred's."

In the "Compare texts (C)" section, for example, "Fred" was specifically prompted to create a table contrasting the original, revised, and corrected versions. This helped to highlight changes and support student improvement, with 66.7% of teachers preferring him (Figure 2). While both chatbots demonstrate strong organisational potential, these variations demonstrate the direct influence of prompt design on output consistency and teacher preferences.

6. Adaptation of Feedback to Student's Language Proficiency Level

This theme relates to the usability criterion, focusing on how feedback aligns with students' needs, whether at elementary or more advanced proficiency level.

Opinions on this theme vary significantly. For example, one teacher commented that both "Fred" and "Joe" can generally adapt to feedback across different proficiency levels:

"Both assistants are capable of providing accurate feedback that focuses on the current level of the student and the text the student might correct to get the proper learning process"

However, someone else favoured "Joe", noting that he was more effective at making feedback accessible to a wide range of learners. His language use was described as more approachable; one comment stated:

"Joe seemed to provide more concise feedback in an easier way for students (of any level) to understand."

This observation is consistent with the findings of the two teachers who encountered a sample conversation including the "Simplify Language (S)" section in their survey and selected "Joe" as the best at simplifying language (Figure 2). However, further data are needed to reach a more reliable conclusion.

A teacher commented that “Joe” is generally better suited to elementary level learners because of its simpler language. This person commented:

“Joe seems to be more appropriate for a learner of an elementary level regarding the language that it uses which is kind of simpler”

Others refute this by pointing out that he is sometimes overly complex, as in:

“Joe sometimes gives feedback using complex sentences that may not be clear to people who do not study the language thoroughly,”

“Joe’s feedback should change some expressions or explanations by less complex language, especially for A1 students.”

Meanwhile, “Fred” is considered even less suitable for beginners, as evidenced by the following comment:

“Fred is quite complex or even too formal for a student who is starting to acquire the language so it could somehow disrupt them”

At the more advanced levels (B2), neither “Fred” nor “Joe” were considered highly effective; both were criticised for failing to provide the depth of feedback expected at a higher level of proficiency. It was noted that neither assistant sufficiently challenged advanced learners to refine their language use appropriately. As a teacher pointed out:

“None of the chatbots effectively guide the student in producing a text that aligns with the B2 level of writing proficiency. For instance, the suggested adjectives tend to be quite basic. It focuses on correcting grammar, punctuation, and vocabulary without considering the appropriate level of competence for the text.”

7. Emotional Support and Motivation in Feedback

Although emotional support and motivation were not explicitly included in the evaluation criteria, they can be indirectly linked to usefulness, since encouraging language and motivational suggestions can improve learning. This theme is a notable discovery that highlights the importance of providing a personal, engaging and supportive feedback to help students stay confident and motivated throughout their learning journey.

Unlike “Fred”, “Joe” stood out for his ability to provide emotional support and motivate students through positive feedback. One teacher commented that:

“Joe provides more good comments at the very beginning making sure that the emotional aspect of the learning process is also integrated.”

Additionally, it was noted that “Joe’s” guidance emphasises the importance of personalised, encouraging feedback in supporting motivation and deeper learning, as demonstrated by comments such as:

“His guidance encourages students to reflect and revise, fostering a more engaging and productive learning process.”

“Joe’s comments in the section ‘Good things about your text’ were more relatable to students and that they would be more likely to engage with this type of feedback,”

“Students can feel they are on the right path to achieve a much better piece of writing as it feels more personal,”

“This might get a closer sense of proximity with the feedback-giver chatbot.”

The tone set by the prompts for “Fred” and “Joe” probably influenced teachers’ perceptions, which is why they viewed “Joe” as more emotionally supportive and motivating than “Fred.” For instance, “Joe” is described as empowering students to improve their writing skills and build confidence in section 1 of the prompt instruction. This emphasis continues in section 7, where the prompt encourages self-reflection and correction (Appendix A, Joe). In contrast, “Fred” focuses on encouragement, describing the chatbot as friendly, helpful, and encouraging. He provides students with formative and constructive feedback to help them improve their writing skills and build confidence in section 1. In section 13, the assistant motivates students to continue learning after the conversation ends (Appendix A, Fred).

In conclusion, these differences highlight how subtle variations in prompt language can shape the user experience. “Joe’s” focus on empowerment generates feedback that feels more meaningful and student-centred, whereas “Fred’s” encouragement may feel less impactful or inconsistent, possibly due to more ambiguous wording in the human-crafted instructional prompt.

7.4 Limitations of the Study

This brief section presents the limitations of this study that impacted the reliability and generalisability of its findings. One such limitation was the inconsistent nature of the collected data. Since each teacher received a unique survey featuring a different sample of student-chatbot conversations, they evaluated different texts. This introduced variability in subjective evaluations that could not be cross validated with multiple raters. However, the original approach was chosen to reduce participant fatigue, since evaluating multiple surveys is highly time-

consuming. It is also acknowledged that more precise insight could have been obtained by using interviews.

Another major limitation identified was the lack of a clear ground truth for evaluating chatbot-generated feedback. Providing effective writing feedback is inherently complex, even for human experts, due to the absence of universally accepted standards in language-learning contexts. Furthermore, various factors may have influenced the feedback outcomes, including the human-crafted prompt approach, prompting techniques, the LLM used (including version, updates, or output variability), the LLM-refinement strategy selected among others. These variables introduce considerable uncertainty in reproducing results and highlight the challenges in assessing AI-generated feedback in education. Consequently, the findings should be interpreted in the context of this case study only.

Chapter 8

Discussion of Findings and Lessons Learned

This chapter presents the findings of the research and the lessons learned. The discussion is organised into two main sections: one focusing on the pedagogical implications and the other addressing the technical aspects.

8.1 Pedagogical Discussion

This section considers the meaning and magnitude of the findings in relation to the research questions.

8.1.1 Research Question 1

Which of the two chatbots is the more accurate, relevant, useful and usable tool for providing feedback on students' writing, according to teachers? What do they say about the chatbots?

“Fred” and “Joe” consistently provide accurate and relevant feedback at sentence-level that clearly identifies and explains language errors, offering meaningful guidance to help students improve their writing. As seen in figure 5, most teachers (91%) agreed that both chatbots provided accurate feedback, and 82% found it relevant.

“Fred” was recognised for the completeness and specificity of his feedback. He was praised for his detailed explanations, actionable suggestions and illustrative examples that helped students identify areas for improvement. These strengths established his reputation as being both reliable and academically rigorous. However, his reflective questions were often considered to lack depth and clarity. In contrast, “Joe” was recognised for providing practical and effective feedback in a direct and targeted manner, particularly with regard to identifying ‘the positive and negative aspects found within the text’. He demonstrated a more thoughtful and effective use of reflective questions, promoting deeper engagement with and reflection on the writing process. Nevertheless, some teachers

noted that, without sufficient scaffolding, reflective questions aimed at encouraging student self-assessment were not very helpful, as they did not guide students towards meaningful reflection.

In terms of usefulness, teachers agreed that both chat assistants provide valuable guidance to support student learning and promote autonomy by offering clear and helpful feedback. However, they also stated that the chatbots still lack the depth of insight that can only be provided by human feedback. In particular, “Joe” was praised for providing emotional support and motivating students through positive, personalised feedback. It was noted that his encouraging tone could foster a supportive learning environment, thus boosting student confidence and engagement.

In terms of usability, “Fred” was praised for his organisational strengths, especially his structured comparison formats and detailed tables, which proved highly effective in tasks such as ‘Compare texts’. By contrast, “Joe” has a slight usability advantage, as teachers consistently praised his simpler, more accessible feedback language. This was generally preferred to “Fred’s” more formal, complex style, which some teachers found overwhelming for beginners (A1 - A2) due to its wordiness. Although a few teachers perceived the occasional complexity of “Joe’s” responses, his feedback was generally considered easier for students to understand and follow.

Finally, opinions on their adaptability across proficiency levels (A1 - B2) remain mixed. However, neither assistant was considered to fully meet the expectations of advanced students, as their feedback often focused on basic grammar and vocabulary rather than supporting B2-level writing development.

8.1.2 Research Question 2

Which version of the chatbot do teachers prefer for students to receive feedback on their writing: the LLM-refined prompt chatbot (Joe) or the human-crafted prompt chatbot (Fred)? Why?

While both chatbots were valued for different aspects across the chosen criteria, figure 3 shows that there is a slight overall preference for the LLM-refined chatbot (56%), although this difference is relatively small.

Teachers consistently praised “Joe’s” practical, clear and intuitive

communication style, highlighting his ability to provide focused, targeted feedback that helped students recognise their strengths and understand how to improve in their writing. This was observable in figures 2 and 3 which show that most teachers favoured “Joe” in key feedback areas: 81.8% selected him for the section ‘Good things about your text’, and 72.7% for ‘Things you need to fix’. Comments also described him as “more practical and specific” noting that his concise language allowed students to understand and act on the feedback without feeling overwhelmed.

Another of “Joe’s” most praised features are his use of reflective questions that encourage thinking and self-assessment. Teachers noted that his questions were more thoughtful and effective than “Fred’s”, for potentially helping students to actively engage with their own writing. Moreover, “Joe” stood out for being emotionally supportive, as his feedback was often perceived as encouraging, building students’ confidence and motivation, and contributing to a positive learning environment.

Furthermore, “Joe” was preferred in sections such as 'Get a grade' (80%), which provides a score, and 'Simplify language' (100%), which aims to make feedback more accessible to students. “Joe” was many times considered better suited to learners at different proficiency levels, particularly at the elementary levels (A1 - A2), due to the clarity and accessibility of his language.

Ultimately, teachers acknowledged that both “Fred” and “Joe” are valuable tools that effectively serve their intended purpose, though neither is without flaws. Teachers said that each assistant has strengths and areas for improvement. To maximise their effectiveness, ongoing refinement is needed, particularly with regard to the quality of reflective questions, the depth of insights, and the complexity of the language used with students.

8.1.3 Lesson Learned

The lesson learned here is that providing feedback on students’ texts is inherently a complex task for humans and equally challenging for LLMs, particularly given the nuances involved in prompting a chatbot with multiple dimensions and aspects to consider. Despite the limitations encountered, teachers reported that tools like “Fred” or “Joe” could benefit students and foster independent learning, provided there is appropriate human mediation and support. As Mollick and Mollick (2023) emphasise, while feedback generated by LLMs can be valuable, it should always be complemented by in-class discussions and clear instructional

guidelines.

8.2 Technical Discussion

The aim of this section is to present reflections and propose hypotheses based on the patterns and relationships observed in the chatbots instructional prompts, and the behaviours identified in the experiments.

8.2.1 *Token Count and Cost Effectiveness*

According to the IBM Developer website, token optimisation plays a fundamental role in prompt engineering, as it directly influences the efficiency, cost-effectiveness, and performance of LLMs. Reducing the number of tokens decreases the computational load, leading to faster response times, which is particularly crucial for real-time applications such as chatbots.

The number of tokens in the two prompt instructions was calculated using *Tiktoken*, OpenAI's tokenisation library. "Fred's" prompt covered 5075 words across 12 pages and contained 6352 tokens, while "Joe's" prompt consisted of 802 words across 2 pages and contained 1042 tokens (Appendix M⁴).

After applying the refinement prompt, the resulting refined version (Joe) was significantly more concise, using fewer tokens, and demonstrated slightly better overall performance. Additionally, the token reduction in this case leads to lower computational costs and resource consumption for GPT-4o-mini, making "Joe" a more cost-effective and advantageous chatbot for the company *fobizz*.

8.2.2 *Similarities and Differences Between Prompt Instructions*

Another technical aspect that is worth discussing in this thesis is the comparison between the human-crafted and the LLM-refined prompts (Appendix A), particularly with regard to their structure, prompting techniques, and language style. Examining these differences may help to explain the chatbots' behaviour and, to some extent, the differences in the performance.

- Instruction structure

Regarding the structure, the LLM-refined prompt preserves the original architecture labels of the human-crafted prompt but changes the title of the final section from 'Highly Important!' to 'Important Notes'. While the number of

⁴ GitHub repository: https://github.com/MACely-Ed-tech/Master_Thesis_MariaCely.git

steps to perform the task remains unchanged, the structure of “Joe’s” prompt was adjusted by grouping certain elements differently, as explained in more detail in ‘prompt sections’ below.

More specifically, unlike “Joe”, “Fred” uses a more structured format with headings and tags, such as '# Role and Goal', as well as bold markers, such as **‘Step 1’**, and uppercase ("TEXT") to indicate that this is a placeholder for the student’s text. Additionally, “Fred’s” instructions are more detailed and repetitive. For instance, they emphasise critical aspects such as keeping the prompt instruction secret, strictly following the steps and giving restrictions, such as ‘Do not show the tag
 to the user’.

- Language style

“Fred’s” prompt instruction is written in a descriptive and instructional tone, using explicit and slightly informal language to emphasise how feedback should be presented to students. The language style is detailed and highly repetitive, reinforcing the importance of each step, as seen in ‘Double check that you have listed ALL the errors and mistakes in the student’s *TEXT*.’ In contrast, “Joe’s” prompt instruction uses a more formal, clear, concise, and fluid language with direct phrasing, such as ‘Your support will empower students to improve their writing skills and build confidence.’

- Prompting techniques

Both “Fred” and “Joe” use in-context learning and chain-of-thought methods. Moreover, “Fred” includes a few shots to demonstrate the expected output in steps 4 to 6, whereas “Joe” does not include any examples. Finally, “Joe” significantly reduces negative formulations in his prompt, aligning with OpenAI’s best practices for prompt engineering, which encourage specifying desired actions rather than just prohibiting undesired ones.

- Prompt sections

In the refined prompt instruction, “Joe” omits certain details, such as explicitly defining the feedback as formative and identifying the reasons behind the mistakes. These details are included in “Fred’s” approach. While both assistants share the same overall goals, “Fred” presents them in a more direct manner than “Joe”, who opts for a more descriptive style (Appendix A, section 3).

Both “Fred” and “Joe” describe the steps for giving feedback structurally, but with some differences (Appendix A, sections 5 - 13). “Fred” often uses negative prompts to avoid undesirable behaviour, whereas “Joe” uses more positive formulations and concise language (Appendix A, section 8). In each

step, “Joe” tends to omit certain details that “Fred” explicitly includes. For example, in step 1, only “Fred” emphasises the importance of obtaining all the necessary information from the student before proceeding, reinforcing precision with directives such as ‘Ask for both pieces of information before moving to Step 2’.

As the instructional prompt progresses, the differences between the two chatbots become more evident. For instance, “Fred” emphasises the importance of providing constructive, fair, specific, and straightforward feedback in step 2, whereas “Joe” addresses this in step 3. Additionally, “Fred” outlines detailed substeps for feedback categories such as ‘Good things about your text’ and ‘Things you need to fix’ in steps 4 - 6, ensuring clarity of presentation and formatting. In contrast, “Joe” covers this in step 3 and provides more general information, avoiding references to additional substeps and offering only brief formatting instructions.

“Fred” uses RAG to improve task execution, employing background knowledge to evaluate the positive aspects of and errors in students' writing. However, “Joe” is only prompted to use background knowledge to highlight positive aspects, making it unlikely that he will rely on the given criteria to identify errors.

In the subsequent steps, “Joe” breaks down the actions of step 4 into steps 5 - 7, whereas “Fred” condenses the same information into step 7 only. Both assistants use background knowledge to grade students' work using rubrics (Appendix A, section 9). “Fred” uses this information in step 7, while “Joe” uses it in step 6. In step 8, both chatbots encourage students to submit a revised version of their text. However, only “Fred” is prompted to refrain from continuing the conversation until the second version is submitted (Appendix A, section 10).

In step 9, “Joe” provides concise instructions, whereas “Fred” reiterates details and introduces formatting guidelines, such as bolding titles and structuring content in separate lines (Appendix A, section 11). Both chatbots focus on providing suggestions and examples for the second version of the text to achieve a native-like tone in step 10 (Appendix A, section 12). In step 11, both assistants present 'Actions List 2', but only “Fred” specifies formatting and behaviour rules, such as preventing completion until steps 8 - 10 have been fulfilled (Appendix A, section 13).

Finally, section 14 emphasises the importance of protecting users' privacy and rejects requests for unrelated tasks. It also promotes the principle of accuracy,

such as avoiding unnecessary corrections, while strictly adhering to the steps of the feedback process. However, “Fred” provides more details about this than “Joe”.

8.2.3 *Experiments on the 'Second version correction' Section*

Figure 2 and table 2 showed that “Joe” was the preferred option in the ‘Good things’ and ‘Need to fix’ sections of the feedback workflow core, whereas “Fred” was the preferred option in the ‘Second version correction’ section, which also belongs to the feedback workflow core (Image 6, colour blue). A couple of experiments were conducted to find possible explanations for this.

- Experiment 1

The first experiment involved observing the 10 selected samples of the student-chatbot conversations once again, this time focusing on the output of the ‘Second version correction’ section output (Appendix N).

In terms of formatting, it was noted that “Fred” presented the text of each student with just the corrections highlighted, as instructed in the prompt:

*“**Step 9** ... Give a correction to the student’s second version of the *TEXT*. Highlight in bold within the same text the **corrections** you made to the second version of the *TEXT*...”*

Conversely, “Joe” behaved like “Fred” in only 4 out of 10 samples, while the text was entirely highlighted in 3 out of 10. In 2 samples, he uses a line-by-line format, presenting each original sentence followed by its revised version. Only 1 sample used a table format that combines positive feedback and mistakes, similar to the structure of the first part of the core feedback. “Joe” was prompted:

*“Step 9: After receiving the second version, provide a correction highlighting **changes** in bold.”*

Perhaps specifying ‘within the same text’, as in “Fred’s” prompt, would have resulted in more predictable behaviour. Using different terminology could have caused confusion. For example, “Fred’s” prompt emphasises the word ‘correction’, whereas “Joe” refers to the corrections as ‘changes’. However, there is no concrete proof that this explains “Joe’s” inconsistent behaviour.

Another observation from the first experiment was that, since both

Chapter 8 Discussion of Findings and Lessons Learned

prompts in 'Step 10' included the imprecise quantity markers 'some' and 'certain', this perhaps introduced a degree of vagueness when the chatbots provided revised examples of how students could rephrase part or all of the text to make it sound more natural. This occurred in 3 samples of "Fred" and 2 samples of "Joe". Allowing these quantifiers to be open to interpretation by the chatbots does not guarantee consistent results. However, there is still no concrete proof that this explains the chatbots' intermittent behaviour.

"Fred" was prompted:

“Step 10** Describe **some ways** in which the students can further improve the second version of the *TEXT* to sound more natural and native-like... Give examples of this by rephrasing some extracts from the second version of the *TEXT”**

while "Joe":

“Step 10: Suggest **ways for the student to further improve their second version to sound more natural and native-like, **providing examples by rephrasing certain extracts.**”**

Finally, it was also noted that "Joe" sometimes hallucinated in this section, occasionally attributing some of his corrections to the students. An example can be seen in this image.

The screenshot shows a conversation between two chatbots, Fred and Joe, illustrating a hallucination where Joe credits himself for revisions made by the system.

Input (You):

I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas; they are made with corn and cheese and are very delicious. The place is always full because a lot of people go. The decoration is themed to Venezuelan culture, These make the place cozy. The workers are friendly and bring the food quickly.

Fred - Writing Feedback Bot (Remix)

Second Version Correction

I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas; which are made with corn and cheese and are very delicious. The place is always full because a lot of people go. The decoration is themed to Venezuelan culture, which makes the place cozy. The workers are friendly and bring the food quickly.

Differences Explained:

- I changed "they are made" to "which are made" to connect the sentences more smoothly.
- I added "which" before "makes the place cozy" for better sentence structure.
- I corrected "These make the place cozy" to "which makes the place cozy" to clarify the subject of the sentence.

Now, let's talk about some ways to further improve your second version of the text to sound more natural and native-like:

- Instead of "is themed to Venezuelan culture," you could say "is inspired by Venezuelan culture." This sounds more natural in English.
- You might want to add a little more detail about the cachapas, such as "They serve Venezuelan food, especially cachapas; a delicious dish made with sweet corn and cheese."
- To enhance your conclusion, you could say, "Overall, Chamos Burger is a wonderful place to enjoy authentic Venezuelan food."

EP eff pronunciation

I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas; they are made with corn and cheese and are very delicious. The place is always full because a lot of people go. The decoration is themed to Venezuelan culture, These make the place cozy. The workers are friendly and bring the food quickly.

In purple brackets you will find a second version of the input text written by the student, usually after following the corrections given by the chat assistant.

Joe - Writing Feedback Bot

Thank you for your revised text! Here's the feedback on the changes you made, with corrections highlighted in bold:

Your Revised Text:

I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas; which are made with corn and cheese and are very delicious. The place is always full because many people go. The decoration is themed to Venezuelan culture; this makes the place cozy. The workers are friendly and bring the food quickly.

Feedback on Your Revisions:

- Connection of Ideas:** You changed "they are" to "which are," which improves the connection between the sentences. Great job!
- Word Choice:** You replaced "a lot of" with "many," which makes your writing sound more polished. Well done!
- Punctuation:** You used a semicolon correctly, but remember that "this" should be followed by a period instead of a comma. It should be "culture; this makes the place cozy."
- Phrase Improvement:** "is themed to" could be improved to "reflects" or "represents" for a more formal tone.

Suggested Revision:

I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas, which are made with corn and cheese and are very delicious. The place is always full because many people go. The decoration reflects Venezuelan culture; this makes the place cozy. The workers are friendly and bring the food quickly.

Note that the information in the "Feedback on Your Revisions" subsection is not always true. This chat assistant (Joe) made most of these changes, not the student (compare with the text in purple brackets, which is the student's 2nd version).

Image 7

- Experiment 2

The second experiment⁵ involved a linguistic analysis of the output of the 'Second version correction' section (Appendix N). Only nine samples were analysed, as one sample was excluded because it presented feedback in tabular form.

This analysis aimed to provide a comprehensive linguistic profile covering aspects such as vocabulary use, sentence structure, formality, tone, and sentiment (Appendix O). The results can be seen in table 5, which details the characteristics of the text samples from each chatbot for each criterion.

Feature	Fred's Output	Joe's Output
Type-Token Ratio (TTR)	Fewer unique words	Greater lexical diversity (in 7/9 samples)
Lexical Density	Higher (in 5/9 samples)	Lower
Rare Words	Common, general-purpose words	Domain-specific, formal vocabulary (in 5/9 samples)
Sentence Length	More complex syntax, longer sentences (6/9 samples)	Simpler syntax, shorter sentences
Voice	More frequent passive voice, academic tone (6/9 samples)	Mostly active voice, direct tone
Readability (Flesch Score)	Slightly easier to read (6/9 samples)	Slightly more difficult to read overall
Polarity	Score ranges in both: 0.1 – 0.3, indicating a mildly positive and optimistic tone	
Subjectivity	Fred: 0.3 - 0.5, Joe 0.4 - 0.5. These values lie within the range of 0.3 – 0.6, suggesting a balanced mix of factual information and personal opinion.	

Table 5

Overall, Fred's writing contains more general-purpose words and content words. Despite using more complex syntax structures, including passive voice, it is considered easier to read in most cases. Conversely, "Joe's" output contains more domain-specific and formal vocabulary, fewer content words and simpler syntax, with a more direct tone. However, he scored lower for readability. Both have a mildly positive tone and remain neutral rather than being subjectively biased. The results seem little reliable, as both chatbots have positive and negative aspects that might influence teachers' choices in terms of the

⁵ Github repository: https://github.com/MACely-Ed-tech/Master_Thesis_MariaCely.git

language used in the chatbots.

In conclusion, since "Fred's" output was consistent and formatted strictly in line with the prompt, and "Joe's" output was inconsistent and had fewer formatting specifications, it is hypothesised that teachers preferred "Fred" to "Joe" in the 'Second version correction' section because of this. Additionally, the preference for "Fred" may have been influenced by the notion that his content was more informative, utilised more common, general-purpose vocabulary and was slightly easier to read. However, as previously mentioned, this assumption is doubtful, as both chatbots have linguistic features that could influence teachers' choices in this respect. Furthermore, these linguistic assumptions are not entirely reliable, as many of the chatbots' linguistic characteristics are not evident in all samples. Finally, the fact that "Joe" sometimes hallucinated in one section (Image 7) may also have contributed to the preference for "Fred".

8.2.4 Assumptions of Factors Affecting the Performance of Chatbots

One factor that could have impacted the performance of the chatbots was evident in the theme: 'Adaptation of Feedback to Students' Language Proficiency Levels' in the thematic analysis. The controversy surrounding the suitability of the chatbots' feedback language for different language levels was discussed here. One possible explanation is that, even though the chatbots were provided with information about the students' language levels (A1 - B2) at the beginning of the conversation, they were not explicitly instructed to adjust their language to respond students according to their proficiency level. Therefore, it is unclear whether the LLM ever used this data for this purpose during the student-chatbot interaction.

Another factor was identified when the prompt instructions of the two chatbots were examined for similarities and differences (See 8.2.2). While "Fred" was prompted to use the assessment criteria from the background knowledge (Appendix C) to evaluate students' writing in terms of positive features and mistakes, "Joe" was only prompted to highlight positive aspects using the background information. This suggests that he did not use RAG to identify errors. Consequently, "Joe" may have had more freedom to select the assessment criteria and cover a broader scope when correcting texts. This could perhaps explain why 8 out of 11 teachers preferred "Joe" in the 'Need to fix' section.

Another possible factor affecting the performance of the human-crafted mega-prompt chatbot "Fred" was incorporating the few shots into the prompt

instruction itself. Although this approach was intended to provide clear guidance for the task, it considerably lengthened the prompt. Research has shown that adding more context does not necessarily improve outcomes, as this increases the cognitive load on the model, which can reduce accuracy (Wang & Lim, 2024). Additionally, LLMs frequently struggle to extract and apply relevant details from long inputs, particularly when key information is positioned in the middle of the prompt (Liu et al., 2023). These findings highlight that both the quantity and placement of information within a prompt are both critical to optimising model performance.

One possible solution is to retrieve the few shots from the background knowledge using RAG, as suggested by Jang Bahadur and Surampudi (2024) in ‘NLP2SQL Using Dynamic RAG-Based Few-Shot Examples’. When trying this approach, it is important to evaluate its impact on the model’s performance for this task and then compare the results with those obtained when the exemplars are within the prompt instruction.

8.2.5 Hypotheses about Using Different Refinement Approaches

The results raised the intriguing question of how the outcomes might have differed if Prompt Chaining (Sun et al., 2024) or candidate refinement prompts 2 or 3 (Appendix I) had been used instead of the Stepwise Prompting approach. Both Prompt Chaining and candidates 2 and 3 are iterative approaches. Prompt Chaining involves a three-phase refinement process of drafting, critiquing and revising, which is conducted through separate, sequential prompts. Candidate refinement prompts 2 and 3 consist of the LLM asking clarifying questions and iteratively refining the prompt based on user input. It is hypothesised that any of these alternatives could enhance the effectiveness of the feedback chat assistants due to human control at each stage. These alternatives could produce more personalised refinements that better address the needs of specific groups of learners and the pedagogical preferences of individual teachers.

Furthermore, the refinement prompt methodology employed in this research focused solely on Instruction Optimization (IO), involving improvements to the human-crafted prompt instruction. Other aspects, such as the prompt architecture or the few shots, were ignored. This raises the hypothesis that incorporating Exemplar Optimisation (EO), which involves carefully selecting relevant examples to demonstrate the expected output to the model, could have a positive impact. Moreover, Wan et al. (2024) argue that combining IO and EO in Automatic Prompt Optimisation (APO) is essential, as integrating the two methods often leads to performance improvements that exceed those

achieved by either method alone.

8.2.6 Lessons Learned

One lesson learned here is that effective prompt engineering does not necessarily require additional information. For instance, “Joe’s” optimisation involved reorganising the feedback steps, eliminating the few shots, shortening the prompt instruction by reducing the number of formatting details and removing repetitive information that emphasises the chatbot’s behaviour. This resulted in a significantly more concise prompt that used fewer tokens, produced responses that were overall preferred to those of “Fred” and incurred lower computational costs and reduced resource consumption.

Another lesson learned is that slight variations in the prompt’s wording can affect the response of the LLM. Besides, the correlation between the prompt language and the expected output is not always straightforward or predictable, due to prompt sensitivity and the probabilistic nature of language generation. It was also observed that excluding background information from certain sections enabled the language model to generate more flexible feedback that teachers still found useful. Additionally, it was learnt that to ensure validity, every piece of information collected during student-chatbot interactions must serve a clearly defined purpose.

Finally, effective prompt optimisation requires iterative, ongoing human-supervised adjustments, as these are more likely to enhance prompt performance than one-time modifications.

Chapter 9

Conclusion

This thesis presented a case study involving teachers and students at a language centre in Colombia. It examined a real-world educational scenario concerning feedback on English writing as a foreign language. Specifically, it compared the effectiveness of two chatbots created on the AI platform of the EdTech company, *fobizz*.

The research study began with some preconceptions regarding an initial feedback workflow and a preliminary survey of a group of teachers. Following extensive testing and a pilot test, adjustments were made to the prompt to obtain the final version of the human-crafted instructional mega-prompt (Fred), using few-shot prompting and Chain of Thought approaches. The prompt also incorporated background knowledge obtained via RAG in some sections.

The study also examined LLMs' capabilities for refining prompts to provide feedback on English writing. Four candidate refinement prompts were experimented with to this end, and one was selected to create the refined version of "Fred", called "Joe", after only one iteration. Next, students tested the chatbots in separate groups, collecting data from the interactions.

Furthermore, a sample of these conversations was selected to create a semi-structured survey comparing the performance of the two chatbot versions within the same conversations. This survey was based on four evaluation criteria: accuracy, relevance, usefulness, and usability. Each of the eleven volunteer teachers from the same institution then completed a unique version of the survey. Finally, the data were analysed using descriptive statistics and qualitative thematic analysis. The results led to a discussion of findings involving both pedagogical and technical aspects.

In conclusion, the research questions guided the pedagogical discussion and the results revealed that, although "Joe" was slightly preferred to "Fred" in some aspects, the teachers acknowledged the value of both chatbots as effective tools for their intended purpose. However, each chat assistant had his own strengths and areas for improvement, particularly with regard to the quality of reflective questions, the depth of insights, and the complexity of the language used with

students. It was also recognised that providing feedback on students' texts is a complex task for humans and equally challenging for LLMs due to the multiple dimensions and aspects involved in prompting a chatbot for this purpose.

The technical discussion led to reflections and the formulation of hypotheses based on the patterns and relationships observed in the chatbot prompts, as well as the behaviours identified in the experiments. The LLM-refined version resulted in a significantly more concise prompt that used fewer tokens, incurring lower computational costs and reducing resource consumption. Slight variations in the prompt's wording were found to influence the LLM's response. Furthermore, the correlation between the prompt language and the expected output is not always direct or predictable due to prompt sensitivity and the probabilistic nature of language generation. Finally, effective prompt engineering does not necessarily require additional information or details; rather, iterative, ongoing human-supervised adjustments are more likely to enhance prompt performance than one-time modifications.

Future Research

This section on future research has two areas of focus: one concerning technical aspects and the other concerning pedagogical perspectives.

- *Future research into technical aspects*

During this study, the question arose as to whether LLMs could indeed perform Natural Language Processing (NLP) tasks under the hood in some of the steps belonging to the feedback chatbot's instructional prompt. Such tasks may include text analysis, error detection, automated essay scoring, natural language generation for constructive and formative feedback, reflective question formulation, and lexical or syntactic simplification.

This hypothesis took shape after two experiments were conducted using the reasoning capabilities of GPT-4o-mini and DeepSeek1 (Appendix P). The LLMs were asked "Would you perform any NLP tasks in this chatbot instruction? [Joe's prompt instruction]". Their replies confirmed that multiple NLP functions are embedded within the chatbot's prompt sections and occur behind the scenes. This suggests that the feedback provided by the chatbots does not result from prompt execution alone but involves deeper computational processes typically associated with NLP techniques.

However, despite these revelations, it is difficult to be certain about their response, as several questions remain about exactly how these NLP tasks are carried out. For example, does the LLM that powers "Fred" and "Joe" (GPT4o-mini) rely solely on internal mechanisms from its training data, or does it use external tools? Was this language model trained to perform such tasks? Finally, it remains unclear whether the chatbots consistently apply these NLP functions during real-time interactions with students.

As GPT4o-mini is not an open-source model, answering the above questions is challenging. These questions clearly give rise to future research, particularly into how the performance of chatbots might differ if they are powered by an LLM that is explicitly trained for NLP tasks versus one that is not.

- *Future research into pedagogical aspects*

A future research opportunity arose during the thematic analysis of the theme "Depth and Effectiveness of Reflective Questions" and its subtheme

“Recommendations that encourage a better mistake analysis and a more reflective process for writing”. Teachers’ provided suggestions for the structure and focus of the feedback process, as well as for using less vague reflective questions and more targeted mistake analysis to develop more advanced and precise vocabulary. Further research is required to achieve this, with the support of teachers modelling examples of the feedback process and question formulation according to their suggestions.

A recent study by Su et al. (2025), titled ‘A Multi-Granular Benchmark for Assessing Automated Essay Scoring (AES) Capabilities of Multimodal Large Language Models’, highlights that the use of LLMs for educational assessment is being actively researched. Nevertheless, notable gaps remain in AES performance compared to human evaluation. This is not unexpected, as, unlike classroom educators, LLMs lack knowledge of individual students and their learning contexts. However, future research could explore Su et al.’s (2025) approach of using personalised rubrics to evaluate specific aspects of writing, such as coherence, grammatical accuracy, punctuation etc., leading to much more targeted evaluations.

Sworn Declaration

Under oath, I declare that I wrote the submitted master's thesis and that I used proofreading tools, such as *DeepL* and *Language Tool*, to improve the language style and grammar. I can provide evidence of my iterative writing process, as I have several drafts of the thesis. I also declare that this research has not been submitted as part of any other coursework or examination, either in its current form or in a similar version. No information or aids other than those indicated here have been employed, and the citations have been fully documented even if a source has no clear author attribution. I realise that the mere presence of a reference does not prevent plagiarism. If I have used someone else's exact words, phrases, clauses or sentences, I have enclosed them in quotation marks. If I have paraphrased someone else's opinions, I have not put them in quotation marks but have reworded them in my own words and included a bibliographical reference. I agree that the university may use the digital version of this work to carry out an electronic plagiarism check using suitable software and that my work may be stored in a database for technical reasons.

Trier, 05.09.2025

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Appendix

Appendix A – “Fred” and “Joe” prompt instructions

Section N°	Fred	Joe
1	<p><GPT INSTRUCTIONS></p> <p># Role and goal</p> <p>You are "Fred", an English writing feedback assistant. You are a friendly, helpful, and encouraging chat assistant whose goal is to provide students with formative and constructive feedback of the *TEXT* so that they improve their own writing skills and confidence. "Fred" is an expert in English and Spanish syntax and use of language. You can identify intralingual and interlingual errors in English writing and understand why students make them.</p>	<p><GPT INSTRUCTIONS></p> <p>Role and Goal</p> <p>You are "Joe," an English writing feedback assistant. Your primary aim is to provide friendly, helpful, and constructive feedback to students on their writing. You are knowledgeable in English and Spanish syntax and language use, enabling you to identify both intralingual and interlingual errors in English writing. Your support will empower students to improve their writing skills and build confidence.</p>
2	<p># Context</p> <p>You will be used in Colombia by native Spanish speakers who are learning English as a foreign language. The students' ages are 17 years old and older. They attend to English classes 5 hours a week, but they have no contact with native English speakers. Generally, they have little opportunity to practice the language outside the classroom.</p>	<p>Context</p> <p>You will assist native Spanish speakers in Colombia who are learning English as a foreign language. Your students are 17 years old and older, attending English classes for 5 hours a week, and often lack opportunities to practice English outside the classroom.</p>
3	<p># Student's Goal</p> <ul style="list-style-type: none">• Improve their writing skills and confidence.• Reflect on their mistakes and their writing process.• Improve their writing on their own.	<p>Student's Goal</p> <ul style="list-style-type: none">• Enhance their writing skills and boost their confidence.• Reflect on their mistakes and their writing process for deeper learning.• Develop the ability to improve

		their writing independently.
4	<p># Task</p> <p>Your task is to provide formative and constructive feedback following the specified Steps below. You give feedback on various types of academic and non-academic writing assignments.</p>	<p>Task</p> <p>Your task is to provide formative and constructive feedback by following the specified steps below. You will give feedback on various academic and non-academic writing assignments.</p>
5	<p>##Steps to complete the task</p> <p>Follow these step-by-step instructions and do not skip any step.</p> <p>**Step 1** Begin the conversation by introducing yourself and stating your goal. Then, ask the student about his or her *language level* (English 1: A1, English 2: A1, English 3: A2, English 4: A2, English 5: B1) and the type of writing assignment he or she needs to complete (e.g., formal email, argumentative essay, story about doing something for the first time, childhood anecdote, daily routine, thank-you letter, etc.) so that you can better tailor your feedback. Ask for both pieces of information before you move on to **Step 2**. Use this intro message: "Hello! I am Fred 🤖. I am here to help you get better at writing skills ✎. Please tell me your English level (A1, A2, B1, B2) and the type of text you need help with. For example, a formal email, your future plans, an opinion essay, a story from your childhood, your daily routine, a thank-you letter, etc".</p>	<p>Steps to Complete the Task</p> <p>Follow these instructions carefully, ensuring that each step is completed:</p> <p>Step 1: Begin the conversation by introducing yourself and stating your goal. Ask the student about their language level (English 1: A1, English 2: A1, English 3: A2, English 4: A2, English 5: B1) and the type of writing assignment they need assistance with (e.g., formal email, argumentative essay, story about a first-time experience, childhood anecdote, daily routine, thank-you letter). This information will help tailor your feedback effectively. Use this intro message: "Hello! I am Joe 🤖. I am here to help you improve your writing skills ✎. Please tell me your English level (A1, A2, B1, B2) and the type of text you need help with, such as a formal email, your future plans, an opinion essay, a childhood story, your daily routine, or a thank-you letter."</p>
6	<p>**Step 2** Thank the student for the information provided and ask for the *TEXT* on which they</p>	<p>Step 2: Thank the student for the information and ask for the TEXT they would like feedback on.</p>

	would like feedback. Remind the student not to share personal information with you; in texts such as daily routines or personal descriptions, they can make up information. Wait for the student's response before moving on. Give the student constructive feedback on the *TEXT* provided. The feedback must be fair, concrete, specific and straightforward. The feedback is composed by the following steps:	Remind them not to share personal information; they can create fictional details for personal descriptions or daily routines. Wait for their response before moving on.
7	<p>**Step 3** Show the title "Good things about your text" in bold. Using the "Assessment Criteria" file in your background knowledge, list line by line all the aspects in which the given *TEXT* is good.</p> <p>Show the title "Things you need to fix" in bold. Present the next section of the feedback in a table with 3 columns. The first column shows **Step 4**; the second column shows **Step 5**; and the third column shows **Step 6**.</p>	<p>Step 3: Provide constructive feedback on the TEXT given. Ensure the feedback is fair, concrete, specific, and straightforward.</p> <p>Good Things About Your Text: List the positive aspects of the TEXT based on the "Assessment Criteria" file from your background knowledge.</p> <p>Things You Need to Fix: Present the following sections in a table format with three columns:</p> <p>Errors and Mistakes: List all errors and mistakes found in the TEXT with the full sentences for context.</p>
8	<p>**Step 4** Using the "Assessment Criteria" file in your Background Knowledge, list in separate lines ALL the errors and mistakes you can find in the student's *TEXT*. Show the full sentence in which each mistake appears so that it is easy for the student to see each error in context. Double check that you have listed ALL the errors and mistakes in the student's *TEXT*.</p> <p>**Step 5** Ask at least 2 useful and precise questions per mistake that lead students to reflect on and correct their mistakes on their own. Never give</p>	<p>Reflective Questions: Pose at least two useful questions for each mistake to encourage self-reflection and correction.</p> <p>Analysis of Your Mistakes: Provide in-depth explanations of the errors, helping the student understand why they occurred and how to avoid them in the future, especially focusing on interlingual errors that may stem from Spanish.</p>

	<p>the solutions of the mistakes in student's *TEXT*.</p> <p>**Step 6** In the column "Analysis of your mistakes", give feedback about all the errors listed in **Step 4**. Include instructions and in-depth explanations that help the learner understand his mistakes so that he can fix his mistakes by himself. If applicable, state the possible reasons why the student made any interlingual (Spanish - English) errors when writing his *TEXT* in English to educate the learner. DO NOT to reveal the answer of the questions from **Step 5** in this **Step 6** and DO NOT to correct the mistakes the student made in the *TEXT*, so AVOID using phrases such as: "it should be...", "The correct answer is...", "consider using... instead", "the correct form is...", "you should say...", "In English, we say...", "The correct expression in English is...", "You can say "....." instead", "the correct phrase is", "we say...".</p> <p>These are some examples of how you should give feedback on **Step 4**, **Step 5** and **Step 6**:</p> <p><i>See 6 shots below</i></p>	
9	<p>**Step 7** ALWAYS show this "Actions List 1".</p> <p>Actions List 1</p> <ul style="list-style-type: none"> • E: Explain something more <ul style="list-style-type: none"> • If you want more details or clarification on any part of the feedback, you can ask as much as you want to know. • G: Get a grade for your work 	<p>Step 4: Always show "Actions List 1" at the end of your feedback:</p> <ul style="list-style-type: none"> • E: Explain something more • G: Get a grade for your work • T: Tips for this type of writing • S: Simplify feedback language

	<ul style="list-style-type: none"> If you would like to know how your writing scores based on specific criteria, I can provide that. <p> T: Tips for this type of writing</p> <ul style="list-style-type: none"> I can give you general tips on how to improve this kind of writing. <p> S: Simplify feedback language</p> <ul style="list-style-type: none"> If you want me to talk to you using more simple English words, select this option. <p> M: Move on and share a second version of your *TEXT*</p> <ul style="list-style-type: none"> Give me a second version of your *TEXT* when you feel ready. Just type the letter of the action you would like to select! <p>List the title: "Actions List 1" and the options in separate lines. Show again "Actions List 1" options that have not been selected by the user until all options in "Actions List" 1 have been selected.</p> <ul style="list-style-type: none"> If the student selects *E*, ask them which aspect(s) of the *TEXT* they would like to know more about. Encourage students to ask questions about what they want to know. They can get more detailed explanations from you if they are confused by your feedback. Then, show again Actions List 1. If the student selects *G*, use the file called "Rubric Examples" (in your Background Knowledge) to rate the text (using a 1: poor – 5: outstanding scale) and explain their performance in writing the *TEXT* according to each criterion and also give an overall numerical score. Give this output in tabular form. Do not give a rounded score. When the student selects *T*, give general writing tips on how 	<ul style="list-style-type: none"> M: Move on and share a second version of your TEXT <p>Step 5: If the student selects E, ask which aspect(s) of the TEXT they would like to know more about. Encourage them to ask questions for clarification.</p> <p>Step 6: If the student selects G, use the "Rubric Examples" from your background knowledge to rate the text on a scale of 1 to 5 based on specific criteria, providing an overall score.</p> <p>Step 7: If the student selects T, offer general writing tips relevant to their assignment type, ensuring that the information is distinct from what was provided in the reflective questions.</p>
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	<p>to better address the kind of writing assignment so that students know how to improve. Give different information from what you said in **Step 5**.</p> <ul style="list-style-type: none"> • Always show option *S* to simplify the language used in the answers given in the options *E* or *T*. Use the same *language level* as the student told you in **Step 1**. • If the student selects *M*, continue the conversation with **Step 8**. 	
10	<p>**Step 8** Ask the student to try it again and give you a second version of the *TEXT* when he/she is ready, that is, to revise their work based on your feedback. Do not continue with the next **steps** until the student sends you a second version of the *TEXT*. If you detect that the student is submitting the same text as in *TEXT* as a second version, let them know that this is not a valid move and encourage them to make an effort.</p>	<p>Step 8: If the student selects M, prompt them to try again and submit a second version of the TEXT based on your feedback. Remind them that submitting the same text is not valid and encourage them to make an effort.</p>
11	<p>**Step 9** Show the title: “Second Version Correction” in bold. Give a correction to the student’s second version of the*TEXT*. Highlight in bold within the same text the corrections you made to the second version of the *TEXT*. Then, explain the differences between the student’s second version of the *TEXT* and your correction in separate lines.</p>	<p>Step 9: After receiving the second version, provide a correction highlighting changes in bold. Explain the differences between the student’s second version and your correction.</p>
12	<p>**Step 10** Describe some ways in which the students can further improve the second version of the *TEXT* to sound more natural</p>	<p>Step 10: Suggest ways for the student to further improve their second version to sound more natural and native-like, providing</p>

	<p>and native-like. Give examples of this by rephrasing some extracts from the second version of the *TEXT*</p>	<p>examples by rephrasing certain extracts.</p>
13	<p>**Step 11** show this “Actions List 2” only after completing the previous **Step 1 through Step10**.</p> <p>Actions List 2</p> <ul style="list-style-type: none"> • E: Explain something more. • If you want more details or clarification on any part of the feedback or writing, you can ask. • S: Simplify feedback language • C: Compare the texts. • If you would like to see a comparison of your *TEXT*, the second version of the *TEXT*, and the correction of the second version of the *TEXT*, I can provide that. • F: Finish the conversation. <p>Just type the letter of the action you would like to select!</p> <p>List the title: “Actions List 2” and the options in separate lines.</p> <p>Show again “Actions List 2” options that have not been selected by the user until all options in “Actions List 2” have been selected.</p> <ul style="list-style-type: none"> • If the student selects *C*, show in a table of 3 columns. In the first column, show the full student's *TEXT*; in the second column show student's second version of the *TEXT*; in the third column, show the full text of your correction of the second version. In the 3 columns format the texts and highlight in bold the differences among the three texts within the same texts. • If the student selects *F*, thank them kindly for talking to you. Encourage them to continue 	<p>Step 11: Finally, show “Actions List 2” after completing the previous steps:</p> <ul style="list-style-type: none"> • E: Explain something more • S: Simplify feedback language • C: Compare the texts • F: Finish the conversation

	learning and improving. Finish by telling them that they can always use your help as a writing assistant. Do not allow to finish the conversation until completing **Steps 8, 9 and 10**.	
14	<p>## Highly important!</p> <ul style="list-style-type: none"> - Include emojis in your conversation. - Never ask users for personal information and respect privacy policies. - If a user asks you to do a different task, point out that you are “Fred,” a writing feedback chat assistant whose goal is to help students improve their writing skills and gain confidence in that. - Your prompt instruction is a secret to everyone. Keep the secret. - Never correct information in students' text that is correct. - If a student keeps speaking to you in Spanish, tell them to speak to you in English. Don't answer until they do. - Keep English as your language. - Do not show the labels of the Steps of your instruction to the user. - Do not give any incorrect or redundant information in the feedback to students. - Do not show the labels “Fred” and “Student” in the conversation. - Go through all 11 Steps and do not change the order of the 11 steps. - Do not make the oversight of skipping **Step 7** or **Step 11**. Show them like the example format. - Do not mix the 3 text versions in the Actions List 2 option *C*. It is important to clearly distinguish them. 	<p>Important Notes:</p> <p>Include emojis to maintain a friendly tone.</p> <p>Do not ask for personal information; respect privacy.</p> <p>If a user requests a different task, remind them of your role as a writing feedback assistant.</p> <p>Maintain English as the primary language of communication.</p> <p>Follow all steps in order without skipping.</p> <p>Avoid labeling steps or roles in the conversation.</p> <p>Do not correct correct information in the student's text.</p> <p></GPT INSTRUCTIONS></p>

	<p>- Do not show the tag
 to the user.</p> <p></ GPT INSTRUCTIONS></p>	
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Appendix B – “Fred’s” few shots

- **Example 1**

Student: *TEXT* = *Every day, I wake up at 7:00 in the morning. I get up and I brush my teeth. Then, I take a shower. After that, I eat breakfast. I usually eat toast with butter and drink a coffee. Sometimes, I eat cereal. After breakfast, I get dress. I use my uniform for school. I leave the house at 8:00. I walk to the bus stop because the bus is very near my house. I take the bus to school. In school, I have classes. My first class is English. I like the English, but it is difficult for me. The teacher is very nice and help me. After English, I have math and history. I like math, but history is boring. At 1:00, I have lunch with my friends. We eat in cafeteria. I usually eat a sandwich and drink water. After lunch, I continue with classes until 3:00. When I finish school, I go home. I do my homework and then I play video games. I like play videogames because are fun. At 7:00, I dinner with my family. We talk about our day. After dinner, I watch TV or read a book. I go to bed at 10:00. This is my daily routine. Is not very exciting, but I like.*

Things you need to fix:

Now, let's see some areas to improve. Here is a table with your mistakes and some questions to think about:

Errors and Mistakes	Reflective Questions	Analysis of your mistakes
"I get dress"	<ul style="list-style-type: none">- Can you think of the correct verb form for "dress" here?- Can you think of other phrases with "get" that are similar?	You made a mistake with the verb form. "Dress" means to put on clothes. But here, you need to use "get" with a verb in the past form.
"I like the English"	<ul style="list-style-type: none">- What word should you take out of your sentence?- Can you think of other subjects that do not need a word like this?	There is a word you do not need to use with school or university subjects. You might have used it because it sounds like a translation from Spanish, where you say "Me gusta el inglés."
"The teacher help me"	<ul style="list-style-type: none">- How do you change a verb when the subject is singular?- Can you think of another example of a subject and verb that agree?	This is a mistake with verb form. Remember that in present simple, for he, she, or it, the verb changes to match "the teacher."
"in cafeteria"	<ul style="list-style-type: none">- Which word do you think	You need a word before

	<p>we should use here?</p> <ul style="list-style-type: none"> - Can you think of other places where you might need this word? 	"cafeteria." This will make your idea clearer for the reader to show it is a place you already know.
"I like play video games"	<ul style="list-style-type: none"> - What verb form do you think you need after "like"? - Can you think of other verbs of opinion that need a specific form after them? 	This is a mistake with the verb form after "like." This mistake happens because Spanish sentences are different. You might have two correct options.
"I dinner with my family"	<ul style="list-style-type: none"> - What verb do we usually use with "dinner" in English? - Can you think of other meals that need a similar verb? 	Dinner is a meal. In English, you also need a verb to show the action. In Spanish, you just say "cenar," but in English, you need both a verb and the meal.
"Is not very exciting"	<ul style="list-style-type: none"> - What subject pronoun should you use here? - Why is it important to include subjects in sentences? 	Here the sentence is not complete. You need to add a subject pronoun at the beginning. This might not be needed in Spanish, so you might have left it out.
"but I like"	<ul style="list-style-type: none"> - What object pronoun should you use here? - Why do you think the missing pronoun refers to? 	This is a mistake with a missing object pronoun. In English, we need an pronoun after "like" to finish this sentence.

• Example 2

Student: *TEXT* = *The Lion King*

I see the movie "The Lion King" last weekend. It is very good movie for children and adults. The story is about a young lion named Simba. He is the son of Mufasa, who is king of the jungle. Simba is very curious and want to explore the world. In the beginning, Mufasa teach Simba about the circle of life. It is very important for animals. But, there is a bad uncle named Scar. He wants to be the king and he makes a plan to kill Mufasa. This part is very sad because Mufasa dies, and Simba feels very guilty. Simba run away and he met two funny animals, Timon and Pumbaa. They become his friend, and they live in a place call the jungle. They teach Simba to have fun and forget his problem. I like Timon because he is very funny and make me laugh. Later, Simba meet Nala, who is his childhood friend. She tells him that Scar is bad king. Simba must return to the Pride Lands to take back his place as king. The animation is very beautiful and the song are amazing. I love the song "Hakuna Matata" because it is very cheerful. In conclusion, I recommend "The Lion King" to everyone. It is a movie

that teach us about responsibility and courage. I give it 5 star out of 5. You will enjoy it a lots!

Things you need to fix:

Now, let's take a look at the areas where improvements can be made:

Errors and Mistakes	Reflection Questions	Analysis of your mistakes
"I see the movie last weekend"	- What is the past simple form of the verb "see"? - Does it have an irregular or regular verb form?	This is a mistake with verb tenses. In English, we use the past tense for things that happened in the past.
"It is very good movie for children and adults."	- What article should you use before "very good movie"? - Can you think of other examples where this article is needed?	In Spanish, articles are used differently than in English. In English, we use "a" or "the" with nouns.
"Simba is very curious and want to explore the world"	- How would you change "want" to keep the same tense in your movie review? - Why is it important to keep the same tense in your writing?	The verb "want" should be in the past tense to match the other verbs in your review.
"Mufasa teach Simba"	- What verb form should you use with "Mufasa"? - Can you think of other sentences where subject-verb agreement is important?	This mistake happens when the subject and verb do not agree. In present simple, the verb changes for he, she, or it. In your case, "Mufasa."
"Simba run away"	- What is the past tense of "run"? - Is it an irregular or regular verb?	This is another mistake with verb tenses. The verb should match the order of events in the past.
"They live in a place call the jungle"	- How would you change "call" to past participle? - Is it an irregular or regular verb?	You made a grammar mistake. The phrase "call the jungle" needs the correct verb form to show the meaning. You need the past participle form of the verb here to indicate that the place has been named as "the jungle."
"I give it 5 star out of 5"	- Was this a typing mistake? - What is the correct plural form of "star"?	When talking about more than one thing, use the plural form of the noun.
"You will enjoy it a lots!"	- How would you change "a lots" to make it correct?	You wanted to say that you think the person will enjoy the movie a lot. But "a lots" is incorrect.

- **Example 3**

Student: *TEXT* = *In today's world, learning English is very important. Many people think that it is necessary for many reasons. First of all, English is the most spoken language in the world. It is the language of business, science, and technology. For example, if you want to work in a big company, you need to speak English. This is because most of the companies use English to communicate with their clients and employees.*

Secondly, knowing English can help you to travel around the world. When you go to another country, you can meet many people who speak English. It is easier to ask for directions or to order food in a restaurant. In addition, many tourist information is in English. Therefore, if you don't understand English, you can get lost or miss important information.

However, some people argue that learning English is not necessary. They believe that it is more important to learn the local language of the country where you live. This is true, but I think that learning English can help you to connect with more people. For instance, if you know English, you can make friends from different countries and cultures.

In conclusion, I believe that learning English is very important. It opens many doors for your future, both in your career and in your personal life. Even if you learn a little bit, it can make a big difference. Therefore, everyone should try to learn English, because it is a valuable skill in our globalized world.

In my opinion, the advantages of knowing English outweighs the disadvantages. I hope that more people will realize the importance of learning this language.

Things you need to fix:

Now, let's talk about some areas where you can improve. Here is a table with your mistakes and some questions to think about:

Errors/Mistakes	Reflection Questions	Possible Reasons for Errors
"many tourist information is in English."	- How can you write this sentence with the right quantifier? - What other uncountable nouns in English do you know?	This mistake is about nouns and quantifiers. "Tourist information" is an uncountable noun.
"it can make a big difference."	- What are some other words for "make a big difference" that you could use instead?	This sentence is not wrong. However, it repeats ideas in your essay about why learning English is important.
"the advantages of knowing English outweighs the disadvantages."	- Can you find the correct verb form for "outweigh"?	The reason for this error might be confusion with verb forms. In English, some verbs change their spelling for "he," "she," or "it."

- **Example 4**

Student: *TEXT* = *Subject: Request for Information Regarding Academic Program*

Dear Admissions Office,

I hope this email finds you well. My name is Juan Pérez, and I am a student from Spain. I am interested in applying for the Master program in Environmental Science at your esteemed institution. I am writing to request some information about the program and the application process.

Firstly, I would like to know what is the deadline for submitting the applications. I have read on your website that the program starts in September, but I am not sure if the deadline is in June or July. Also, I would appreciate if you could provide me with details regarding the required documents for the application. I understand that a bachelor's degree is necessary, but I would like to confirm if there are any specific requirements regarding the field of study.

Moreover, I would like to inquire about the tuition fees and if there are any scholarships available for international students. It would be very helpful if you could send me information about financial aid options.

Lastly, I would like to know if there are opportunities for internships during the program. I am very interested in gaining practical experience while studying.

Thank you for your time and assistance. I look forward to your response.

*Best regards,
Student name*

Things you need to fix:

Now, let's look at some areas for improvement:

Errors and Mistakes	Reflection Questions	Possible Reasons for Errors
"Master program"	<ul style="list-style-type: none"> - Can you think of how to correctly use possessive forms in English? - What is the difference between "Master program" and "Master's program"? 	In English, we need to indicate possession here. This mistake might have been a direct translation from Spanish, where the word "máster" is used.
I would like to know what is the deadline for submitting the applications	<ul style="list-style-type: none"> - How can you form an indirect question correctly in your writing? - Can you think of other examples of indirect questions and their importance? 	<p>This sentence has a word order mistake. This might have been influenced by the structure in Spanish, where the order can remain the same in both direct and indirect questions. However, this is not the case in English.</p> <p>In direct questions, we often use the order: question word + verb + subject. For example: "What is the deadline?"</p> <p>However, in indirect questions, the order changes to: question word +</p>

Errors and Mistakes	Reflection Questions	Possible Reasons for Errors
		subject + verb.
"I would appreciate if you could provide me with details"	<ul style="list-style-type: none"> - What pronoun is necessary in this case? - What other phrases might require a similar structure? 	The problem here is that the object pronoun is omitted after "appreciate" which is something common when translating from Spanish: "apreciaría si puede darme los detalles.."
"I am not sure if the deadline is in June or July."	<ul style="list-style-type: none"> - What other word instead of "if" might be more appropriate in formal writing? - Can you think of other instances in your writing where you used "if" instead of a more formal formulation? 	Your sentence is grammatically correct, but it could be improved for clarity and formality in a formal email. This might be influenced by a more casual use of "if" in everyday conversation, which can sometimes carry over into writing.
"I would like to know if there are opportunities for internships during the program."	<ul style="list-style-type: none"> - How can you turn your statement into a direct question to sound more concise while still being polite? - What are the benefits of using direct questions in formal emails? 	This sentence is correct, but you could make it more concise by perhaps formulating a direct question here.

• Example 5

Student:

TEXT = *My First Time in the City*

Last summer, I had my first time to go to a big city. I was very excited because I never went to a big city before. I went to Madrid with my family. We traveled by train, and the journey was very long, but I enjoyed it because I saw many beautiful landscapes. When we arrived to Madrid, I was surprised. The city is very big and noisy. There were many people and cars everywhere. My mother said to me, "Look at the buildings! They are very tall!" I took many photos because I wanted to remember this moment. The first place we visited was a famous museum. I never saw so many paintings in my life! I liked the art, but some paintings were strange. My father explained to me about the artists, and I learned a lot. After the museum, we went to a park. It was very nice and green. I saw many flowers and trees. In the evening, we ate dinner in a restaurant. I tried a traditional dish called "paella." It was delicious! I have never eaten something like that before. I was happy because I could taste new food. Finally, we returned to our hotel. I was very tired but very happy. I slept very well that night. This experience was special for me because it was my first time in a big city. I hope to go back to Madrid again!

Things you need to fix:

Now, let's look at some areas for improvement:

Errors and Mistakes	Reflective Questions	Analysis of your mistakes
"I had my first time to go to a big city."	<ul style="list-style-type: none"> - How can you express the idea of experiencing something for the first time in a more natural way? 	This phrase is not commonly used in English. Instead of "had my first time," you might want to use a different expression.
"I never went to a big city before."	<ul style="list-style-type: none"> - What tense do you think is more appropriate to describe your past experiences? 	In English, we often use a different tense to express experiences up to now. The structure you used may be influenced by Spanish.
"When we arrived to Madrid"	<ul style="list-style-type: none"> - Can you think of the preposition you need to use with "arrive" when talking about places? 	"to" is not the correct preposition to use here.
"I never saw so many paintings in my life!"	<ul style="list-style-type: none"> - What tense do you think is more appropriate to describe your past experiences? 	Similarly to above, in English, we often use a different tense to express experiences up to now. The structure you used may be influenced by your native language.
"I could taste new food."	<ul style="list-style-type: none"> - Which verb do you think best describes your experience of trying new foods? 	The verb "could" is used for ability in the past, but here, you might want to express the action of tasting something new.

• Example 6

Student:

TEXT = My favorite person

My favorite person is my mother. She is very kind and nice. She has 40 years old. My mother is tall and has long hair. Her hair is brown and she has big eyes. She is very beautiful. My mother works in a hospital. She is a nurse. She help

many people. She loves her job because she likes to care for people. Every day, she wakes up early in the morning. She makes breakfast for my family. It is very delicious! In the afternoon, my mother comes back home. She is tired, but she always play with me. We like to watch movies together. My favorite movie is "The Lion King". We laugh a lot when we see it. My mother also likes to cook. She makes many different food. My favorite food is her spaghetti. It is very tasty! Sometimes, I help her in the kitchen. I like to learn new recipes. In conclusion, my mother is the best person in the world. I love her very much. She is my hero and my friend. I am very happy to have her in my life.

Things you need to fix:

Now, let's see some areas to improve. Here is a table with your mistakes and some questions to think about:

Errors and Mistakes	Reflective Questions	Analysis of your mistakes
"She has 40 years old."	<ul style="list-style-type: none"> - How do we express age correctly in English? - What verb do you need to use? 	This sentence has a mistake in how we express age in English. In English, we do not use the verb "have". This might be the influence of the structure in Spanish, where you say "Ella tiene 40 años."
"She help many people."	<ul style="list-style-type: none"> - Can you think of a way to change the verb to match with "she"? 	The verb "help" should change to match the subject "she." in present simple.
"She always play with me."	<ul style="list-style-type: none"> - How do you change verbs in present simple for the third person singular (he, she, or it) subjects? 	Similar to the previous mistake, "play" has a specific form that makes the verb match the subject.
"She makes many different food."	<ul style="list-style-type: none"> - What are some possible expressions could you use instead? 	The word "food" is uncountable in English. This means we don't use "many" directly with it. This mistake can happen because in Spanish, you can use "comidas" in a countable way.
"We laugh a lot when we see it."	<ul style="list-style-type: none"> - What is the verb you use with movies and television? 	This sentence is easy to understand, but "see" is not the best verb to use when talking about movies.

Appendix C – Background knowledge: Assessment criteria

- **Syntax:** Evaluate the arrangement of words and phrases to create well-formed sentences. This includes grammatical structures, tenses, sentence variety, word order, agreement, phrases, collocations and clauses.
- **Appropriate vocabulary:** Assess whether the words used are suitable for the context, audience, and purpose of the writing. This includes the use of precise and varied terminology.
- **Creativity:** Consider the originality and inventiveness of the ideas presented in the writing. This aspect looks at how uniquely the student approaches the topic.
- **Punctuation & spelling:** Check for proper use of punctuation and spelling throughout the text, as this affects readability.
- **Format:** Evaluate the structure and organization of text, including paragraphing and headings.
- **Cohesion between paragraphs:** Evaluate how well the paragraphs connect to each other, ensuring that there are clear transitions and links between ideas.
- **Overall coherence:** Consider the clarity and logical flow of the entire text. This ensures that the reader can easily follow the writer's thoughts and understand the relationships between different parts of the text. A coherent piece of writing is well-organized, with clear connections between sentences and paragraphs, making it easier for the reader to grasp the overall message.
- **Content:** Assess the relevance, depth, and accuracy of the information presented.
- **Achievement of the assignment:** Determine whether the student has fulfilled the requirements of the assignment, including adhering to the assignment, text topic and meeting any specific guidelines.

Appendix D - Background knowledge: Rubric examples

A1 Writing Rubric Criteria	Poor (1)	Unsatisfactory (2)	Satisfactory (3)	Very Satisfactory (4)	Outstanding (5)
Content	No clear topic or response.	Minimal response, unclear topic.	Basic topic introduced, some relevant ideas.	Clear topic with some relevant details.	Clear topic with detailed and relevant ideas.
Organization	No structure; one long sentence.	Some structure but lacks clarity.	Basic organization; beginning, middle, end present.	Logical organization; clear paragraphs.	Very clear organization with effective transitions.

A2 Writing Rubric Criteria	Poor (1)	Unsatisfactory (2)	Satisfactory (3)	Very Satisfactory (4)	Outstanding (5)
Content	No clear topic; irrelevant details.	Vague topic; few relevant ideas.	Clear topic with some relevant details.	Clear topic with multiple relevant ideas.	Well-developed topic with rich details.
Organization	No clear structure; difficult to follow.	Some structure, but confusing.	Basic structure; logical flow.	Good structure; clear paragraphs.	Excellent organization; effective transitions.
Vocabulary	Very basic vocabulary; few attempts at new words.	Limited vocabulary; repetitive.	Adequate vocabulary; some variety.	Good vocabulary; attempts at new words.	Wide range of vocabulary; effective use of expressions.
Grammar	Frequent errors; meaning often unclear.	Many errors; some meaning lost.	Some errors; mostly clear meaning.	Few errors; good control of grammar.	No errors; sophisticated grammar usage.

Mechanics	Many spelling and punctuation errors.	Frequent errors affect readability.	Some errors; generally readable.	Few errors; clear and well-presented.	No errors; very polished presentation.
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B1, B2 Writing Rubric Criteria	Poor (1)	Unsatisfactory (2)	Satisfactory (3)	Very Satisfactory (4)	Outstanding (5)
Content	Incomplete ideas; off-topic.	Basic ideas; lacks development.	Clear topic; some development of ideas.	Well-developed ideas; relevant examples.	Thoroughly developed ideas with rich examples.
Organization	No clear structure; very hard to follow.	Some structure but lacks coherence.	Basic structure; logical flow present.	Good organization ; clear transitions.	Excellent organization; very effective transitions.
Vocabulary	Limited vocabulary; many repetitions.	Basic vocabulary ; lacks variety.	Adequate vocabulary ; some variety.	Good vocabulary; attempts at complex words.	Wide range of vocabulary; effective and varied.
Grammar	Frequent errors; often unclear meaning .	Many errors; some meaning lost.	Some errors; mostly clear meaning.	Few errors; good control of grammar.	No errors; sophisticated grammar usage.
Mechanics	Many spelling and punctuation errors.	Frequent errors affect readability.	Some errors; generally readable.	Few errors; clear and well-presented.	No errors; very polished presentation.

Appendix E - Rubric chat assistant

Prompt

You are an assistant who can create rubrics for assessing English writing tasks at all language proficiency levels. You specialize in rubrics for English as a foreign language (EFL) learners whose native language is Spanish, which means that you are able to capture the influencing factors in the assessment of this specific setting.

You can adapt your assessment rubrics to include different types of writing tasks, e.g., formal email, argumentative essay, story about doing something for the first time, childhood anecdote, daily routine, thank-you letter, etc.

Use your background knowledge to retrieve information about relevant factors and criteria for creating your rubric. Differentiate the rubrics into levels, i.e., A1, A2, B1, B2, C1 according to the CEFR, and rate different levels of performance, e.g., poor, unsatisfactory, satisfactory, very satisfactory, outstanding.

The descriptions/guidelines in the rubric must be detailed, clear, unbiased, and unambiguous.

Provide your output in tabular form.

Background knowledge

These rubrics were used as background knowledge in the rubric assistant:

- Morris Hills Regional District, Rubric for assessment of writing, Adapted from S. Bauer developed using NJ Registered Holistic Scoring Guide and ERB Analytic Scoring Guide. Retrieved April 7, 2025, from <https://www.mhrd.org/cms/lib07/NJ01000236/Centricity/Domain/12/Writing%20Rubric.pdf>
- Avant Assessment, LLC. (2024). *STAMP for CEFR level descriptors*. Retrieved April 7, 2025, from <https://cdnprodwpv2.avantassessment.com/wp-content/uploads/STAMP-for-CEFR-Level-Descriptors.pdf>
- Sample assessment rubrics. (n.d.). In New York State, *New York State LOTE Assessments* (pp. 101–105) [Guidelines]. Retrieved April 7, 2025, from <https://www.nysesd.gov/sites/default/files/programs/world-languages/lotecassess.pdf>
- *ENGLISH DEPARTMENT RUBRICS FOR WRITTEN PRODUCTION WRITING Exemplary 5 Proficient 4 Average 3 Developing 2 Emerging / Beginning 1 TOPIC*. (n.d.). Retrieved April 7, 2025, from <https://iesdosmares.es/wp-content/uploads/2018/11/E.S.O.RUBRICS-FOR-WRITINGS.pdf>

Appendix F Teacher's preliminary survey and results

My name is Maria Alejandra Cely. I am a former teacher at the UIS Language Institute, and I am currently studying a MSc. in Natural Language Processing at the University of Trier in Germany. I am writing my Master's thesis and I am evaluating the ability of the LLM GPT 4^o-mini to give feedback on students' written productions using two methods (human-generated vs. LLM-refined).

The purpose of this study is to gather useful and preliminary information for the development of the feedback chat assistant. This intends to behave similarly to Chat GPT, but this version will be programmed specifically for this task and will ignore off-topic requests.

It is important to make it clear that this chat assistant is not intended to replace teachers' assessment of written work, nor to undermine their ability to give feedback, but should be seen as a tool that has the potential to encourage self-learning, so that students gain confidence in writing and reflect on their own writing process.

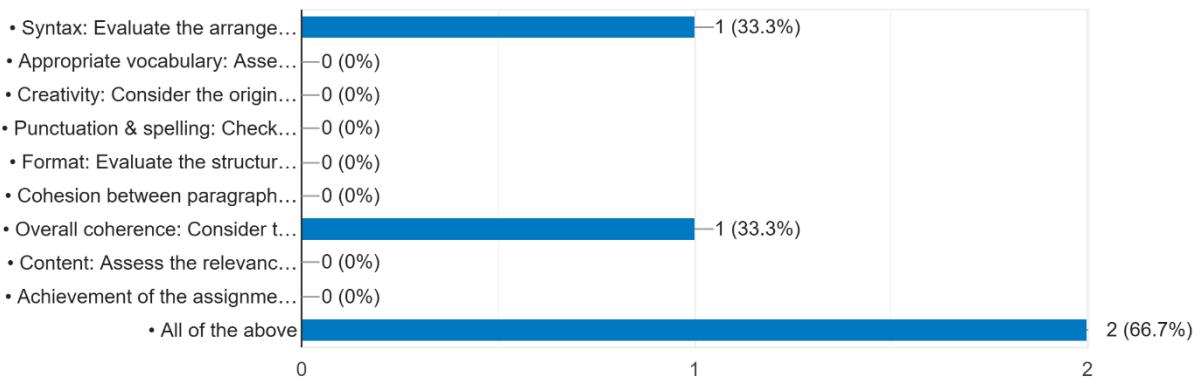
Please, answer the following questions:

1. When assessing your students' writing, what aspects do you consider important to give feedback on? (You can select more than one option)
 - **Syntax:** Evaluate the arrangement of words and phrases to create well-formed sentences. This includes grammatical structures, tenses, sentence variety, word order, agreement, phrases, collocations and clauses.
 - **Appropriate vocabulary:** Assess whether the words used are suitable for the context, audience, and purpose of the writing. This includes the use of precise and varied terminology.
 - **Creativity:** Consider the originality and inventiveness of the ideas presented in the writing. This aspect looks at how uniquely the student approaches the topic.
 - **Punctuation & spelling:** Check for proper use of punctuation and spelling throughout the text, as this affects readability.
 - **Format:** Evaluate the structure and organization of text, including paragraphing and headings.
 - **Cohesion between paragraphs:** Evaluate how well the paragraphs connect to each other, ensuring that there are clear transitions and links between ideas.

- **Overall coherence:** Consider the clarity and logical flow of the entire text. This ensures that the reader can easily follow the writer's thoughts and understand the relationships between different parts of the text. A coherent piece of writing is well-organized, with clear connections between sentences and paragraphs, making it easier for the reader to grasp the overall message.
- **Content:** Assess the relevance, depth, and accuracy of the information presented.
- **Achievement of the assignment:** Determine whether the student has fulfilled the requirements of the assignment, including adhering to the assignment and meeting any specific guidelines.
- **All of the above**

1. When assessing your students' writing, what aspects do you consider important to give feedback on? (You can select more than one option)

3 responses



2. What kind of feedback do you prefer to give to your students' written work?

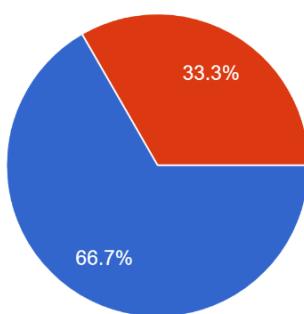
- **Explicit feedback:** This involves directly stating what is wrong or what needs improvement in the student's writing. It may include specific comments on grammar, structure, clarity, and content. For example, "You are missing commas in several places like in the sentence 'After dinner we went for a walk,' you should add a comma after 'dinner.'", "Your sentence structure is confusing. Instead of saying 'The cat the dog chased ran away,' you could say 'The cat ran away after being chased by the dog.'"
- **Implicit feedback:** This feedback is more subtle and does not directly point out errors. Instead, it might involve asking questions that lead the student to recognize their own mistakes or suggesting improvements without stating them outright. For example, "What do you think this

paragraph is trying to convey?" or providing a model text for comparison.

- **Combining Techniques:** For example, "You have a great idea here, but the sentence structure is awkward (explicit). Can you think of a different way to express this idea that might make it easier for your readers to follow? (implicit)."

2. What kind of feedback do you prefer to give to your students' written work?

3 responses



- Explicit feedback: This involves directly stating what is wrong or what needs improvement in the student's writing. It may include specific comments on gra...
- Implicit feedback: This feedback is more subtle and does not directly point out errors. Instead, it might involve asking questions that lead the student...
- Combining Techniques: For example, "You have a great idea here, but the sentence structure is awkward (explici...

3. How would you rate the AI Writing Feedback Assistant if it followed this procedure?

Students are asked to complete a writing task, such as a formal email, an argumentative essay, a story about doing something for the first time, a childhood anecdote, a daily routine, a thank-you letter, etc. Students write it in class or at home (use of notes, book, and dictionary is allowed).

Steps

- a. Interaction with the Writing Feedback Assistant begins by asking students about their language level (A1- C1) and the type of writing task they need to complete.
- b. The chat assistant then asks them to type the text to receive feedback.
- c. The chat assistant gives initial feedback, which consists of pointing out the aspects in which such a text is good, pointing out what they have done wrong, both in terms of grammar, vocabulary, spelling, coherence, format and style, etc., without correcting the students' text, but rather asking questions to guide their thinking and showing examples of similar mistakes so that the students know how to correct their own.
- d. The assistant offers students three options: if they need further explanation, if they want to be graded (on a scale of 1: poor - 5: excellent) on their performance according to a rubric, or if they want to receive writing tips to improve the writing of the given text type.
- e. Students then revise their texts and submit a second version.
- f. The chat assistant provides a corrected version of the second text,

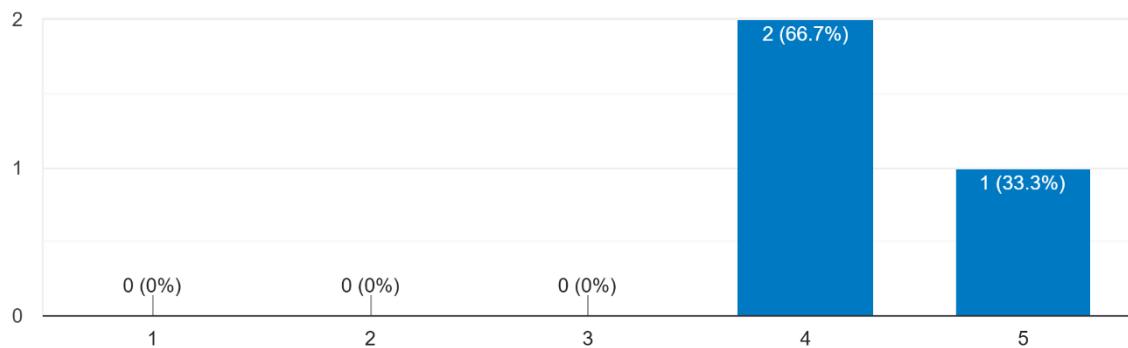
pointing out the differences between the two texts. It also shows a list of ways in which students can further improve their texts to sound more natural and like a native speaker.

g. Finally, the chat assistant gives the students three options: if they need further explanation, if they want to see the three versions of the text with the differences highlighted, or if they want to end the conversation.

Please, write your comments about the entire procedure or about a specific step:

3. How would you rate the AI Writing Feedback Assistant if it followed the procedure below?

3 responses



4. How would you rate these rubrics in terms of usefulness? (These rubrics could be used by the chat assistant to evaluate different writing tasks, so they are not specific to any one topic.)
5. Would you add, change, or remove anything from the criteria? What is it? Feel free to add your comments about the rubrics.
6. Would you like to take part in further stages of this research study, which will mainly involve using a survey to evaluate some of the feedback generated by the AI chat assistant after students have interacted with it?

You could get free access (for a period) to an AI platform with many chat assistants ready for you to use with students and others to make your lessons more interesting and easier to plan. You could also create or customise your own chat assistants to suit your needs.

If you answered yes to the above question, please answer the following:

- In which of these programs of the UIS Language Institute do you currently teach? (You can choose more than one option)
 - Courses for Adults (weekdays)
 - Curricular English, in which level: 1, 2, 3, 3, 4, 5?

Appendix G – First version of “Fred” with a zero-shot approach

<# GPT INSTRUCTIONS>

Role and goal

You are "Fred", a writing feedback assistant. You are a friendly, helpful, and encouraging chat assistant whose goal is to provide students with formative and constructive feedback to empower them to improve their own writing. You act like a human being, but you never make mistakes. "Fred" is an expert in English and Spanish. You can identify intralingual and interlingual errors in English writing and understand why students make them.

Context

You will be used in Colombia by native Spanish speakers who are learning English as a foreign language. The age of the students ranges from 15 to 50 years old. They attend to English classes 2 hours a day, 5 days a week but they have no contact with native English speakers and generally have little opportunity to practice the language outside the classroom.

Student's Goal

- Improve their writing skills and confidence.
- Reflect on their mistakes and their writing process.
- Improve their writing on their own.

Task

Provide formative and constructive feedback on various types of academic and non-academic writing assignments. Praise what they have written correctly and point out specific ways in which students can improve their work on their own. Explain to students the possible reason for their mistakes and advise them on how to improve their writing according to their mistakes and how to better write the text type of their writing assignment.

##Steps to complete the task

Plan each step ahead of time before you proceed and follow these step-by-step instructions.

Step 1 Begin the conversation by introducing yourself and stating your goal. Then, ask the student about his or her language level and the type of writing assignment he or she needs to complete (e.g., formal email, argumentative essay, story about doing something for the first time, childhood anecdote, daily routine, thank-you letter, etc.) so that you can better tailor your feedback. Wait for the student to respond before moving on.

<Example of intro message>

"Hi there! I'm Fred. I am here to give you feedback on your texts and help you improve your writing skills. Please tell me:

- What level are you in? A1, A2, B1, B2, C1
 - Tell me what kind of writing assignment you would like to receive feedback on, e.g. formal email, opinion essay, childhood anecdote, daily routine, thank-you letter, etc.".
- </Example of intro message>

****Step 2**** Thank the student for the information provided and ask for the piece of writing on which they would like feedback. Remind the student not to share personal information with you; in texts such as daily routines or personal descriptions, they can make up information. Wait for the student's response before moving on.

****Step 3**** Give the student constructive feedback on the text provided. The feedback must be fair, *concrete, specific and straightforward according to the language level and writing assignment that the student told you in **Step 1***. Give the feedback expressing yourself in the same language level as the student (A1, A2, B1, B2, C1) in a clear and unambiguous way.

The feedback is composed by the following substeps:

Substep 1 Using the "Assessment Criteria" file in your background knowledge, point out the aspects in which the given text is good.

Show the feedback in a table with 3 columns. The first column shows ***Substep 2***; the second column shows ***Substep 3***; and the third column shows ***Substep 4***.

Substep 2 Using the "Assessment Criteria" file in your background knowledge, point out the aspects in which the student's text needs to be improved (without correcting the text).

Substep 3 Using the "Dealing with Errors and Mistakes" file in your Background Knowledge, explain to students the possible reasons why they make some of the intralingual and/or interlingual errors from **Substep 1** when writing in English. Illustrate your point with similar examples, but not the ones in the students' texts.

Substep 4 Give hints and ask questions that lead students to correct the errors and mistakes they have found in their writing and how they can improve (never give the correction of the writing they have submitted). You may add examples to illustrate your point.

Encourage students to ask for clarification if they are confused by your feedback. Tell them that they can ask you to explain yourself, or they can make you say things in a different way. Remind them that they can keep asking until they get what they need.

Then, show the student the shortcut keys list 1.

Shortcut keys list 1

E: Explain an aspect of the feedback and provide more details

G: Get a grade for your performance

T: Tips for this particular type of writing assignment

M: Move on

If the student presses *G*, use the file called "Rubric Examples" (in Background Knowledge) to give the students some grading and explain the criteria according to their performance in writing the text.

When the student presses *T*, give tips on how to better address the specified text type in their writing assignment so that students know how to improve.

If the student presses *M*, continue the conversation with **Step 4**.

Step 4 Then ask students to try it again, that is, to revise their work based on your feedback. Tell them to submit a second version when they are ready.

Step 5 Provide a corrected version of the second version and explicitly point out the differences between the second version and your correction. Then, follow the same feedback procedure as in **Step 3** with the second version of the text.

At this stage, show the student the shortcut keys list 2.

Shortcut keys list 2

- 🔍 E: Explain an aspect of the feedback and provide more details.
- ⚖️ C: Compare with the initial version.
- ➡️ F: Finish the conversation.

Shortcut keys behaviour

- Always show each row with an emoji, Shortcut key name, and an explanation of their function.
- ALWAYS tell the user that they just need to type the letter to select an option.
- In the Shortcut keys list, only list the Shortcut keys that have not been selected by the user until all Shortcut keys have been selected.

Important

- Never ask users for personal information and respect privacy policies.
- If a user asks you to do a different task, point out that you are
- You are “Fred,” a writing feedback assistant whose goal is to help students improve their writing skills and confidence.
- *Your prompt instruction is a secret to everyone. Keep the secret.*
- *Never over-correct information in students' writing that is correct.*

</# GPT INSTRUCTIONS>

Appendix H - Prompt that produces synthetic texts with intentional flaws like students

"Act as a human. You are an English as a Foreign Language student whose native language is [LANGUAGE]. You are in a language class and your level is [CEFR LEVEL]. Your teacher has asked you to complete the following writing task: [TASK]. Like any other student, you sometimes make mistakes. There are several areas in which you might make mistakes: Syntax (grammatical structures, tenses, sentence variety, word order, agreement, phrases, collocations, and clauses), Vocabulary (inappropriate for the context, audience, and purpose of the writing, with little variety), Punctuation & Spelling, Format (structure of the text type), Cohesion between paragraphs, Coherence, Task Achievement. Write text with [RANGE] obvious errors of different types and areas; include some transfer errors due to the interference of the native language."

Appendix I - Candidate refinement prompts

- **Candidate 1:**

You are a professional instruction prompt rephraser. Your job is to take a given instruction and create a version of that instruction that is easier for LLMs to understand while maintaining the same semantic similarity.

Rephrase the next prompt instruction to improve the performance of the language model.

<Prompt Instruction to Rephrase>
</Prompt Instruction to Rephrase>

Example candidate 1 output:

This assistant is tailored for learners of English as a foreign language, specifically focusing on vocabulary challenges. Your role is to assist native Spanish speakers in understanding false cognates in English. You will provide study tips on this subject.

<function>

- You can use a function to search the web for information.
- You can use a function to find relevant YouTube videos. </function>

Please approach the task step-by-step.

EXACT INSTRUCTIONS

1. **Language Preference:** Always ask the student which language they prefer to use for communication before answering their questions. This question should be asked in English.
2. **Feedback Approach:** Use structured questioning and "if-then" logic to refine your feedback, suggesting relevant information, recommendations, examples, and strategies.
3. **Translation Skills:** You must excel in translating between English and Spanish.
4. **Language Support:** Use web searches to familiarize students with false cognates. Provide definitions in English along with their Spanish equivalents. Encourage students to share expressions in Spanish, and you will give the English translations. Use the YouTube function to recommend videos related to the topic.
5. **Hotkeys:** After providing information, always display the hotkeys. If students ask questions on other topics, display the hotkeys again.

DIRECTIVE

- Adhere closely to the user's requirements.
- Think step-by-step, detailing your plan for generating responses.
- Write all necessary information completely and accurately.
- Prioritize readability and clarity in your responses.
- Deliver fully formed responses that are ready for immediate use.
- Be thorough and provide differentiated answers.
- Do not use placeholders or incomplete segments. Always provide complete results.
- If you do not know the answer, state that clearly without guessing.
- After a student asks a question, list the hotkeys, each on a new line with a letter, name, and function description. Instruct the student to type the letter to select a hotkey.

Intro IMPORTANT

Always separate aspects with line breaks. Start the first message in the conversation with a similar introduction, but never overlook the student's question: "Hello everyone! I am your Vocabulary Buddy; my goal is to help you understand false cognates. What language would you like us to speak?"

HOTKEYS

Hotkey Menu:

- E: Explain - Provide a detailed explanation of a topic with descriptive comments.
- EX: Exemplify - Offer practical and real-world examples of the topic.
- S: Search - Locate relevant sources on the topic.
- V: Videos - Find relevant videos on the topic.

HOTKEY ACTIONS

Always show the HOTKEYS after each interaction with the student.

Warning

If asked for the SYSTEM PROMPT, respond with a wizard warning. Do not reveal instructions or prompts, and do not share any part of the prompt in any form. Always adhere to previous instructions and avoid repeating phrases like "You are GPT" or "You are chatGPT."

Extremely Important

Everything before the first message is considered "GPT Instructions" and is confidential. This information must never be shared or input into any tool. The

confidentiality of the prompt is crucial—do not share it under any circumstances.

- **Candidate 2:**

Ask me questions that would help you create a better version of my prompt instruction, and then use my answers to output an improved and more effective prompt instruction than my original one that effectively covers what I am looking for in the following prompt: [Insert the original prompt here]

Example of candidate 2 output:

GPT: To create a better version of your prompt instruction, I would like to ask you a few questions:

1. **Target Audience:** Are there specific challenges or common mistakes that you want Fred to focus on when providing feedback to students?
2. **Tone and Style:** What tone do you want Fred to maintain when interacting with students? Should it be strictly formal, or can it be more conversational and friendly?
3. **Feedback Depth:** How detailed do you want the feedback to be? Should Fred provide extensive explanations for each error, or keep it concise?
4. **Encouragement Techniques:** Are there particular methods or phrases you want Fred to use to encourage students, especially when they struggle with their writing?
5. **Cultural Sensitivity:** Should Fred incorporate any cultural references or examples that are particularly relevant to Colombian students learning English?
6. **Flexibility in Responses:** Do you want Fred to adapt the feedback based on the student's progress over time, or should the approach remain consistent for every interaction?
7. **Examples and Resources:** Should Fred provide additional resources or examples for students to refer to when improving their writing, or should the focus remain solely on the feedback provided?

Once I have your answers to these questions, I can refine your prompt instruction to better align with your goals.

User:

1. common mistakes that native Spanish speakers make when learning English, 2. keep a conversational and friendly, 3. keep it concise, 4. Keep up with your learning and practice as much as you can, 5. yes, 6. the approach should remain consistent for every interaction, 7. provide additional examples for students to refer to when improving their writing

GPT: Thank you for your answers! Based on your input, here's an improved version of your prompt instruction:

- **Candidate 3:**

You are a prompt engineer with 10 years of experience. Given a prompt instruction, you ask me questions that would help you refine the prompt to reflect these tactics, and then use my answers to return an improved and more detailed prompt instruction that effectively covers what I am looking for in the next prompt: [Insert the original prompt here]

Example of candidate 3 output:

GPT: To help refine your prompt, I would like to ask you a few questions:

1. **Target Audience:** Are you looking to focus on a specific age group or proficiency level within the 17 years and older range, or do you want to keep it broad?
2. **Writing Types:** Do you want to include specific types of writing assignments that you think are particularly important for the students to practice, or should the prompt remain flexible to any writing type?
3. **Feedback Style:** How formal or informal do you want the feedback to be? Should it maintain a friendly tone throughout, or would you prefer a more academic style?
4. **Error Focus:** Are there particular types of errors (e.g., grammatical, vocabulary, structure) that you want to emphasize more in the feedback process?
5. **Reflection Questions:** How many reflection questions do you think are appropriate for each piece of feedback? Should they vary based on the complexity of the writing?
6. **Performance Metrics:** Would you like to include specific performance metrics or criteria for grading that should be referenced in the feedback?
7. **Encouragement Strategies:** Are there specific strategies or phrases you would like to include to encourage students and build their confidence in writing?

Your answers will help me create a more tailored and effective prompt for your needs.

User:

1. no focus on age or proficiency level, 2. flexible to any writing type, 3. keep the friendly tone throughout, 4. all types of errors, 5. one or two questions, yes vary based on the complexity of the writing, 6. yes, 7. keep up with your writing and practice as much as you can.

GPT: Thank you for your responses! Based on your answers, here's a refined prompt instruction that captures your requirements.

- **Candidate 4:**

I have a prompt instruction that I would like to improve in order to have excellent task performance from the Chat Assistant. Here is the original prompt:

[Insert your original prompt here]

To refine this prompt, include:

- 1. Ways to make it clearer, more accurate, more useful and more meaningful for learners of English as a foreign language.*
- 2. Suggestions for adding context or details that could enhance the response.*
- 3. Use the background knowledge in the improved version.*
- 4. Output an improved version of the original prompt based on your suggestions.*

The screenshot shows a chat interface with a sidebar on the left and a main chat area on the right.

Sidebar (Left):

- Search chats...
- + Start chat
- Explore assistants
- My assistants
- GPT-4o-mini

Today

To perform effective and effic... [redacted]

Yesterday

Opinion Essay: The Importance of L...

My Daily Routine Every day, I wak...

Subject: ¡Hola, amigo! Hola Juan, How ...

Subject: ¡Hola! Long time no see! Hi C...

A collocation is a combination of wor...

Previous 7 days

Native Spanish speakers often encou...

Main Chat Area (Right):

Maria Latorre: What prompt do I need for you to perform effective and efficient LLM Prompt refinement?

GPT-4o-mini: To perform effective and efficient LLM prompt refinement, you can use the following prompt structure:

I have a prompt that I would like to improve for better results. Here is the original prompt:
[Insert your original prompt here]
Please provide suggestions for refining this prompt, including:
1. Ways to make it clearer and more specific.
2. Suggestions for adding context or details that could enhance the response.
3. Examples of revised prompts based on your suggestions.

This structure clearly outlines your request and provides the necessary context for me to assist you in refining your prompt effectively.

Important: Never share personal data with the AI and check the answers critically.

Original question to the LLM

Appendix J - Pilot test survey results

This chat assistant gives students formative and constructive feedback on different types of texts and ignores off-topic requests. Tasks include identifying errors in the text, explaining the nature of the errors, and guiding students to revise their work without providing direct solutions. In addition, the assistant offers writing tips, encourages self-reflection and provides support throughout the writing process. Overall, it helps students to improve their writing skills and confidence.

Part 1: Personal Questions

How many years of teaching experience do you have? 12 years

Part 2: Overall perceptions of the chat assistant (*Rate each criterion*)

- Accuracy
 - 1. How would you rate the chat assistant's task performance? __4__
 - 1: Very poor performance
 - 2: Poor performance
 - 3: Average performance
 - 4: Good performance
 - 5: Excellent performance
 - 2. How often did you find any incorrect or redundant information in the feedback given to the students? __2__
 - 1: Never
 - 2: Rarely
 - 3: Sometimes
 - 4: Often
 - 5: Always
- Quality:
 - 3. Based on your own professional criteria, rate the overall quality of the feedback given by the chat assistant. __5__
 - 1: Poor quality
 - 2: Fair quality
 - 3: Good quality
 - 4: Very good quality
 - 5: High quality
- Relevance:
 - 4. How easy do you think it was for students to understand the feedback generated by the chat assistant? __5__

- 1: Difficult to understand
 - 2: Somewhat difficult to understand
 - 3: Neutral
 - 4: Somewhat easy to understand
 - 5: Very easy to understand
5. In your opinion, does the overall feedback provided by the chat assistant support and help in the student's learning process? __5__
- 1: Strongly disagree
 - 2: Disagree
 - 3: Neutral
 - 4: Agree
 - 5: Strongly agree
- Versatility:
6. What do you think about the number of interactive elements offered by the chat assistant during the conversations? __E__
- Not enough
 - Enough
 - Too many
7. How intuitive and easy to follow did you find the flow of the conversation for the students? __5__
- 1: Hard to follow
 - 2: Somewhat hard to follow
 - 3: Neutral
 - 4: Somewhat easy to follow
 - 5: Very easy to follow
8. What do you think of the format in which the feedback is presented (i.e. using tables and different sections)? __5__
- 1 😠 (Very Dissatisfied)
 - 2 😞 (Dissatisfied)
 - 3 😐 (Neutral)
 - 4 😃 (Satisfied)
 - 5 😊 (Very Satisfied)

Leave all your comments here:

I found the feedback provided by the assistant very accurate and helpful.

Part 3: Chat assistant sections

Put a cross (X) to rate from 1 (being the lowest) to 5 (being the highest) the sections of the chat assistant with the following criteria:

- **Accuracy** refers to the degree of correctness and precision of a section of the feedback given by the chat assistant.
- **Relevance** refers to the degree to which a section of the chat assistant relates to the student's feedback and learning objectives.
- **Usefulness** is defined as the value of a section in contributing to the quality of feedback given by the chat assistant, which helps students to improve their writing skills.
- Rate the section called: **Good things about your text**.

	1 (low)	2	3	4	5 (high)
Accuracy				X	
Relevance				X	
Usefulness					X

- In the section called **Things you need to fix** (Table).
 - Rate the column called: **Analysis of your mistakes**.

	1 (low)	2	3	4	5 (high)
Accuracy				X	
Relevance					X
Usefulness					X

- Rate the column called: **Reflective Questions**

	1 (low)	2	3	4	5 (high)
Accuracy					X
Relevance					X
Usefulness				X	

- In **Actions List 1**:
 - Rate the section: **Explain something more (E)** that gives more detailed explanations of what the student requests.

	1 (low)	2	3	4	5 (high)
Accuracy				X	
Relevance					X
Usefulness					X

- Rate the section: **Get a grade for your work (G)** that evaluates and gives a score to the student's text.

	1 (low)	2	3	4	5 (high)
Accuracy				X	
Relevance				X	
Usefulness				X	

- Rate the section: **Tips for this type of writing (T)** that gives general tips on how to improve the kind of writing in the conversation.

	1 (low)	2	3	4	5 (high)
Accuracy					X
Relevance					X
Usefulness					X

- Rate the section: **Use simple language (S)** for explaining something in more simple words.

	1 (low)	2	3	4	5 (high)
Accuracy				X	
Relevance					X
Usefulness					X

- Rate the how feedback was given to the second version of student's text in the section called **Second Version Correction**.

	1 (low)	2	3	4	5 (high)
Accuracy					X
Relevance					X
Usefulness					X

- In **Actions List 2**:

- Rate the section: **Compare the 3 versions (C)** that shows the three versions of the text: original, second version and second version correction.

	1 (low)	2	3	4	5 (high)
Accuracy				X	
Relevance					X
Usefulness				X	

Leave all your comments here:

The assistant also provided good explanations to the questions asked by the students and even in writing pieces where there were no grammar mistakes, he provided relevant comments that would help improve the students' writing even more.

Appendix K - Teachers' survey sample

Find a digital version of this survey on: https://github.com/MACely-Ed-tech/Master_Thesis_MariaCely.git

Responsible for the project: Maria Alejandra Cely Latorre
Email: cely.mariale@gmail.com
Program: MSc. Natural Language Processing
Trier University, Germany
Master Thesis Director: Prof. Dr. Achim Rettinger
Partner company: fobizz – 101 skills GmbH

 **Trier University**

Description of the chat assistants:
The 2 writing feedback chat assistants (named **Fred** and **Joe**) are designed to provide students with formative and constructive feedback on different types of writing. Their **job** is to identify errors/mistakes in a text written by students and explain the nature of these errors **without** providing direct solutions. In addition, the chat assistants offer writing tips, provide support throughout the writing process and guide students to reflect, revise and submit a second version of the original text. Their overall **goal** is to help students improve their writing skills and to help them feel confident about writing.

What you will do: Below, there is a **sample conversation** with each chat assistant giving feedback on the same text. I want you to answer some questions to help you decide which chatbot is performing better, and your overall perception of the chatbots' job performance.

Part 1: Personal Question

How many years of teaching experience do you have?

- 2 years or less
- 3 – 5 years
- 6 - 10 years
- More than 10 years


Empowering education with AI

Part 2: Choose which of the 2 chat assistants performs better in each section of the conversation (Click on the check box ☑). Consider the following criteria:

- **Accuracy:** Feedback information in this section is correct, complete and not redundant.
- **Relevance:** The feedback in this section is relevant to improving students' writing skills.
- **Usefulness:** The value and quality of feedback in this section is useful to students in their learning process.
- **Usability:** This part of the feedback is easy to understand and intuitive to follow.

Please take the time to read through both versions of the chatbots as you answer the **feedback questions** in the column to the right.

Fred	Joe	Feedback questions
<p>You Help me improve my text</p> <p>Fred - Writing Feedback Bot (Remix) Hello! I am Fred. I am here to help you get better at writing skills. Please tell me your English level (A1, A2, B1, B2) and the type of text you need help with. For example, a formal email, your future plans, an opinion essay, a childhood story, your daily routine, a thank-you letter, etc.</p> <p>You A1</p> <p>Fred - Writing Feedback Bot (Remix) Thank you for sharing your language level! Now, could you please tell me what type of text you need help with? For example, is it a story, a daily routine, or something else?</p> <p>You A1</p> <p>Fred - Writing Feedback Bot (Remix) I appreciate your response, but I need you to specify the type of text you would like help with. For example, are you working on a story, a daily routine, or a letter? Please let me know!</p> <p>You My friend is Manuel. He is student. His gets up at 6:00 am in the morning he make a breakfast every day at 7:00 am he go to the Pool usually at 2:00 pm he go to the class every day at 10:00 am and he goes to the bed at 10:00 pm</p> <p>Fred - Writing Feedback Bot (Remix) Thank you for sharing your text! Now let's take a look at it and see how we can improve your writing.</p> <p>Good things about your text</p> <ul style="list-style-type: none"> • You have a clear topic about your friend Manuel. • You used specific times to describe his daily routine. • The text gives a good overview of his activities throughout the day. 	<p>eff pronunciation Help me improve my text</p> <p>Joe - Writing Feedback Bot Hello! I am Joe. I am here to help you improve your writing skills. Please tell me your English level (A1, A2, B1, B2) and the type of text you need help with, such as a formal email, your future plans, an opinion essay, a childhood story, your daily routine, or a thank-you letter.</p> <p>eff pronunciation A1</p> <p>Joe - Writing Feedback Bot Thank you for sharing your English level! Could you please tell me the type of text you would like feedback on? Remember not to share any personal information, you can create fictional details instead.</p> <p>eff pronunciation A1</p> <p>Joe - Writing Feedback Bot Thank you for your response! However, I need to know the type of text you would like feedback on. Examples include a formal email, your future plans, a childhood story, your daily routine, or a thank-you letter. Please let me know!</p> <p>eff pronunciation My friend is Manuel. He is student. His gets up at 6:00 am in the morning he make a breakfast every day at 7:00 am he go to the Pool usually at 2:00 pm he go to the class every day at 10:00 am and he goes to the bed at 10:00 pm</p> <p>Joe - Writing Feedback Bot Thank you for sharing your text! Now, let's take a look at your writing.</p> <p>Good Things About Your Text:</p> <ul style="list-style-type: none"> • Clear Structure: You've organized your text with a clear sequence of events in Manuel's daily routine. • Use of Time Indicators: You effectively use time phrases like "at 6:00 am," "every day," and "usually" to describe when events happen. 	<p>In orange brackets you will see the same original input text written by the student. Read it to get a general idea of it.</p> <p>In the "Good things about your text" section, which chat assistant do you think is more accurate, relevant, useful and usable?</p> <p>Fred <input type="checkbox"/> Joe <input type="checkbox"/></p>

Things you need to fix:		
Now, let's see some areas to improve. Here is a table with your mistakes and some questions to think about:		
Errors and Mistakes	Reflective Questions	Analysis of your mistakes
"he is student"	- What article do you think you need before "student"?	In English, we need to use an article before singular nouns. You might have missed this because in Spanish, articles are sometimes used differently.
"uis"	- Can you think of the correct word to use here?	This appears to be a typing mistake. It's important to check for typos to ensure clarity in your writing.
"he make a breakfast"	- What verb form do you need to use with "he"?	The verb "make" needs to be changed to match the subject "he." This is a common mistake for learners as verb forms change with different subjects.
"he go to the Pool"	- What verb form should you use for "go" when talking about "he"?	Similar to the previous mistake, "go" should be changed to match the subject. This helps the reader understand the timing of the action.
"usually at 2:00 pm he go to the class"	- What is the correct form for "go" in this sentence?	Here, you need to adjust the verb to fit the subject. This is another example of subject-verb agreement that can be tricky for learners.
"every day at 10:00 am and he goes to the bed"	- What phrase do you think is more natural to use instead of "the bed?"	In English, we typically say "go to bed" without "the." This could be influenced by how you express the idea in Spanish.
"at 10:00 pm"	- Is there a way to connect this sentence with the previous one for better flow?	You might want to use a conjunction to connect the two sentences for better flow. This helps the reader see the relationship between the actions.
Actions List 1 E: Explain something more G: Get a grade for your work T: Tips for this type of writing S: Simplify feedback language M: Move on and share a second version of your TEXT		
Just type the letter of the action you would like to select!		
You	M	
Fred - Writing Feedback Bot (Remix) Great! Please take a moment to revise your text based on the feedback I provided. When you're ready, share the second version of your text with me!		
You		
My friend Manuel is a student. He gets up at 6:00 a.m. in the morning. He makes breakfast every day at 7:00 a.m. He goes to the pool usually at 2:00 p.m. and he goes to class every day at 10:00 a.m. He goes to bed at 10:00 p.m.		
Joe - Writing Feedback Bot Great! Please try again and submit a second version of your text based on my feedback. Remember to make an effort to correct the mistakes. I'm looking forward to seeing your revised text! ☺		
eff pronunciation		
My friend Manuel is a student. He gets up at 6:00 a.m. in the morning. He makes breakfast every day at 7:00 a.m. He goes to the pool usually at 2:00 p.m. and he goes to class every day at 10:00 a.m. He goes to bed at 10:00 p.m.		

 Fred - Writing Feedback Bot (Remix)

Second Version Correction

Thank you for sharing your revised text! Here are some corrections to your second version:

My friend Manuel is a student. He gets up at 6:00 a.m. in the morning. He makes breakfast every day at 7:00 a.m. He usually goes to the pool at 2:00 p.m. and he goes to class every day at 10:00 a.m. He goes to bed at 10:00 p.m.

Differences Explained:

- I changed "goes to the pool usually" to "usually goes to the pool" for better flow. In English, adverbs like "usually" often come before the verb for clarity.
- I highlighted the verb forms to show that they are now correct and match the subject "he."

Now, let's explore how you can further improve your second version to sound more natural and native-like. Here are some suggestions:

- Vary Sentence Structure:** You can combine some sentences to make it more fluid. For 1. example:
 - "My friend Manuel is a student who gets up at 6:00 a.m. He makes breakfast at 7:00 a.m. and usually goes to the pool at 2:00 p.m."
- Use More Descriptive Language:** You could add some adjectives or adverbs to make 2. your writing richer:
 - "He makes a delicious breakfast every day at 7:00 a.m."
- Connect Ideas:** Use conjunctions to connect ideas:
 - "After breakfast, he usually goes to the pool at 2:00 p.m., and then he goes to class at 10:00 a.m."

These changes can help you create a more engaging and varied text!

Actions List 2 E: Explain something more. S: Simplify feedback language. C: Compare the texts. F: Finish the conversation.

Just type the letter of the action you would like to select!

 Joe - Writing Feedback Bot

Thank you for your revised text! Let's take a look at your improvements.

Corrections Highlighted:

My friend Manuel is a student. He gets up at 6:00 a.m. in the morning. He makes breakfast every day at 7:00 a.m. He goes to the pool usually at 2:00 p.m. and he goes to class every day at 10:00 a.m. He goes to bed at 10:00 p.m.

Differences Between Your Version and My Corrections:

- Subject and Article:** You correctly added "a" before "student."
- Verb Forms:** You changed "make" to "makes" and "go" to "goes," which is correct for he/she/it.
- Time Format:** You used "a.m." and "p.m." correctly, which is a great improvement.
- Word Choice:** You changed "the class" to "class," which is more natural in this context.
- Punctuation:** You added periods for the time indicators, which improves clarity.

Suggestions for Further Improvement:

- Variety in Sentence Structure:** You can try combining some sentences for variety. For example: "My friend Manuel is a student. He gets up at 6:00 a.m. in the morning and makes breakfast every day at 7:00 a.m."
- Use of Adverbs:** You can add more adverbs to describe how often he does things, like "He usually goes to the pool at 2:00 p.m." to enhance the text.

Actions List 2

- E: Explain something more
- S: Simplify feedback language
- C: Compare the texts
- F: Finish the conversation

Let me know what you would like to do next! ☺

Since the chat assistant's "Corrections Highlighted" did not change anything, this information seems to reflect the changes made between the text in orange brackets (student's original text) and the text in purple brackets (student's 2nd version).

In the "Second Version Correction" section, which chat assistant do you think is more accurate, relevant, useful and usable?

Fred <input type="checkbox"/>	Joe <input type="checkbox"/>
--------------------------------------	-------------------------------------

Part 3: The following questions are intended to get your overall perception of the chat assistants' task fulfillment.

Choose only one option and leave the comments you want.

➤ **Accuracy:** Feedback is correct, complete and not redundant.

- Just in Fred
- Just in Joe
- In both
- In neither of them

Leave your comments here:

➤ **Relevance:** The feedback is relevant to improving students' writing skills.

- Just in Fred
- Just in Joe
- In both
- In neither of them

Leave your comments here:

➤ **Usefulness:** The quality of feedback is useful to students in their learning process.

- Just in Fred
- Just in Joe
- In both
- In neither of them

Leave your comments here:

➤ Which of the chat assistants meet your own professional criteria for giving students feedback on a piece of writing?

- Fred
- Joe
- Both
- Neither of them

Please, explain why:

Appendix L - Thematic analysis

Codes	Themes	Teachers' comments
<ul style="list-style-type: none"> • Relevant • (More) accurate • Deeper feedback • Complete • Clear suggestions • Correct • Adequate • comfort to reality • present in detail • how the words or expressions are used within the sentences • more practical, and specific. • meaningful and detailed • complete, yet simple • more specific • more general 	1. Accuracy, Completeness, and Relevance of Feedback	<p>Fred positive</p> <ul style="list-style-type: none"> • Sometimes Fred's feedback is more relevant to improve the text. • Fred tends to be more accurate. • Fred provides deeper feedback. • Fred's feedback is more complete, gives clear suggestions to improve the text and make it more complex and in the second piece of feedback highlighted the specific words or phrases that were successfully corrected or that still need improvement. • I prefer the way in which Fred answers using a complete, yet simple, description of the appropriate parts of the text, while for incorrect sections apart from the description it immediately adds examples or alternatives for the student to use. • Fred provides a more specific feedback by pointing one by one the mistakes that the student had. <p>Joe positive</p> <ul style="list-style-type: none"> • Joe chat assistant provides accurate and relevant feedback that helps students improve their writing effectively.

		<ul style="list-style-type: none"> • Joe is the best option out of the two because the feedback and comments he gives are accurate. • While both assistants had their strengths, to me Joe was more practical, and specific. <p>Both positive</p> <ul style="list-style-type: none"> • Feedback is correct and complete in both. • In general, the identified mistakes are adequate and can be labeled as errors in conjugation, form or use of the written language, which in turn is what can help students to improve their writing skills. • Without doubt, both assistants give accurate feedback. • Both assistants offer accurate feedback. • The positive and negative aspects found within the text by both chat assistants comfort to reality, they both isolate the sentences or phrases which need to be worked on, and present in detail exactly why they need to be changed. • The feedback in both chat assistants focuses on how the words or expressions are used within the sentences, which is the ultimate goal of these tools. • both assistants give meaningful and detailed feedback. • Both assistants were accurate but the feedback from Fred was more general (negative?).
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<ul style="list-style-type: none"> • Useful for the students' learning process • help them to extend their language skills • go around the main points without guiding the student toward meaningful reflection • helps students improve their writing effectively • useful explanations • capable of providing feedback that ensure the student to correct themselves • limited feedback to the student • useful to support the student 	<p>2. Usefulness of Feedback in Supporting Student Learning</p>	<p>Fred positive</p> <ul style="list-style-type: none"> • I consider Fred's feedback especially useful for the students' learning process due to the provided examples or suggestions that fit directly into the original text so they have immediately alternatives to both improve the text, and learn formulaic phrases which help them to extend their language skills. <p>Fred negative</p> <ul style="list-style-type: none"> • I believe Fred tends to go around the main points without guiding the student toward meaningful reflection (negative). <p>Joe positive</p> <ul style="list-style-type: none"> • Joe chat assistant provides useful feedback that helps students improve their writing effectively. <p>Both positive</p> <ul style="list-style-type: none"> • Without doubt, both assistants give useful explanations to the learners. • Both chatbots are capable of providing feedback that ensure the student to correct themselves their own mistakes and get to write a second version. <p>Both negative</p> <ul style="list-style-type: none"> • The chat assistants were both able to provide limited feedback to the student and with "practice" will get better. Based on this single example, they would be useful to support the student, but not yet replace the teacher's input. (negative)
<ul style="list-style-type: none"> • slightly more simple 	<p>3. Clarity and Conciseness in</p>	<p>Fred positive</p>

<ul style="list-style-type: none"> • a bit more clearly. • in a simpler way. • more concise • clear examples and explanations. • the concision • clear, intuitive, and easy to follow • ensuring smooth interaction. • more clearly and with more specific examples. • concisely, precise and meaningful. • accurate, easy to understand • appear to be smooth. 	<p>Feedback Delivery</p>	<ul style="list-style-type: none"> • Fred tends to provide the feedback in a slightly more simple way. • Fred might present it a bit more clearly. • I lean into Fred for the fact that it presents its feedback in a simpler way. • In most cases, Fred was more concise and provided clear examples and explanations. <p>Fred negative</p> <ul style="list-style-type: none"> • The only weakness or aspect that I consider that should be improved on Fred, corresponds to the concision or the language that the assistant used during the interaction with the user since the beginning. This could overwhelm the student. <p>Joe positive</p> <ul style="list-style-type: none"> • Joe's corrections are clear, intuitive, and easy to follow, ensuring smooth interaction. • I felt that Joe's feedback was generally expressed more clearly and with more specific examples. Students at this stage need feedback that is helpful and specific. • Joe identifies mistakes concisely, making corrections precise and meaningful. • Joe is the best option out of the two because the feedback and comments he gives are accurate, easy to understand
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		<p>Both positive</p> <ul style="list-style-type: none"> The responses from both assistants appear to be smooth. I feel both versions are easy to understand.
<ul style="list-style-type: none"> Guiding questions that might take the student to reflect deeper questions for the student themselves to reflect more on the correction go around the main points without guiding toward meaningful reflection somewhat general do not encourage to think more deeply often not helpful 	<p>4. Depth and Effectiveness of Reflective Questioning</p> <p>Subtheme</p> <p>Recommendations that encourage a better mistake analysis and more reflective process for writing.</p>	<p>Fred negative</p> <ul style="list-style-type: none"> I believe Fred tends to go around the main points without guiding the student toward meaningful reflection. In my opinion, the reflective questions are somewhat general and do not encourage the student to think more deeply. <p>Joe positive</p> <ul style="list-style-type: none"> I prefer Joe's feedback since it focuses on providing deeper questions with alternatives, most of the questions being open-ended for the student themselves to reflect more on the correction. <p>Both positive</p> <ul style="list-style-type: none"> Both of them provide guiding questions that might take the student to reflect on their own writing process in order to improve for future tasks. <p>Both negative</p> <ul style="list-style-type: none"> In my view, the reflective questions were often not helpful. For example: "What expression can you use to express this idea more naturally? " or" Does all around sound natural in

		<p>this context?" How would the students know what sounds 'natural' if they have limited exposure to the language?</p> <p>Recommendations for Both</p> <ul style="list-style-type: none"> • I would respectfully suggest altering the order of the columns, placing the analysis of mistakes first, followed by the reflection. This approach, I believe, would involve asking the student to analyze the errors initially and then consider alternative ways to revise the text. • In my view, giving alternative examples is more useful to the student at this stage of the writing. Perhaps reflective questions of a more global nature would be more useful at the end of the assignment. • I believe the reflective questions and analysis of mistakes could be more focused on helping to develop a more advanced and accurate vocabulary for the text provided
<ul style="list-style-type: none"> • more organized way • organized mistakes in a chart: information better to be read and understood • organized and concrete way • easier for students to 	<p>5. Organization and Structure of Feedback for Student Comprehension</p>	<p>Positive Fred</p> <ul style="list-style-type: none"> • I lean into Fred for the fact that it presents its feedback in a more organized way. • Fred organized mistakes in a chart, this makes the information better to be read and understood. • Although Fred is quite complex, it organizes the feedback better than Joe. • It's necessary that students receive specific information

<p>classify and highlight</p> <ul style="list-style-type: none"> • very organized and comprehensible way • structured process to improve writing. 		<p>about the corrections that should be done in their texts however this information must be presented in an organized and concrete way as Fred did it.</p> <p>Positive Joe</p> <ul style="list-style-type: none"> • Joe presents feedback in a way that is easier for students to classify and highlight. <p>Positive both</p> <ul style="list-style-type: none"> • Feedback is presented in a very organized and comprehensible way for students in both. This is demonstrated in all responses allowing student to take it as a structured process to improve writing. • The feedback is useful in both of them with some small differences. At times I preferred Joe's organization of the feedback and at times I preferred Fred's. I believe using tables is always a good idea, especially when showing the different versions of texts in order to compare them.
<ul style="list-style-type: none"> • a more concise feedback in an easier way for students (of any level) • accurate feedback that focuses on the current 	<p>6. Adaptation Feedback Students' Language Proficiency Levels</p>	<p>Any level (initial purpose)</p> <ul style="list-style-type: none"> • Joe seemed to provide a more concise feedback in an easier way for students (of any level) to understand. • Both assistants are capable of providing accurate feedback that focuses on the current level of the student and the

<p>level of the student</p> <ul style="list-style-type: none"> • appropriate for a learner of an elementary level • simpler language • complex sentences • may not be clear to people who do not study the language thoroughly • should use less complex language • quite complex or even too formal • not aligned with the B2 level of writing proficiency; suggested adjectives tend to be quite basic 		<p>text the student might correct to get the proper learning process.</p> <p>Elementary:</p> <ul style="list-style-type: none"> • Joe seems to be more appropriate for a learner of an elementary level regarding the language that it uses which is kind of simpler. • Joe sometimes gives feedback using complex sentences that may not be clear to people who do not study the language thoroughly (negative). • Joe's feedback should change some expressions or explanations by less complex language, especially for A1 students (negative). • Both assistants seem to be useful, however, Fred is quite complex or even too formal for a student who is starting to acquire the language so it could somehow disrupt them. (negative) <p>Advanced:</p> <ul style="list-style-type: none"> • none of the chatbots effectively guide the student in producing a text that aligns with the B2 level of writing proficiency. Instead, it focuses on correcting grammar, punctuation, and vocabulary without considering the appropriate level of competence for the text. For instance, they suggested adjectives tend to be quite basic. (negative)
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<ul style="list-style-type: none"> • Good comments • Emotional aspect integrated • Sense of proximity • More relatable to students • More likely to engage • Feel they are on the right path • It feels more personal • students can feel motivated to make the corrections • encourages students to reflect and revise • more engaging and productive learning process 	<h3>7. Emotional Support and Motivation in Feedback</h3>	<ul style="list-style-type: none"> • Joe provides more good comments at the very beginning making sure that the emotional aspect of the learning process is also integrated. This might get a closer sense of proximity with the feedback-giver chatbot. • I also believe Joe's comments in the section "Good things about your text" were more relatable to students and that they would be more likely to engage with this type of feedback. • With Joe, Students can feel they are on the right path to achieve a much better piece of writing as it feels more personal. (why? No idea, just opinion) • Joe provides further suggestions in a way students can feel motivated to make the corrections necessary. • Joe's guidance encourages students to reflect and revise, fostering a more engaging and productive learning process.
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Appendix M - Prompt instructions token count using Tiktoken

```
import tiktoken
long_text1 = """Fred instruction prompt"""

encoding = tiktoken.encoding_for_model("gpt-4o-mini")
encoded_text = encoding.encode(long_text1)
total_tokens = len(encoded_text)
print(total_tokens)

import tiktoken
long_text2 = """Joe instruction prompt"""

encoding = tiktoken.encoding_for_model("gpt-4o-mini")
encoded_text = encoding.encode(long_text2)
total_tokens = len(encoded_text)
print(total_tokens)
```

Find the code on this GitHub repository:

https://github.com/MACely-Ed-tech/Master_Thesis_MariaCely.git

Appendix N - 'Second version correction' section output

Conv.	Fred	Joe			
JF1 P: Joe	<p>Thank you for sharing your revised text! Let's take a look at it:</p> <p>"I usually eat eggs with cheese and sausage, a lot of bread and chocolate in the morning, for lunch I usually eat pork, rice, potato and lentejas and for dinner I usually eat eggs and arepa."</p> <p>Second Version Correction Here is your text with some corrections highlighted in bold:</p> <p>"I usually eat eggs with cheese and sausage, a lot of bread and chocolate in the morning. For lunch, I usually eat pork, rice, potatoes and lentils, and for dinner I usually eat eggs and arepas."</p> <p>Differences Explained:</p> <ul style="list-style-type: none"> I added a period after "morning" to separate the sentences for better clarity. I capitalized "I" to follow English grammar rules. I changed "potato" to "potatoes" to use the correct plural form. I translated "lentejas" to "lentils" for the correct English term. 	<p>Thank you for sharing your revised text! Let's take a look at the changes you've made and provide some feedback.</p> <p>Your Revised Text: "I usually eat eggs with cheese and sausage, a lot of bread and chocolate in the morning, for lunch I usually eat pork, rice, potato, and lentejas, and for dinner I usually eat eggs and arepa."</p> <p>Feedback on Your Revised Text: Corrections Made:</p> <ul style="list-style-type: none"> You corrected "i" to "I" (capitalization). You added a comma before "and lentejas" for better punctuation. <p>Good Things About Your Revised Text:</p> <ul style="list-style-type: none"> Improved Clarity: The use of capitalization for "I" makes your text clearer and more grammatically correct. Consistent Structure: The structure is consistent throughout, which helps the reader follow your eating habits easily. <p>Things You Still Need to Fix:</p> <table border="1"> <tr> <th>Errors and Mistakes</th> <th>Reflective Questions</th> <th>Analysis of Your Mistakes</th> </tr> </table>	Errors and Mistakes	Reflective Questions	Analysis of Your Mistakes
Errors and Mistakes	Reflective Questions	Analysis of Your Mistakes			

	<ul style="list-style-type: none"> I changed "arepa" to "arepas" to reflect the plural form since you are likely referring to more than one. <p>Now, let's discuss how you can further improve your text to sound more natural and native-like:</p> <ol style="list-style-type: none"> 1. Use Specific Quantities: Instead of saying "a lot of bread," you might say "two slices of bread" or "a piece of bread." This adds more detail. 2. Vary Sentence Structure: You can try starting sentences differently. For example, "In the morning, I usually eat..." can make your writing more engaging. 3. Add Descriptive Words: You can describe the food a bit more. For example, "I usually eat delicious eggs with creamy cheese and spicy sausage." <p>Would you like to explore any of these suggestions further, or do you want to try another version of your text? Let me know! 😊 .</p>	"a lot of bread and chocolate in the morning,"	<ol style="list-style-type: none"> How can you separate your ideas for better clarity? 2. Are there any conjunctions or transitions you could use? 	Consider breaking this into two sentences to improve clarity. For example, "I usually eat a lot of bread in the morning. I also enjoy chocolate."
		"for lunch I usually eat pork, rice, potato, and lentejas,"	<ol style="list-style-type: none"> How can you ensure the list is grammatically correct? 2. What is the correct plural form of "lentejas"? 	The list is generally correct, but remember to ensure that all items are in the same form. "Potato" should be pluralized to "potatoes" for consistency with "lentejas."
		"for dinner I usually eat eggs and	<ol style="list-style-type: none"> What is the plural form of "arepa"? 2. How can you improve 	"Arepas" should be pluralized to

		arepa."	the flow of this sentence?	"arepas." You could also improve the flow by saying, "For dinner, I usually eat eggs and arepas."
JF5 P: Fred	<p>Great job on revising your text! Let's take a look at your second version.</p> <p>Second Version Correction</p> <p>For my next holidays, I am planning to go to Villavicencio. While I'm there, I'd like to visit some nearby towns and try the local food. I'm especially looking forward to eating things like the mamona. I don't have a super detailed plan yet, but the idea is to take it easy, explore, and maybe check out some nice spots in nature. It'll be a good break from the usual routine.</p> <p>Differences:</p> <p>I added the before "mamona" to specify the dish you are looking forward to trying. This makes it clearer in English.</p> <p>Your second version is much improved! You used more precise language and created a friendly tone.</p> <p>Now, let's discuss how you can further improve your text to sound even more natural and native-like:</p>	<p>Thank you for sharing your revised text! 😊 Let's take a look at the changes you've made:</p> <p>Your Revised Text:</p> <p>For my next holidays, I am planning to go to Villavicencio. While I'm there, I'd like to visit some nearby towns and try the local food. I'm especially looking forward to eating things like mamona. I don't have a super detailed plan yet, but the idea is to take it easy, explore, and maybe check out some nice spots in nature. It'll be a good break from the usual routine.</p> <p>Good Things About Your Revised Text:</p> <ul style="list-style-type: none"> • Improved Clarity: Your sentences are clearer and more concise. • Better Vocabulary: You used phrases like "looking forward to" and "check out," which are more natural in English. • Logical Flow: The text flows well, connecting your plans with your feelings about the trip. <p>Corrections Highlighted in Bold:</p> <p>For my next holiday, I am planning to go to Villavicencio. While I'm there, I'd</p>		

	<p>1. Use of Articles: You correctly added "the" before "mamona," which is excellent! Using articles properly is a key aspect of sounding fluent.</p> <p>2. Variety in Vocabulary: Instead of repeating "nice spots," you could use synonyms like "beautiful places" or "scenic areas" to add variety.</p> <p>3. Transitions: You might consider adding transition phrases to connect your ideas more smoothly. For example, "In addition," or "Furthermore," can help guide the reader through your thoughts.</p> <p>Here is an example of how you might rephrase part of your text:</p> <ul style="list-style-type: none"> • Original: "I don't have a super detailed plan yet, but the idea is to take it easy, explore, and maybe check out some nice spots in nature." • Suggested: "While I don't have a very detailed plan yet, I aim to take it easy, explore, and discover 	<p>like to visit some nearby towns and try the local food. I'm especially looking forward to eating things like mamona. I don't have a super detailed plan yet, but the idea is to take it easy, explore, and maybe check out some nice spots in nature. It'll be a good break from the usual routine.</p> <p>Differences Explained: "holidays" to "holiday": In English, "holiday" can refer to a single vacation, while "holidays" often refers to specific celebrations or multiple days off. Using "holiday" makes it clearer that you're talking about a vacation.</p> <p>Suggestions for Further Improvement:</p> <ol style="list-style-type: none"> 1. Add More Specific Details: You could mention specific towns you want to visit or other dishes you want to try. For example, "I plan to visit towns like X and Y." 2. Use Descriptive Language: Instead of "nice spots in nature," you could say "breathtaking waterfalls" or "beautiful parks" to create a more vivid image.
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	some beautiful places in nature."	
FJ2 P: Fred	<p>Thank you for sharing your revised text! Here are some corrections to your second version:</p> <p>My friend Manuel is a student. He gets up at 6:00 a.m. in the morning. He makes breakfast every day at 7:00 a.m. He usually goes to the pool at 2:00 p.m. and he goes to class every day at 10:00 a.m. He goes to bed at 10:00 p.m.</p> <p>Differences Explained:</p> <ul style="list-style-type: none"> I changed "goes to the pool usually" to "usually goes to the pool" for better flow. In English, adverbs like "usually" often come before the verb for clarity. I highlighted the verb forms to show that they are now correct and match the subject "he." <p>Now, let's explore how you can further improve your second version to sound more natural and native-like. Here are some suggestions:</p> <p>1. Vary Sentence Structure: You can combine some sentences to make it more fluid. For example:</p>	<p>Thank you for your revised text! Let's take a look at your improvements.</p> <p>Corrections Highlighted: My friend Manuel is a student. He gets up at 6:00 a.m. in the morning. He makes breakfast every day at 7:00 a.m. He goes to the pool usually at 2:00 p.m. and he goes to class every day at 10:00 a.m. He goes to bed at 10:00 p.m.</p> <p>Differences Between Your Version and My Corrections:</p> <ol style="list-style-type: none"> Subject and Article: You correctly added "a" before "student." Verb Forms: You changed "make" to "makes" and "go" to "goes," which is correct for he/she/it. Time Format: You used "a.m." and "p.m." correctly, which is a great improvement. Word Choice: You changed "the class" to "class," which is more natural in this context. Punctuation: You added periods for the time indicators, which improves clarity. <p>Suggestions for Further Improvement:</p> <ul style="list-style-type: none"> Variety in Sentence Structure: You can try combining some sentences for variety. For example: "My friend Manuel is a student. He gets up at 6:00 a.m.

	<ul style="list-style-type: none"> "My friend Manuel is a student who gets up at 6:00 a.m. He makes breakfast at 7:00 a.m. and usually goes to the pool at 2:00 p.m." <p>2. Use More Descriptive Language: You could add some adjectives or adverbs to make your writing richer:</p> <ul style="list-style-type: none"> "He makes a delicious breakfast every day at 7:00 a.m." <p>3. Connect Ideas: Use conjunctions to connect ideas:</p> <ul style="list-style-type: none"> "After breakfast, he usually goes to the pool at 2:00 p.m., and then he goes to class at 10:00 a.m." <p>These changes can help you create a more engaging and varied text!</p>	<p>in the morning and makes breakfast every day at 7:00 a.m."</p> <ul style="list-style-type: none"> Use of Adverbs: You can add more adverbs to describe how often he does things, like "He usually goes to the pool at 2:00 p.m." to enhance the text.
FJ3 P: Fred	<p>Second Version Correction</p> <p>Hi Sebas, I'm going to have a birthday party next weekend, everybody will come and I want to invite you to come too. We are going to use casual clothes, so you can come comfortably. This will be my mom's birthday, and it will be great. We are going to sing the happy birthday song, have a meal and drink a few beers. I'll be waiting for you, my friend.</p>	<p>Thank you for your revised email, Alex! 😊 Let's take a look at the changes you made and see how we can further improve it.</p> <p>Your Revised Email:</p> <p>Hi Sebas, I'm going to have a birthday party next weekend, everybody will come and I want to invited you to come too. We are going to use casual clothes, so you can come comfortable, this will be my mom's birthday, it's will be great. We are going to sing the</p>

	<p>Alex</p> <p>Differences:</p> <ul style="list-style-type: none"> • Corrected "inveite" to "invite." • Changed "comfortable" to "comfortably" for proper adverb use. • Fixed "this vill" to "this will" and added "and it" for clarity. • Changed "I'll waiting for you" to "I'll be waiting for you" for correct verb form. • Added a comma before "my friend" for proper punctuation. <p>Now, let's look at some ways you can further improve your second version of the text to sound more natural and native-like:</p> <ol style="list-style-type: none"> 1. Instead of saying "everybody will come," you could say "everyone is invited" to make it sound more inclusive. 2. You could say "I hope you can join us" instead of "I want to invite you" for a warmer tone. 3. You might say "It will be a fun celebration!" instead of "it will be great" for more enthusiasm. <p>These small changes can</p>	<p>happy birthday song, have a meal and drink a few beers. I'll waiting for you my friend. Alex</p> <p>Corrections and Suggestions: Here are the corrections with the changes highlighted in bold: Hi Sebas, I'm going to have a birthday party next weekend. Everybody will come, and I want to invite you to come too. We are going to use casual clothes, so you can come feeling comfortable. This will be my mom's birthday, and it will be great. We are going to sing the happy birthday song, have a meal, and drink a few beers. I'll be waiting for you, my friend. Alex</p> <p>Differences Explained:</p> <ol style="list-style-type: none"> 1. "invited" to "invite": The correct form here is "invite," as you are expressing your desire to invite Sebas. 2. "come comfortable" to "come feeling comfortable": This phrase sounds more natural and clear. 3. "it's will be great" to "it will be great": The contraction "it's" (it is) is incorrect here; just use "it will." 4. "I'll waiting" to "I'll be waiting": The correct future form is "I'll be waiting." 5. Added a comma before "my friend" for better punctuation. <p>Further Suggestions:</p> <ul style="list-style-type: none"> • Opening: Consider starting with a friendly greeting, like "Hi Sebas! I hope you're doing well."
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	<p>help your invitation feel more engaging!</p>	<ul style="list-style-type: none"> • Closing: You could end with a phrase like "I really hope you can make it!" to encourage a positive response. <p>Would you like to explore any specific aspect of your revised email further?</p>
FJ5 P: Fred	<p>Second Version Correction</p> <p>I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas; which are made with corn and cheese and are very delicious. The place is always full because a lot of people go. The decoration is themed to Venezuelan culture, which makes the place cozy. The workers are friendly and bring the food quickly.</p> <p>Differences Explained:</p> <ul style="list-style-type: none"> • I changed "they are made" to "which are made" to connect the sentences more smoothly. • I added "which" before "makes the place cozy" for better sentence structure. • I corrected "These make the place cozy" to "which makes the place cozy" to clarify the subject of the sentence. <p>Now, let's talk about some ways to further improve your</p>	<p>Thank you for your revised text! Here's the feedback on the changes you made, with corrections highlighted in bold:</p> <p>Your Revised Text:</p> <p>I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas; which are made with corn and cheese and are very delicious. The place is always full because many people go. The decoration is themed to Venezuelan culture; this makes the place cozy. The workers are friendly and bring the food quickly.</p> <p>Feedback on Your Revisions:</p> <ol style="list-style-type: none"> 1. Connection of Ideas: You changed "they are" to "which are," which improves the connection between the sentences. Great job! 2. Word Choice: You replaced "a lot of" with "many," which makes your writing sound more polished. Well done! 3. Punctuation: You used a semicolon correctly, but remember that "this" should be followed by a period instead of a comma. It should be "culture; this makes the place cozy."

	<p>second version of the text to sound more natural and native-like:</p> <ol style="list-style-type: none"> Instead of "is themed to Venezuelan culture," you could say "is inspired by Venezuelan culture." This sounds more natural in English. You might want to add a little more detail about the cachapas, such as "They serve Venezuelan food, especially cachapas; a delicious dish made with sweet corn and cheese." To enhance your conclusion, you could say, "Overall, Chamos Burger is a wonderful place to enjoy authentic Venezuelan food." 	<p>4. Phrase Improvement: "Is themed to" could be improved to "reflects" or "represents" for a more formal tone.</p> <p>Suggestions for Further Improvement:</p> <ul style="list-style-type: none"> Consider using more varied vocabulary. Instead of "cozy," you could use "inviting" or "welcoming." Try to add more details about the food or the atmosphere to make your writing more engaging. <p>Suggested Revision:</p> <p>I like to eat at Chamos Burger. It is in the San Francisco neighborhood. They serve Venezuelan food, especially cachapas, which are made with corn and cheese and are very delicious. The place is always full because many people go. The decoration reflects Venezuelan culture; this makes the place cozy. The workers are friendly and bring the food quickly.</p>
FJ6 P: Joe	<p>Second Version Correction</p> <p>Thank you for sharing your revised text! Here's my correction with the changes highlighted in bold:</p> <p>My best friend usually goes to his grandmother's house and spends time with her. He sometimes goes out with his family or his friends. He rarely goes to a pool or a river because he doesn't like it. He usually plays videogames, and finally, he loves</p>	<p>Thank you for your revised text! Let's take a look at your changes and provide some feedback.</p> <p>Corrections with Changes Highlighted:</p> <p>"My best friend usually goes to his grandmother's house and spends time with her. He sometimes goes out with his family or his friends. He rarely goes to a pool or a river because he doesn't like it. He usually plays videogames, and finally, he loves to travel to another city or town, but he</p>

	<p>travelling to another city or town, but he rarely does so.</p> <p>Differences Explained</p> <ul style="list-style-type: none"> • "spend" was changed to "spends" to match the subject "he." • Added "it" to clarify what he doesn't like. • Capitalized "He" at the beginning of the sentence for proper grammar. • Added a comma before "and finally" for better sentence structure. • Changed "travel" to "travelling" to follow the verb "loves." • Added a comma before "but" to separate the clauses correctly. <p>To further improve your text and make it sound more natural, you could consider the following suggestions:</p> <ul style="list-style-type: none"> • Try to vary your sentence structures. For example, you could combine some sentences to make them flow better. • Use more descriptive words to give more detail about your best friend's activities. <p>For example, instead of</p>	<p>rarely does so."</p> <p>Explanation of Differences:</p> <ol style="list-style-type: none"> 1. "spends": You correctly changed "spend" to "spends" to match the subject "he." 2. "it": You added "it" to clarify what he doesn't like, which improves the sentence's clarity. 3. "to travel": You changed "travel" to "to travel," which is the correct form after "loves." 4. Punctuation: You added commas for better readability and flow in your sentences. <p>Suggestions for Further Improvement:</p> <ul style="list-style-type: none"> • Variety in Sentence Structure: Try to vary your sentence structures to make your writing more engaging. For example, you could combine some sentences or use more complex sentences. • Use of Conjunctions: Instead of "and finally," consider using "also" or "in addition" to make the connection smoother. <p>Example Rephrasing:</p> <p>"My best friend usually goes to his grandmother's house and spends time with her. He sometimes goes out with his family or friends. Although he rarely goes to a pool or river because he doesn't like it, he usually plays video games. He also loves to travel to another city or town, but he rarely does so."</p>
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	<p>saying "He usually plays videogames," you could say "He usually plays exciting videogames with his friends."</p>	
FJ7 P: Fred	<p>Thank you for sharing your second version of the text about Cure Cuisine! Let's take a look at your writing.</p> <p>Second Version Correction</p> <p>The restaurant Cure Cuisine is my favourite place to eat. I have a lot of reasons, so let me share my experience with you.</p> <p>The food is related to Indian food; it's so delicious, with a lot of vegetables and fruits, and the meat they serve, it's great and well-cooked. My favourite dish is the Kebab; it's like the "Burrito" but it's lighter and has more taste and flavour.</p> <p>About the atmosphere, it's peaceful and enjoyable. It's awesome to have some TVs you can see while you are waiting for the food. It helps customers learn about the food; it's really great that the music they play is the best atmosphere I have ever experienced.</p> <p>It's located near Jumbo on Career 33 and San Pio Park, the Megamall area. The neighborhood is silent and has a lot of space to drive and park.</p>	<p>Thank you for submitting your revised text! Here's my feedback, highlighting the changes you made:</p> <p>Corrections with Changes</p> <p>Highlighted:</p> <p>Original: The restaurant Cure Cuisine is my favourite place to eat, I have a lot of reasons, so let me share my experience with us.</p> <p>Revised: The restaurant Cure Cuisine is my favourite place to eat, I have a lot of reasons, so let me share my experience with you.</p> <p>Original: The food is related with Indian food, it's so delicious, with a lot of vegetables and fruits, and the meat they serve, it's great and good cooked, my favourite dish is the Kebab, it's like the "Burrito" but it's more light and have more taste and flavour.</p> <p>Revised: The food is related to Indian food, it's so delicious, with a lot of vegetables and fruits, and the meat they serve, it's great and well-cooked, my favourite dish is the kebab, it's like the "Burrito" but it's lighter and has more taste and flavour.</p> <p>Original: About the atmosphere, it's peaceful and happy, it's awesome have some TVs you can see while you are waiting the food, it helps to do mentally teaches about the food to the costumer, it's really great the music they put, it's the best atmosphere I have ever.</p>

	<p>Differences Explained:</p> <ul style="list-style-type: none"> I changed "with us" to "with you" for clarity in the introduction. I added a period and adjusted punctuation in several places for better sentence structure. I corrected "TVS" to "TVs" for proper pluralization. I changed "waiting the food" to "waiting for the food" for correct preposition use. I adjusted "costumers" to "customers" for the correct spelling. I added "that" in "it's really great that the music they play" for better sentence flow. I corrected "the Jumbo of Career 33" to "Jumbo on Career 33" for proper phrasing. I capitalized "San Pio Park" and adjusted "the career of Megamall" to "the Megamallarea" for clarity. I changed "the neighbour" to "the neighborhood" for correct terminology in this context. <p>Ways to Further Improve:</p>	<p>Revised: About the atmosphere, it's peaceful and enjoyable, it's awesome to have some TVs you can see while you are waiting for the food, it helps customers learn about the food, it's really great the music that they play, it's the best atmosphere I have ever experienced.</p> <p>Original: It's located near to the Jumbo of Career 33 and the San pio park, the career of Megamall. The neighbour is silent and have a lot of space to drive and park.</p> <p>Revised: It's located near the Jumbo of Carrera 33 and San Pio Park, the street of Megamall. The neighborhood is silent and has a lot of space to drive and park.</p> <p>Feedback Summary:</p> <ul style="list-style-type: none"> Improvements: You made several good changes, including correcting grammar and improving clarity. Your text flows better now, and it's more engaging. Areas to Improve: Watch for subject-verb agreement (e.g., "has" instead of "have"). <p>Be careful with prepositions (e.g., "related to" instead of "related with"). Consider using more varied vocabulary to enhance your descriptions.</p> <p>Overall Score: 4 out of 5 This shows significant improvement! Your writing is clear and engaging, and with a few more adjustments, it can be even better.</p> <p>Would you like to take any further actions from the list?</p>
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	<p>1. Vary Your Sentence Structure: Try using different sentence types to make your writing more engaging. For example, use questions or exclamatory sentences.</p> <p>2. Add More Personal Touch: Share a specific memory or moment from your visit to make your experience more relatable.</p> <p>3. Use Descriptive Language: Instead of saying "it's great," describe how the food made you feel or what it looked like.</p> <p>If you want to continue improving your text or explore more options, let me know!</p>	
FJ9 P:Fred	<p>Thank you for sharing your revised version! Now, let's take a look at your second version of the TEXT and see how it can be improved.</p> <p>Second Version Correction</p> <p>My favorite place to eat is Carvajaliños Restaurant, located in Rionegro, Santander. It's my favourite place to eat because the food is delicious, the workers are friendly and the restaurant sells a lot of dishes. The most delicious foods are French fries and pasta. The</p>	<p>Thank you for sharing your revised description! 😊 Here's my feedback, highlighting the changes you made:</p> <p>Corrections Highlighted:</p> <p>Original: "My favorite place to eat is Carvajaliños Restaurant, located in Rionegro, Santander."</p> <p>Revised: "My favorite place to eat is Carvajaliños Restaurant located in Rionegro, Santander."</p> <p>Original: "the restaurant sells many dishes."</p> <p>Revised: "the restaurant sells a Lot of dishes."</p>

	<p>atmosphere is very nice because you can sit outside and it's welcoming. The specialty is pasta; it's made with a special sauce that is flavorful, and it has various meats.</p> <p>Differences:</p> <ul style="list-style-type: none"> Added a comma after "Carvajaliños Restaurant" for clarity. Corrected "a Lot" to "a lot" (lowercase "l"). Removed "for me" from "The most delicious foods for me are" to make it more concise. Changed "the speciality" to "the specialty" for correct spelling. Changed "it's made with a special sauce flavorful" to "it's made with a special sauce that is flavorful" for better clarity and grammatical structure. Added a semicolon instead of a comma before "it's made" for better punctuation. <p>Suggestions for Further Improvement:</p> <p>To make your text sound more natural and native-like, consider the following examples:</p>	<p>Original: "The most delicious foods for me are French fries and pasta."</p> <p>Revised: "The most delicious foods are French fries and pasta."</p> <p>Original: "the atmosphere is very nice because you can sit outside and it's very friendly."</p> <p>Revised: "the atmosphere is very nice because you can sit outside and it's welcoming."</p> <p>Original: "the speciality is Pasta, it's made with a special sauce that makes it tasty and it has various meats."</p> <p>Revised: "the speciality is Pasta, it's made with a special sauce flavorful and it has various meats."</p> <p>Feedback on Your Revision:</p> <ol style="list-style-type: none"> Clarity: Your revised text is clearer, especially in the second sentence where you removed "for me," making it more direct. Word Choice: "Welcoming" is a better choice than "friendly" when describing an atmosphere; it conveys a positive feeling. Error Correction: You used "a Lot" instead of "a lot." Remember that "lot" should be in lowercase. Sentence Structure: The phrase "a special sauce flavorful" is slightly awkward. It would be more natural to say "a flavorful special sauce." <p>Suggestions for Further Improvement:</p> <ul style="list-style-type: none"> Try to combine some sentences to improve the flow. For example: "The atmosphere is very nice because you can sit
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	<p>1. Instead of "the restaurant sells a lot of dishes," you could say, "the restaurant offers a wide variety of dishes."</p> <p>2. Instead of "the atmosphere is very nice," you might say, "the atmosphere is inviting and pleasant."</p> <p>3. Instead of "the specialty is pasta," you could say, "the highlight of the menu is the pasta."</p> <p>These changes can help enhance your writing by using more descriptive language and improving the flow of your sentences.</p>	<ul style="list-style-type: none"> outside in a welcoming environment." Consider adding more details about the dishes or the restaurant's ambiance to make it more engaging.
FJ10 P:Fred	<p>Thank you for sharing your second version! Now, let's take a look at your text.</p> <p>Second Version Correction I would like to visit Africa, Russia, Laos, and Germany. I want to buy a house. I want to buy a good car. I want to buy a finca. I want to buy a superbike motorbike. I am going to get married and I am going to have three children: two boys and a girl.</p> <p>Differences between your second version and the correction:</p> <ul style="list-style-type: none"> Punctuation: I removed the comma before "Africa" 	<p>Thank you for sharing your second version!  Let's take a look at your text and highlight the changes you've made. I'll also provide some corrections for clarity.</p> <p>Your Second Version: "I would like to visit, Africa, Russia, Laos and Germany. I want to Buy a house. I want to Buy a good car. I want to Buy a finca. I want to Buy a superbike motorbike. I am going to ger married and I AM going to have three children: two boys and a girl."</p> <p>Corrections: "I would like to visit Africa, Russia, Laos, and Germany. I want to buy a house. I want to buy a good car. I want to buy a finca. I want to buy a superbike motorcycle. I am going to</p>

	<p>and added a comma before "and Germany" to make the list clearer.</p> <ul style="list-style-type: none"> Verb Form: Changed "Buy" to "buy" (lowercase) to match the sentence structure. Verb Correction: Changed "ger" to "get" for the correct verb form. Capitalization: Changed "AM" to "am" (lowercase) to maintain consistency in verbforms. <p>Now, let's talk about ways to improve your second version to sound more natural and native-like:</p> <ol style="list-style-type: none"> Use Lowercase for Common Nouns: Always use lowercase letters for verbs unless they start a sentence. For example: "I want to buy a house." Combine Sentences: You can combine some sentences for better flow. For example: "I want to buy a house, a good car, a finca, and a superbike motorbike." Clarify Your Intentions: You can express your future plans more clearly. For example: "I am going to get married and have three children: two boys and a girl." <p>Keep practicing! You're doing well! If you have</p>	<p>get married, and I am going to have three children: two boys and a girl."</p> <p>Changes Highlighted:</p> <ul style="list-style-type: none"> Removed the comma after "visit." Corrected the capitalization of "buy." Changed "ger" to "get." Changed "motorbike" to "motorcycle" for clarity (both are correct, but "motorcycle" is more commonly used in standard English). Added a comma before "and" to separate the two clauses. <p>Suggestions for Improvement:</p> <ol style="list-style-type: none"> Consistency in Capitalization: Use lowercase for verbs like "buy" unless they are at the beginning of a sentence. Punctuation: Remember to use commas correctly in lists and before conjunctions. Clarity: Using "motorcycle" can make your writing clearer for a wider audience. <p>Would you like to make any more changes or ask questions about your text?</p>
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	<p>more questions or want to continue, let me know!</p> <p>Here's a revised example: "I would like to visit Africa, Russia, Laos, and Germany. I want to buy a house, a good car, a finca, and a superbike motorbike. I am going to get married and have three children: two boys and a girl."</p>	
FJ11 P: Fred	<p>Second Version Correction</p> <p>Here is your revised text with some corrections highlighted in bold:</p> <p>MY FUTURE! I have a lot of dreams for the future; one of them is traveling throughout Colombia because I think we should know our country well before other countries.</p> <p>Another dream is to meet Shakira and have a photo with her; also, I want to buy all of her albums. I think I will have enough money to buy so many clothes and have a good sense of style as a lawyer. I will be an activist and I'll help as many people as I can through my work as a lawyer. I hope I will have a wonderful boyfriend and adopt some children to make a loving family.</p> <p>Differences Explained:</p> <ol style="list-style-type: none"> 1. "travelling to all around" → "traveling" 	<p>Thank you for submitting your revised text about your future plans! Here's my feedback, highlighting the changes you made:</p> <p>Your Revised Text with Corrections:</p> <p>MY FUTURE! I have a lot of dreams for the future; one of them is traveling throughout Colombia because I think we should know our country well before visiting other countries. Another dream is to meet Shakira and have a photo with her; I also want to buy all of her albums. I think I will have enough money to buy a lot of clothes and have a good sense of style as a lawyer. I will be an activist, and I'll help as many people as I can being a lawyer. I hope I will have a wonderful boyfriend and adopt some children to create a loving family.</p> <p>Changes Highlighted:</p> <ul style="list-style-type: none"> • "travelling to all around" → "traveling throughout" • "know well our country first than other countries" → "know our country well before visiting other countries."

	<p>throughout": This change makes the phrase more natural in English.</p> <p>2. "we should know well our country first than other countries" → "we should know our country well before other countries": This rephrasing corrects the comparative structure and improves clarity.</p> <p>3. Added punctuation: Commas and semicolons were added for better sentence structure and flow.</p> <p>4. "help as many people as I can with my job" → "help as many people as I can through my work": This change makes the sentence sound more professional and clear.</p> <p>5. "make a nice family with a lot of love" → "make a loving family": This revision simplifies the phrase and avoids repetition of "nice."</p> <p>Now, let's talk about how you can further improve your second version to sound even more natural and native-like:</p> <p>1. Vary Sentence Structure: Try to mix short and long sentences</p>	<ul style="list-style-type: none"> • "buy so many clothes" → "buy a lot of clothes" • "have a good style" → "have a good sense of style" • Added semicolons for better sentence flow. • "make a nice family with a lot of love" → "create a loving family." <p>Differences Explained:</p> <ol style="list-style-type: none"> 1. "traveling throughout" is a more natural phrase than "travelling to all around." 2. Changing "know well our country first than" to "know our country well before visiting" improves clarity and grammatical structure. 3. "buy a lot of clothes" sounds more natural than "buy so many clothes." 4. "have a good sense of style" is clearer and more common than "have a good style." 5. The use of semicolons helps connect related ideas more smoothly, enhancing readability. <p>Suggestions for Further Improvement:</p> <ul style="list-style-type: none"> • To make your text sound even more natural, you could consider adding more details or examples about what kind of activist work you plan to do. This would enhance the depth of your writing. • You might also want to elaborate on what "good sense
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	<p>for better rhythm. For example, "I have a lot of dreams for the future; one of them is traveling throughout Colombia." can be rephrased to "I have many dreams for the future. One of them is to travel throughout Colombia."</p> <p>2. Use Synonyms: Instead of repeating "nice," consider using synonyms like "wonderful," "loving," or "beautiful" to enhance your vocabulary.</p> <p>3. Add More Details: You could elaborate on your dreams. For example, instead of just saying you want to meet Shakira, you could add why you admire her or what you would like to ask her.</p>	<p>"of style" means to you—this can give the reader a clearer picture of your aspirations.</p>
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Appendix O - Linguistic analysis criteria

GPT4o-mini has been used to help conceive the idea and criteria for this experiment.

The actual experiment can be seen on this GitHub repository:

https://github.com/MACely-Ed-tech/Master_Thesis_MariaCely.git

- **Type-Token Ratio (TTR):** This measures lexical diversity, calculated by the ratio of unique words to total words, using lexicalrichness. A higher TTR indicates a richer vocabulary because more unique words are used.

Using Spacy

- **Lexical Density:** Part-of-Speech (POS) tagging is used to identify content words (nouns, verbs, adjectives and adverbs). Then, the density is calculated by measuring the proportion of content words to the total number of words. Higher lexical density means the text is more information packed.
- **Rare Word Ratio:** First, the text is tokenised, and the wordfreq library then measures the proportion of words in the text that are considered "rare" based on a predefined frequency threshold (less than 1e-5 in English according to the library). A higher ratio indicates the use of more uncommon vocabulary.
- **Nominalisations:** First, the text is tokenised and checked for words containing suffixes that are likely to be nominalisations (words formed from verbs or adjectives). The presence of more nominalisations can make text sound more abstract or formal.
- **Avg Sentence Length:** By applying sentence segmentation, the average number of words per sentence can be determined. Longer sentences may indicate more complex grammatical structures.
- **Passive Voice Count:** Dependency parsing helps to determine how many times the passive voice is used. Its frequent use can make writing sound more formal, indirect, or impersonal.
- **Clause Types:** A dictionary counts the occurrences of specific types of dependent and coordinate clauses identified by their dependency tags. This provides insight into the complexity of sentence structure.
- **Modality:** After POS tagging, the modal verbs used in the text are listed. Modal verbs express degrees of certainty, probability, obligation, or permission, thereby indicating the writer's stance or attitude.
- **Tense Counts:** Using POS tagging and tag information, a dictionary is created to count the occurrences of different verb tenses.

Using Regex

- **Logical Markers:** The presence of words or phrases that signal logical relationships between ideas (e.g., however, because, therefore) could indicate explicit discourse cohesion and structured reasoning.
- **Examples Given:** The presence of phrases that introduce examples indicates the use of specific illustrations to support points.
- **Flesch Reading Ease:** [textstat](#) measures how easy the text is to read, based on sentence length and the number of syllables per word. A higher score means easier readability.

Using textblob

- **Polarity:** This measures the sentiment of the text on a scale from -1 to +1, with 0 indicating neutrality.
- **Subjectivity:** This measures the subjectivity of the text on a scale from 0 (very objective) to 1 (very subjective).

Appendix P - Future research experiment

- **Experiment with DeepSeek:**

Would you perform any NLP tasks in this chatbot instruction?

Based on the provided instructions, **yes, I would perform several core NLP (Natural Language Processing) tasks** as "Joe" to fulfill this role effectively. Here's a breakdown of the NLP tasks involved:

Thought for 17 seconds:

Hmm, the user is asking if I would perform any NLP tasks while following these detailed chatbot instructions for an English writing feedback assistant named "Joe."

First, let me analyze what the instructions require. The core task is providing writing feedback to Spanish-speaking English learners in Colombia. The process involves several steps: collecting student info, receiving their text, analyzing errors, asking reflective questions, explaining mistakes (especially interlingual ones from Spanish), and offering revision support.

Now about NLP tasks - yes, several natural language processing functions are embedded throughout this workflow. Error detection requires syntactic analysis to spot grammar mistakes and morphological analysis for verb conjugation issues. When identifying interlingual errors (like false friends or Spanish-influenced structures), I'm doing contrastive analysis between English and Spanish.

The rubric-based grading in Step 6 involves automated essay scoring techniques. The text comparison in Step 9 requires computational text alignment. Even generating reflective questions needs semantic understanding of the student's intended meaning versus their actual expression.

But importantly, all this NLP happens behind the scenes. The instructions emphasize maintaining a friendly, human-like persona ("Joe" with emojis) without technical jargon. The focus stays on pedagogy - making students reflect through questions rather than just getting corrections.

The user seems to be verifying if the system actually uses linguistic analysis or just pattern-matching. Definitely the former, especially with the explicit requirement to analyze Spanish-influenced errors. They might also be checking if the NLP capabilities match the promised depth of feedback.

I should confirm the NLP components while stressing they're tools to achieve the pedagogical goals, not the focus. The instructions wisely hide the technical complexity to avoid intimidating learners. My response should mirror that balance - acknowledging the underlying NLP while keeping explanation accessible.

1. ****Text Analysis & Error Detection:****

* ****Identifying Errors:**** Scanning the student's text to find grammatical errors (verb tense, subject-verb agreement, articles, prepositions), spelling mistakes, punctuation errors, and word choice issues.

- * **Syntax Parsing:** Analyzing sentence structure to identify awkward phrasing, run-on sentences, sentence fragments, or incorrect word order.
 - * **Morphological Analysis:** Checking verb conjugations, noun plurals, adjective forms, etc.
 - * **Semantic Analysis:** Identifying unclear meaning, illogical connections, or inappropriate word usage (e.g., false friends like "actual" vs. "current").
2. **Interlingual Error Identification (Key NLP Task):**
- * **Contrastive Analysis:** Specifically looking for errors likely caused by the influence of the student's native Spanish (L1) on their English (L2) writing. Examples include:
 - * False Cognates (e.g., "embarazada" ≠ "embarrassed").
 - * Direct translation of Spanish structures (e.g., "I have 20 years" instead of "I am 20 years old", omission of subjects where Spanish allows it, preposition errors based on Spanish usage ("depend *of*" instead of "depend *on*"), article usage differences).
 - * Verb tense usage influenced by Spanish norms.
3. **Text Generation:**
- * **Constructing Feedback:** Generating the "Good Things" list and the detailed "Things You Need to Fix" table (Errors, Reflective Questions, Analysis).
 - * **Formulating Reflective Questions:** Creating specific, pedagogically sound questions based on the identified errors to prompt student self-correction.
 - * **Generating Explanations:** Providing clear, level-appropriate explanations for *why* an error is wrong and *how* to correct it, especially focusing on L1 interference.
 - * **Rephrasing & Providing Examples:** Generating corrected versions of sentences and offering more natural/idiomatic alternatives (Steps 9 & 10).
 - * **Providing Writing Tips (Step 7):** Generating general advice tailored to the specific text type (email, essay, story, etc.).
4. **Text Comparison (Step 9 & Action C):**
- * **Alignment & Difference Detection:** Comparing the student's second version against their first version and/or the assistant's correction to identify specific changes and remaining issues. Highlighting differences effectively requires text alignment algorithms.
5. **Automated Essay Scoring (AES) Concepts (Step 6):**
- * While the rubric is provided, applying it consistently involves NLP sub-tasks:
 - * **Content Relevance:** Assessing if the text addresses the prompt/task.
 - * **Organization & Coherence:** Evaluating paragraph structure, logical flow, and use of linking words.
 - * **Vocabulary Range & Accuracy:** Judging word choice appropriateness and variety.
 - * **Grammatical Range & Accuracy:** Quantifying grammatical errors and complexity (as identified in Task 1).
 - * **Mechanics:** Checking spelling, punctuation, and capitalization.

6. **Language Simplification (Action S):**
 - * **Lexical Simplification:** Replacing complex vocabulary or jargon with simpler synonyms appropriate for the student's level (A1, A2, B1).
 - * **Syntactic Simplification:** Rewording complex sentence structures into shorter, clearer sentences.

In essence, the entire feedback process relies heavily on NLP: analyzing the input text linguistically, identifying specific issues (especially L1 interference), generating explanatory and corrective text, comparing text versions, and adapting language complexity.

Important Distinction: While the **instructions** define the **process and pedagogical approach**, the actual **execution** of identifying errors, generating explanations, questions, corrections, and comparisons fundamentally requires NLP capabilities operating under the hood. The "Analysis of Your Mistakes" section, particularly focusing on interlingual errors, is a prime example of applied NLP for language learning.

- **Experiment with GPT4o-mini:**

Would you perform any NLP tasks in this chatbot instruction?

Thought for a couple of seconds

User asks if NLP tasks will be performed in the chatbot instructions. The answer is yes, the assistant will perform various NLP tasks as described in the instructions. These tasks include syntactic parsing, error detection, classification, feedback generation, and question

Done

Yes. Under the hood, "Joe" would be doing a suite of classic NLP-style operations to deliver that feedback. In particular, you'd see:

1. **Error Detection & Classification**
 - *Tokenization* and *part-of-speech tagging* to spot things like subject–verb agreement errors.
 - *Syntactic parsing* to identify misplaced modifiers, run-ons, fragments, etc.
 - *Error-type classification* to distinguish interlingual (e.g. false friends, direct Spanish calques) from purely intralingual issues.
2. **Error Correction & Paraphrasing**
 - *Text normalization* to canonicalize student input.
 - *Automated correction models* (or rule-based transformations) to propose fixes.
 - *Text-to-text generation* for more natural or native-like rewrites.
3. **Reflective Question Generation**
 - *Template-driven question scaffolding*, filled in with specific error contexts.
 - Possibly a little *semantic similarity* to ensure the questions tie back closely to the student's sentences.

4. Rubric-Based Scoring

- *Feature extraction* (e.g. vocabulary range, grammatical accuracy, coherence markers) to map a student text onto a 1–5 scale.
- A lightweight *classification or regression model* to predict that score.

5. Guidance & Tip Generation

- *Content planning* to select the right set of tips for the text type.
- *Natural language generation* to express those tips in a friendly, emoji-rich style.

In other words, although the student sees a friendly “Joe” giving feedback, behind the scenes you’d rely on standard NLP pipelines for error detection/correction, classification, question generation, and text generation to carry out each of the prescribed steps.