

FROM PROMPT TO RESPONSE: UNDERSTANDING CHATGPT LANGUAGE PROCESSING FRAMEWORK TO IMPROVE EFL TEACHING

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Abstract: Foreign Language (FL) learning and teaching have known a drastic shift due to the implementation of the fast-growing Artificial Intelligence (AI) tools. Traditional methods to teaching English involve one-size-fits-all approach that makes it challenging to address individual needs. Teachers interacting with AI-language assistant chatbots as ChatGPT for generating teaching materials and designing tasks that align with students' different proficiency levels, may not receive the intended response of the query. This can be the result of their limited knowledge of how the model function to generate texts. The present study analyzes ChatGPT language processing framework, centered on key components of prompting, tokenization, vectorization, transformer mechanism, and semantic analysis. The research aims to analyze how ChatGPT interprets and generates human-like texts, and hypothesizing that these stages can impact significantly the response coherence and accuracy. Adopting a qualitative method, the study illustrates language processing features through examples, showcasing its capacity to extract meaning from written text, and the importance of context in constructing responses. The Findings revealed that for the Large Language Model (LLM) to provide the accurate response to the given prompt, it interacts with the input lexical and semantic structures, and contextual specificity. EFL teachers understanding prompt engineering can refine their queries to receive more reliable responses which permit them to master the skill to lessen ambiguity in prompts generation and improve AI interaction for academic and educational purposes.

Keywords: Artificial Intelligence, ChatGPT, context, English as a Foreign Language, Large Language Model, prompt, response

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1. Introduction

Technology is becoming a transformative power shaping an uplift in various domains including education (Bean, 2018). In this regard, language chatbots gained attention over the years to supplement traditional methods by offering innovative tools that can enhance teaching methodologies and FL learning experience. The integration of language technologies allows personalized instructions to both students and teachers. Virtual language agents offer instant feedback and interaction with the user, and practice language at their own pace on smartphone, tablets, or computers (Ziatdinov et al., 2024).

Concerns are raised over teachers' literacy of integrating AI-language assistants in educational setting such as ChatGPT, particularly their capacity in manipulating AI for generating texts more efficiently. Many language instructors have limited knowledge of this new innovation; in light of this, the study addresses the questions of how LLM functions? How it processes input? and how it generates responses to queries. Teachers understanding of this gap can influence the quality of the generated response in terms of accuracy, coherence, and contextual relevance.

In an attempt to answer the research questions, the research aims to (1) examine the way through which ChatGPT processes and interprets input; (2) explain the relationship between the prompt and the generated output by focusing on how LLM interacts with the lexical input, semantic structure, and contextual cues. Thus, teachers' digital AI-literacy enables them to utilize information, communicate and evaluate it critically. The understanding of how these technological devices are effectively used in performing safe and engaging online practices; develops teachers personal and professional growth.

2. Literature Review

The present study is based on some research conducted recently on AI in education and FL. The reviewed studies provide the background of the research regarding perspectives on the effectiveness of technology in motivating students and teachers to engage in a more interactive learning experience. The diversity of digital tools increased interest among users depending on students' language learning needs and teachers' teaching objectives.

2.1. Artificial Intelligence in Education

The simulation of human intelligence in machines as computers is called Artificial Intelligence (AI), it enables them to achieve tasks commonly require human cognition including language processing, problem-solving, decision making, etc (Cheng & Day, 2014). History of AI dates back to Alan Turing and John McCarthy during (1950s) who set the foundations for '*intelligent systems*' (Karsenti, 2019). Today, AI plays a significant role in diverse sectors as healthcare, industries, finance, and education due to its automating process and constantly enhanced efficiency in providing smart procedures.

AI tools were studied initially to develop intelligent tasks by robots that usually humans can perform. In education, FL learning has been revolutionized due to technological advancements, as AI tools offer personalized tutoring and instant feedback to the students (Gawate, 2019). The growing interest in using digital platforms to become competent in FL was due to the variety and accessibility of AI applications.

Research on AI involves fields as cognitive computing, machine learning, language processing, neural network and other technologies. Some examples of AI involve Google Translate that provides instant interpretation and pronunciation of words with the capacity Text-to-Speech translate. Another tool 'Assessment-Based Learning Environment for English' or ABLE permits the learning of grammar through assessment. An effective

application called English Learning Speech Assistant (ELSA), combines speech recognition systems and AI to improve EFL students' pronunciation and speaking skill. Duolingo, is an application that encourages learning various languages through games where students can be asked to match words, construct sentences, etc (Eka, 2020; Nghi et al. 2019). The latest and rapid advanced technology is *Chatbot* that functions as a conversation friend in written or vocal mode, which had exhibited remarkable utility as a learning tool of English language (Afrianto et al., 2019). Recently, a notable application that had been manipulated by language teachers and students is ChatGPT, a language model assistant.

2.2. ChatGPT

OpenAI built a chatbot that can virtually assist users named ChatGPT, and it was first launched on November 2022. This AI tool is often referred to as Large Language Model (LLM) which is considered a machine learning model, enabling users to engage in conversations depending on the type of language, style, structure, and specific details (Wolfram, 2023). The model is the latest innovation of Generative Pre-Trained Transformer (GPT). It is described as a prototype based on a dialogue and it has the capacity to comprehend the human language and generate human-like written texts. ChatGPT system provides user-friendly interface designed to answer questions through conversational mode. According to OpenAI, the model's dialogue format allows it to answer users' follow-up questions, recognize its mistakes, raise a challenge over false assumptions, and decline inappropriate inquiries (November 30th, 2022).

LLMs are trained on data-based texts available on the internet to produce language that is meaningful, coherent and relevant. LLMs capacities extend text generation to translation, summarizing passages, analyzing and providing visual representation of data. By 2023, ChatGPT became one of the world's fastest developed AI tool which urged other rivals to produce applications as Gemini, Grok, Claude, Llama, Ernie (Wikipedia, December 28, 2024) and its latest version ChatGPT4o-mini is available since July 2024. Furthermore, Microsoft released Copilot which is basically designed on GPT-4, while the Chinese DeepSeek AI (January, 10th, 2025) released the chatbot DeepSeek-R1 Model (Wikipedia, February 4, 2025).

ChatGPT responses are produced via Natural Language Processing (NLP) systems which enable the delivered text to sound more human-like. Computers learn how to understand and translate language via machine learning systems that are used by NLP. ChatGPT which is constructed on GPT is a machine learning product and a kind of deep learning model designed to handle NLP activities. LLM is based on mimicking human intelligence and it possesses abilities to process information like humans do, and learn to improve itself by doing tasks. Using Machine Learning (ML), ChatGPT can understand the input and interact with it. Technically speaking, signal transmission is realized through artificial neurons that are used by neural network prototyped after the human brain. In other words, neural networks enhance their accuracy by training itself via errors minimization and reviewing vast amount of data. Therefore, neural networks trying to get better in NLP looks like the process of humans learning a new language (Aydin & Karaarslan, 2022).

In terms of EFL learning and teaching, many findings assume that ChatGPT can supplement the traditional language teaching and learning instructions. Some studies demonstrated that the incorporation of the LLM in the classroom improves learners' engagement in the lesson activities and stimulate real-life interactions. The model capacity of providing immediate feedback on the students' writings motivates them to perform the task in a more self-directed learning. A study of Indonesian learners showed their increased interest

in using AI to evaluate their academic writing assignments due to its interactive features and satisfactory responses (Hatmanto & Sari, 2023).

Regardless of teachers' recognition of ChatGPT beneficial use in increasing students' engagement, helping in generating teaching materials for lesson planning, and providing instant feedback; others raised ethical concerns about plagiarized content delivered by the students which may be the result of AI overreliance and misuse (Hadj Ameer & Belkhir, 2024; Iqbal et al., 2022). Many instructors questioned teachers' roles in higher education when using LLMs and called for reevaluation of AI mission; furthermore, they stressed the fact that AI should supplement the traditional method rather than replace the teacher (Benaicha & Semmoud, 2024).

A study on 120 students in Vietnam studying English for Specific Purposes at Korea University and Da Nang University, demonstrated that despite students manipulation of ChatGPT to handle language difficulties related to paraphrasing, vocabulary and grammar, learners recognized the importance of teachers' guidance in EFL classroom to adequately use ChatGPT (Ho, 2024). In another research investigating students' and teachers' views and practices in a Malaysian public school, towards the utilization of ChatGPT to improve EFL students writing proficiency, showed that they favor the LLM generation of ideas, personalized assessment, and proofreading. Additionally, they highlighted challenges related to the limited teachers' and students' digital literacy and overdependency that can influence negatively the learners academic development (Aineh & Ngui, 2024).

Depending on the previously reviewed studies that described the utility of LLMs in EFL teaching and learning, more research needs to be carried out to explore the challenges. The present study calls for providing insights on ChatGPT at work in terms of how it interacts with human users' texts to generate responses.

3. Methodology

The employment of AI tools in education has transformed the way FLs are taught and learned. At many levels, LLMs facilitate learning due to the accessible learning platforms, applications dedicated to grammar, vocabulary, pronunciation mastery, and plagiarism checkers for written passages, etc. Humans use language to communicate among each other in diverse languages but still may misunderstood the delivered content. Developing an AI system that can generate human-like passages that are based on particular user requests can be a bit challenging, especially if the responses do not fit the users' intended meaning. ChatGPT is one of the mostly used AI-language assistants by EFL students and teachers. Therefore, the research aims to uncover the path that ChatGPT goes through to process users' queries and generate texts. Teachers understanding the model's language processing framework, can enable them to develop their skills in prompt creation which results in enhancing conversational interaction between EFL teachers and the LLM; and with which ChatGPT can provide better responses.

3.1. Research Design

To fulfill this goal, the research design is *qualitative* in nature by applying both *descriptive* and *analytical* approaches. These approaches provide a comprehensive framework to examine how ChatGPT generates human-like text and identify the underlying mechanism that influences its output. It allows to offer understanding on how LLM interacts with user's query and pinpoint the linguistic patterns and response tendencies in terms of lexical, semantic, and contextual interpretation. Meanwhile, the analytical approach helps to extract in-depth information linked to coherence, accuracy, and limitations. This research design permits to describe not only how ChatGPT processes language input but also to evaluate the

reliability, effectiveness, and the possible bias embedded in its output. Perspectives enable to formulate implications about LLM prompt-response connection and its significance to be understood by EFL teachers.

3.2.Data Collection and Analysis

The study provides illustrations on how ChatGPT processes language with the use of language examples, and explaining different stages that the procedure involves as prompting, tokenization, vectorization, transformer mechanism, and semantic analysis under the umbrella of descriptive approach. These steps are fundamental in ChatGPT's language processing framework which is part of NLP. Extracting, examining, and interpreting how these features function with the use of analytical approach, enlightens perspectives on their roles in understanding AI language processing. The results will enable to formulate conclusions on the significance of expanding teachers' digital literacy to promote EFL teaching.

First, the researcher tested a set of prompts on ChatGPT (OpenAI, 2025) in order to determine and examine certain response features that align with the user's query, and the results are presented in figures captured from ChatGPT. Second, in an attempt to understand the AI language processing framework, the researcher adopted the '*Sequence modeling in LLMs*' introduced by Vaswani et al. (2017) in 'Attention is all we need'. The achieved results are illustrations that were provided to the modeling with the use of authentic language materials, and presented with diagrams created by Napkin AI (2025). This tool offered visual representation of the findings and extracted data. It assists in generating diagrams useful to mind-mapping and brainstorming in a structured format. Napkin has the capacity to interpret input information and suggest diverse visual outputs from which the researcher selected the best that represents the target meanings. In terms of validity, the program is based on AI-automated feedback and the conceptual accuracy can be assessed if it aligns with the researcher's intent, and transform the input into a coherent visual structure. Napkin showed high level of reliability after being tested overtime in creating similar diagrams to the user input.

4. Results

The research findings are based on the description and analysis of ChatGPT features involved in language processing.

4.1.ChatGPT Prompt Architecture

A prompt refers to the instruction the user types in the chatbot in order to generate answers. It varies from a statement to a question that describes a thought. In the following, examples of prompts about writing a professional email that are formed from more general to more specific in terms of the degree of precise query. This permits to observe the difference in the quality and amount of the delivered information response.

4.1.1. Prompt 1: How to write a professional email

- User Prompt: Create a template of a professional email.



Subject: [Brief and Clear Subject]

Dear [Recipient's Name],

I hope this email finds you well. My name is [Your Full Name], and I am writing to [state the purpose of your email]. [Provide any necessary context or background information if applicable.]

[Body of the Email]

[Be concise and organized in presenting your main points. Use paragraphs to separate ideas and maintain clarity.]

[Closing]

Thank you for your time and attention to this matter. I look forward to [next steps, further discussion, etc.]. If you have any questions or require additional information, please feel free to reach out.

[Closing Salutation],

[Your Full Name]

[Your Position]

[Your Company]

[Your Contact Information]

Figure1: ChatGPT Input to Prompt of Creating a Template of a Professional Email

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization.

In this prompt, ChatGPT provides guidelines to writing a professional email in relation to email format and suggestions of possible content in general. In this regard, ChatGPT offers advice on the language structure including the clarity of the information, paragraphs organization in terms of ideas coherence, and the use of polite expressions.

4.1.2. Prompt 2: Example of a professional email

- User Prompt: Write a professional email to my boss who is strict about delivering work on time and request a deadline extension of a week period



Subject: Request for Deadline Extension – [Project Name]

Dear [Boss's Name],

I trust this email finds you well. I am writing to discuss the current timeline for the completion of [specific project/task]. I appreciate the importance of delivering work on time, and I am committed to upholding our standards of timeliness.

However, I find myself facing unforeseen challenges that have impacted the progress of the project. [Briefly explain the nature of the challenges without going into excessive detail.] In order to ensure the final delivery meets the high standards we strive for, I am requesting an extension of the deadline by [specific number of days/weeks, e.g., one week].

I want to assure you that I am fully dedicated to delivering a quality outcome, and I am working diligently to overcome the current obstacles. An extension would allow me to address these challenges thoroughly and present a more refined and polished final product.

I understand the significance of adhering to deadlines, and I am committed to minimizing any disruption this extension may cause. I am more than willing to discuss this matter further at your earliest convenience.

Thank you for your understanding and consideration. I look forward to your guidance on how to best proceed.

Best Regards,

[Your Full Name]

[Your Position]

[Your Contact Information]

Figure 2: ChatGPT Input to Prompt of Example of a Professional Email

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization

In this prompt, ChatGPT responds to the user's inquiry of deadline extension in which the body of the email is based on the background information that the boss is 'strict'. In the light of this, considerations were made on gaining the boss empathy via showing awareness towards the significance of respecting the deadline, praising one's capacities of being committed to work, and requesting politely the most convenient procedure to handle the situation.

4.1.3. Prompt 3: Steps of Professional Email

- User Prompt: write an email to my boss who gets upset if I don't submit the work on time, explain to him that I was severely sick that is why I could not manage to finish the work.



Subject: Explanation for Delayed Submission – [Project Name]

Dear [Boss's Name],

I hope you are doing well. I am writing to explain the delay in submitting [specific project/task] and sincerely apologize for any inconvenience caused.

Unfortunately, I was severely ill over the past few days, which temporarily prevented me from working. I am now recovering and fully committed to completing the pending work as soon as possible. I understand the impact of this delay on the team's schedule and regret any disruption it may have caused.

I am taking all necessary steps to catch up and ensure the project stays on track. If there are any specific measures you would like me to take to minimize the impact, please let me know, and I will prioritize them accordingly.

Thank you for your understanding and support. I appreciate your patience and look forward to resuming full productivity.

Best regards,

[Your Full Name]

[Your Position]

[Your Contact Information]

Figure 3: ChatGPT Input to Prompt of Steps to a Professional Email

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization.

Being more specific in this prompt helps to detail the challenges that the user is facing/faced while attempting to complete the work. Similar to the previous prompts, the model explains and assures the user's commitment and awareness of the critical situation.

Through the observation of suggested prompts, it is noticed that the more precise the prompt is, the more corresponding and satisfying ChatGPT response will be to the user's query. It is found that the employed prompt dictates the output given by the model in which the messages the user exchanges shape the conversation. The LLM accessibility to loads of text data trained it on how human beings engage in conversations. Conversing with ChatGPT enables it to speculate the following word in the phrase which allows it to generate more replies; thus, feeding the model with the relevant prompt will assure more appropriate feedback. Providing information on the contextual background, preferences, and particular details or facts, as illustrated in Prompt 3, give more accurate answers that meet the user's wants. For personal information, the model leaves instructions between enclosed brackets to be filled out by the user. In this regard, ChatGPT engineers do not recommend communicating personal names or addresses - that are not supposed to be available to anyone - because conversations are reviewed by OpenAI trainers and data are stored online; which increases the risk of being hacked.

In other situations, the AI model provides a list-format response instead of a paragraph, preceded by a concise text to the given input prompt. When ChatGPT comes across a large amount of text data, it interacts with numerous information that is presented in text and in list-format which exist in wide range of materials such as articles, books, websites, etc. This can be explained that ChatGPT does not necessarily follow a particular '*training data pattern*'; but it *learns* to identify structural cues that demonstrate the existence of a list. Therefore, the model presents the listed information in a bulleted - utilize asterisks (*), hyphens (-), and plus signs (+) - or numbered data in which a number of the list is followed by a period (Eg. 1., 2., 3.). Technically speaking, the generated response in a text or list-

format is tied up to the given prompt, if the user prefers information presented in a particular manner can specify this in the prompt.

Suggesting ways on how to create a good prompt necessitates understanding of how ChatGPT interprets and analyzes the prompt in a given sentence. The AI model goes through a number of stages in order to generate answers (Walter, 2024). To exemplify these patterns, the researcher made use of the ‘*Sequence modeling in LLMs*’ initiated by Vaswani et al. (2017), that involves: prompting or input sequence, tokenization, vectorization or contextual representation, prediction of the next token, and the complete sequence or output. These features are illustrated through the prompt selected randomly by the researcher: ‘*Explain cognitive intelligence?*’ and processed by ChatGPT:

- (1) Tokenization: ChatGPT breaks down the prompt into separate tokens (what is referred to as smaller entities) as presented in Figure 4:

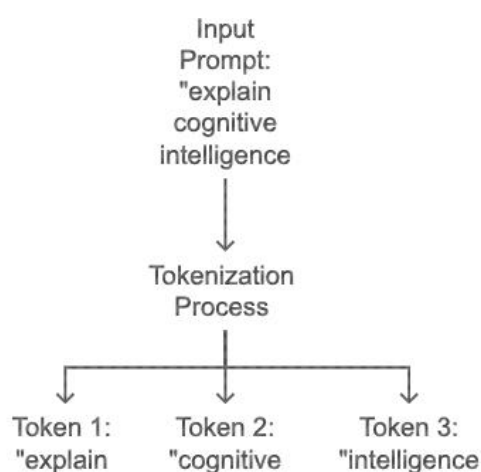


Figure 4: Tokenization Process in ChatGPT of the prompt ‘Explain cognitive intelligence’

Note. Created by the author using Napkin.ai (2025) for visualization.

LLM does not read texts word-by-word like humans do, instead it breaks down the text input into tokens ‘explain’, ‘cognitive’, and ‘intelligence’ (More details are provided in section 4.2.1)

- (2) Context Understanding: Figure 5 demonstrates the recognition of the prompt nature shown in a request, in which the keywords refer to ‘explain’, ‘cognitive’, and ‘intelligence’.

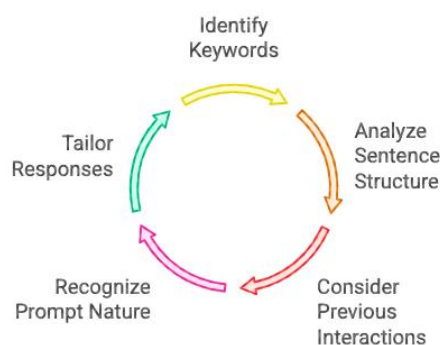


Figure 5: Cycle of Context Understanding in NLP to the prompt: ‘Explain cognitive intelligence’

Note. Created by the author using Napkin.ai (2025) for visualization.

ChatGPT identifies the important words in the prompt and each of these key terms determine the type of answer needed. For example, ‘Explain’ marks the user’s want of a detailed response. The items ‘cognitive’ and ‘intelligence’ suggest topics related to human thinking or AI cognitive processes.

- (3) Attention Mechanism: paying attention to the key tokens ‘*cognitive*’ and ‘*intelligence*’ as demonstrated in Figure 6.

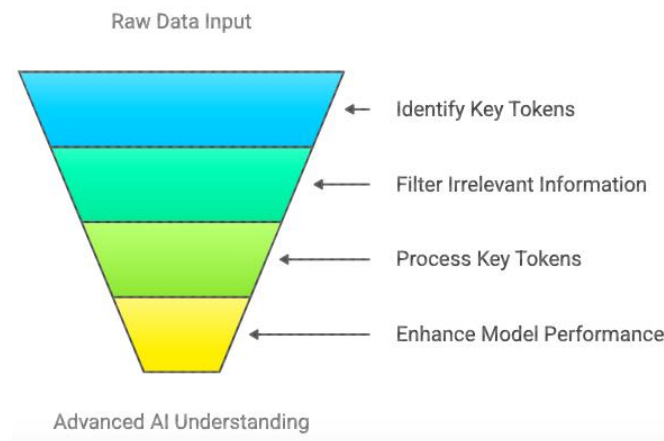


Figure 6: LLM Attention Mechanism

Note. Created by the author using Napkin.ai (2025) for visualization.

In an attempt to generate responses, ChatGPT prioritizes particular information by giving more focus to some words over others, which contributes better in understanding the prompt (More details are provided in section 4.2.3)

- (4) Neural Network Processing: Each layer of the neural network captures the context and structure of the tokenized input (Figure 7).

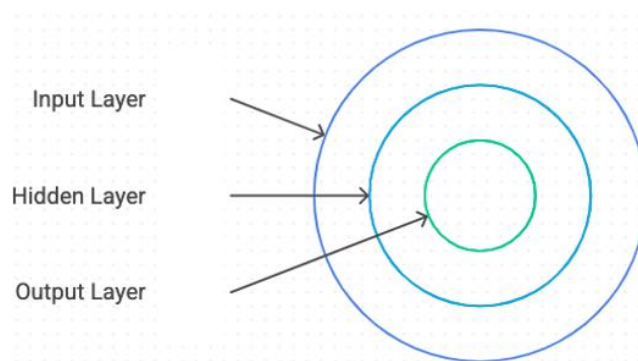


Figure 7: Neural Network Processing in ChatGPT of the prompt ‘Explain cognitive Intelligence’

Note. Created by the author using Napkin.ai (2025) for visualization.

Figure 7 suggests that the understanding of the context of the tokens ‘cognitive’ and ‘intelligence’ requires the LLM to go through layered processing starting with input data (receives data), passes through the hidden transformations (extracts features) and producing meaningful output (transform data into final results). It is assumed that each layer is built up upon the previous one which indicates how neutral networks are structured to simulate human-like cognitive process.

- (5) **Adjusting Parameters:** the model adjusts its parameters according to the variety of dataset that has been trained through (Figure 8).

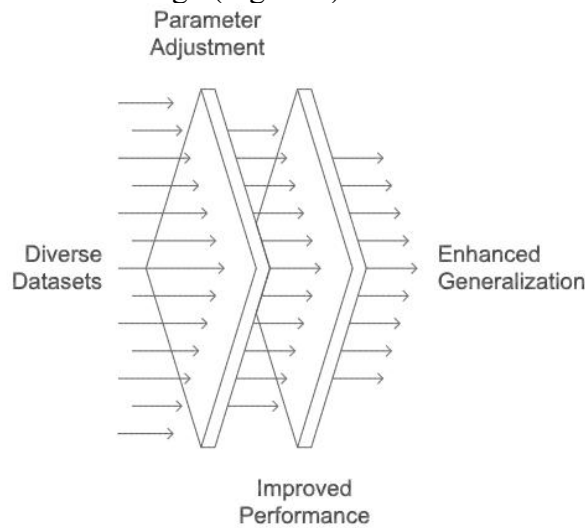


Figure 8: LLM Parameters Adjustment in ChatGPT

Note. Created by the author using Napkin.ai (2025) for visualization.

For ChatGPT to learn and improve responses, it needs to adjust parameters relying on the training data; this allows the model to enhance response quality and lessen error occurrence (Figure 8).

- (6) **Generation of Input:** it generates responses based on knowledge and understanding of the input prompt (Figure 9).

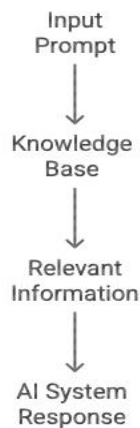


Figure 9: ChatGPT Input Generation

Note. Created by the author using Napkin.ai (2025) for visualization

Response generation is based on knowledge, training, and understanding of the prompt. ChatGPT output is the result of tokenization, context analysis, and prediction (Figure 9).

Users dealing with ChatGPT tend to ask a regular question, for instance: ‘*What is the capital of Italy?*’, the answer to this question is ‘*Rome*’ which is generated via matching the existing data, and this is what is meant with ‘*Direct Prompting*’. We can also use ‘*Prompt by Example*’ (Walter, 2024) to train the model on a specific way of response, as it is illustrated in Figure 10:

Question: "What is the capital of Italy?"
Answer: "The capital of [Italy] is: (Rome)"



Question: "What is the capital of France?"
Answer: "The capital of [France] is: (Paris)"

Figure 10: Prompt by Example

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization

In some other questions, we may not receive the exact response that we are inquiring which urges the application of other strategies to formulate a prompt that stimulates ChatGPT. These are illustrated following Walter (2024) model:

- (a) In the *Role Prompt*, the user can assign specific roles to ChatGPT (Figure 11), for example: 'you are a historical figure, write a letter expressing your thoughts about the use of modern technologies'.

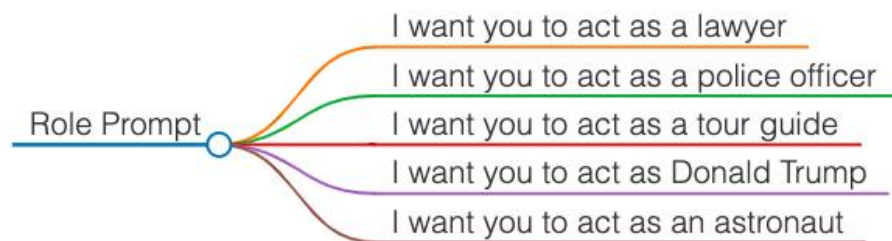


Figure 11: Role Prompt

Note. Created by the author using OpenAI, ChatGPT, Mindmap (2025) for visualization.

- (b) If the response is not satisfactory, you can add a *context* to the prompt that includes the information tied up to the question.
- (c) *Giving instructions*: at this stage you suggest ways to the language model on how to answer the question. For instance: the use of brief description or specific words, the response format is in long or short text, presentation of information in a table or mindmap, etc.
- (d) *Few Shot Prompting*: Chatgpt is trained and tuned to follow instructions based on a large amount of dataset. This AI model is found to be capable of performing a given task constructed on *Zero-Shot*; that is, the user asks a direct question to the language model without exemplifying the assignment or guidance.

4.2. LLM ChatGPT Language Processing

When we conduct a search on Google and start typing, the website provides suggestions or 'autocomplete' that helps you to select the most appropriate one for your search (Figure 12).

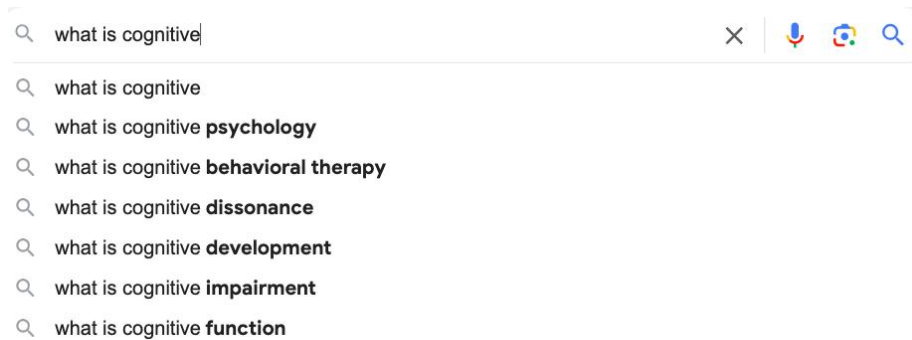


Figure 12: Google Autocomplete Search

Note. Screen capture created by the author using computer (2025) for visualization

These predictions are a reflection of the search queries that had been done on the Google website which involves the location, the trending interest, the language, and the personal past search. Similarly, LLMs models are designed to *predict* the next word sequentially when they receive the prompt of generating a text based on the training with a large number of texts data.

LLMs generate texts depending on user input as it was exemplified in prompt generation. Processing written text requires the model to go through certain stages. These are illustrated as follows:

4.2.1. Tokenization

During the language learning process, children tend to break down language into chunks, a technique that allows them to learn punctuation in a sentence - which becomes deep-rooted as we get older - then shift to the grammatical notions. In this regard, LLM adopts a method called *Tokenization* where language is broken down into smaller parts that are labelled '*tokens*' (Figure 13), at which language is viewed as pieces of puzzle that harmonize together in a phrase and a paragraph (Patel, 2024).



Figure 13: AI Tokenization

Note. Created by the author using Napkin.ai (2025) for visualization

Tokenization is a predominant step in NLP in which a text is broken down into feasible pieces for linguistic analysis. Figure 13 presents AI tokenization of the sentence '*I go to school by bus*', where every single word or *token* is presented separately in a box, which serves as a basic unit to be fractionated.

In Figure 14, the prompt used to stimulate ChatGPT to generate sentences was creating similar structures to '*I go to school by bus*', and maintaining the fixed position of school in the sentences.

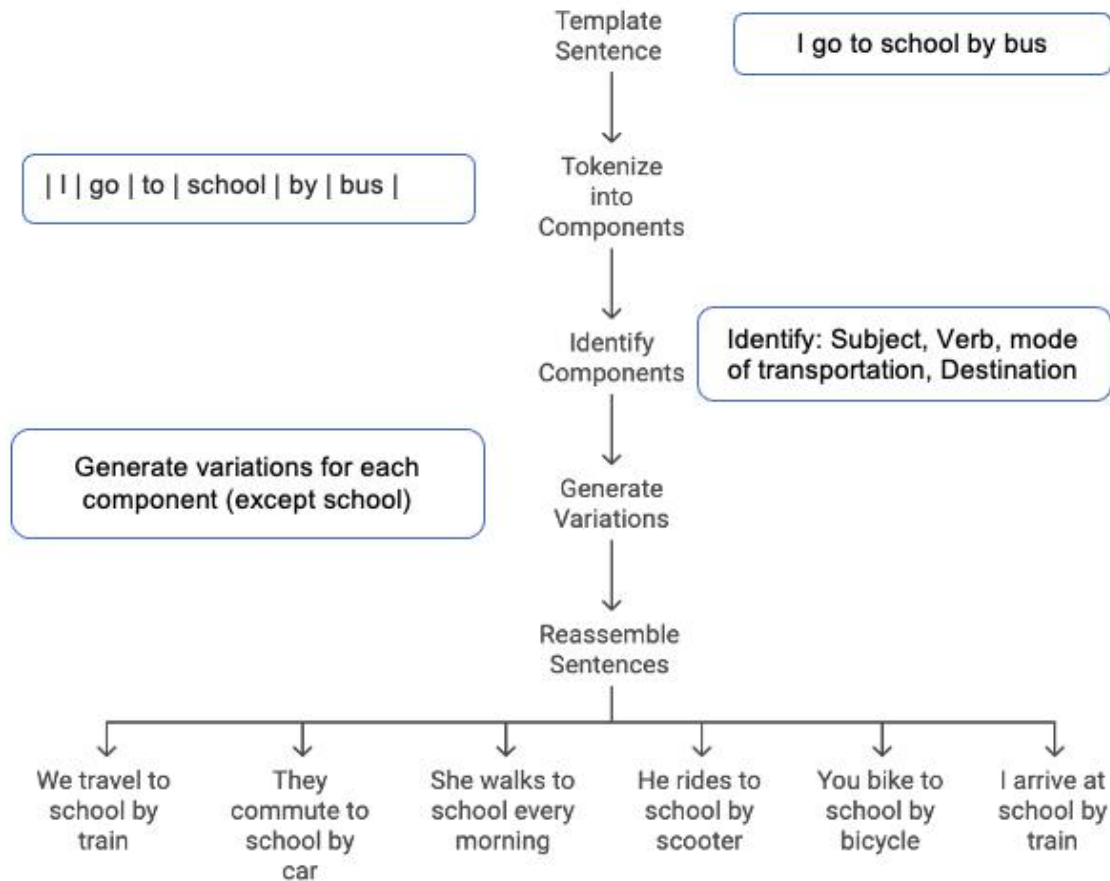


Figure 14: Tokenization and Generation of Sentence Variations

Note. Created by the author using Napkin.ai (2025) for visualization.

The LLM tokenizes the sentence into components that are identified as subject, verb, mode of transportation, and destination. Variations for each token are generated except for school respecting the user prompting intent. This is realized as the model observes the context into which the token ‘school’ is introduced, then through a large amount of data it looks for adjacent words and collate possible examples

4.2.2. Vectors

The tokens are transformed into numbers and the meaning and function are expressed through the context in which the tokens are positioned. This can be explained as the model processing this word, it produces a *vector* or *values* and makes necessary adjustments depending on the word nearness to given words in a particular context of the training data. Figure 15 demonstrates the overlapping and closeness directions in semantic similarity of the words ‘sea’ (in bleu) and ‘River’ (in green) and it exhibits that these words have almost identical meanings in word embeddings, that is, vectors. Compared to Figure 16, the words ‘Juice’ (in orange) and ‘soda’ (in purple) are undifferentiated and can be used interchangeably.

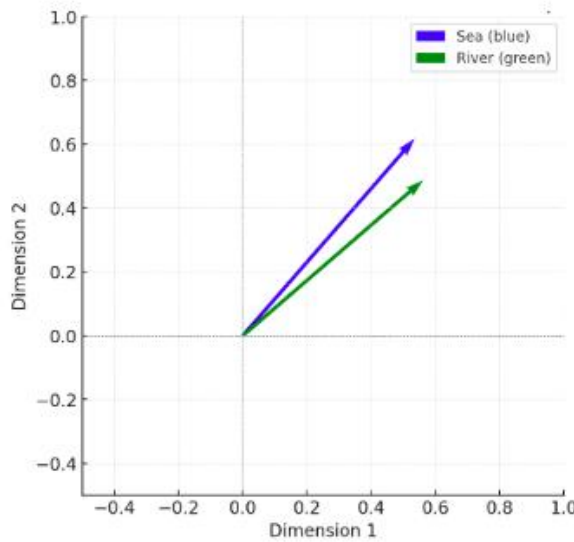


Figure 15: Similarity Level of “Sea” and “River” in Vector Space

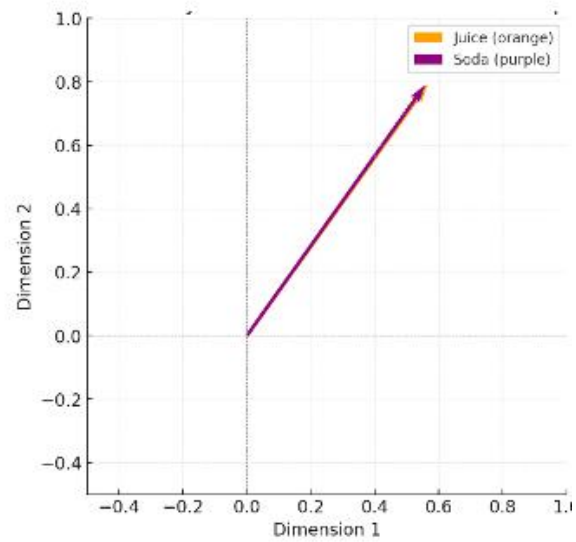


Figure 16: Similarity Level of “Juice” and “Soda” in Vector Space

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization

Figures 15 demonstrates that the tokens ‘*sea*’ and ‘*river*’ can be used to replace one another mutually in a generalized or metaphorical setting. However, in some literal and particular situations it is impossible due to their divergent meanings. These variations are demonstrated in Table 1:

Table 1.

Overlapping and Divergent of the words ‘Sea’ and ‘River’

| Overlapping Usage | Metaphorical Language | Generalized Context |
|---------------------------|---|--|
| | He found solace by the <i>river/sea</i> → both reflect peace by the body of water. | She listened to the soothing sound of water → it can be ‘ <i>sea</i> ’ or ‘ <i>river</i> ’ and it is not really important which type of water. |
| Non-interchangeable Usage | Literal | Context-specific Expressions |
| | The <i>river</i> flows through the valley → the ‘ <i>sea</i> ’ does not flow so it cannot replace ‘ <i>river</i> ’. | The <i>river</i> is freshwater → the ‘ <i>sea</i> ’ is saline so it cannot substitute river. |

In the case of tokens ‘juice’ and ‘soda’, the usage is identical because they are served as drinks when having meals, they share similar packaging but they may divert in ingredients as carbonation and nutritional content which does not affect the meaning and function in a sentence (Figure 16). For example:

- (a) ‘I grabbed a can from the fridge’ → it can be a juice or soda
- (b) ‘Would you like a drink with your meal’ → it can be a juice or soda
- (c) ‘I prefer juice not soda’ → the divergence in terms of flavor or ingredients.

Figure 17 illustrates the visualization of the LLM first step in text generation of the sentence structure ‘*I learn to write on paper*’ which is modelled after a sample suggested by Visual Storytelling Team, & Murgia (2023).

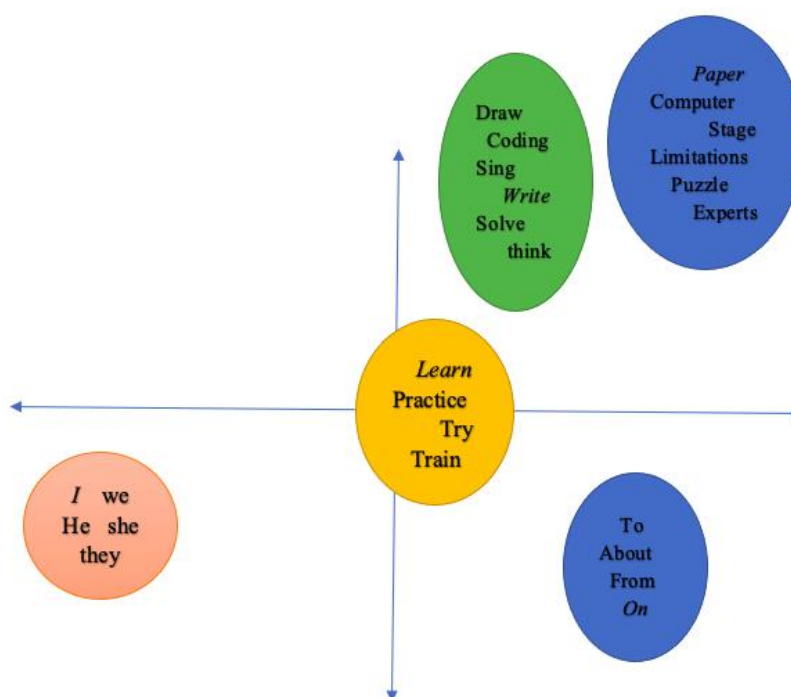


Figure 17: Text Generation of the Sentence ‘I learn to write on paper’

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization.

Figure 17 shows that when the LLM generates text, it reduces embeddings until it reaches the most convenient for the context. Those values are found to be quantified into specific categories based on meaning and function.

In terms of language processing, it is crucial to highlight the resemblance and variation of categorizing words in LLMs and the human brain as a way to promote LLM effectiveness. Both mechanisms adopt certain standards, for instance, the human brain tends to categorize words through the world’s experiences around us and sensory stimuli reinforced with culture and context. LLM is designed on statistical correlation of text-based training data as it was explained previously, but it has limited grounds on cultural and sensory distinctions (Table 2).

Table 2.*LLM and Human Brain Mechanism of Word Treatment*

| Aspect | LLM | Human Brain |
|------------------------|---|---|
| Learning | Statistical patterns based on dataset | Experience and sensory input |
| Adaptability | Context adaptability based on training data | Context-sensitivity |
| Representations | Word embeddings in <i>vectors</i> | Prototypes, concepts, and schemata |
| Errors | Errors as a result of gaps or bias in training data | Misclassification because of lack of experience |

Table 3 demonstrates how the human brain and LLM categorize the word ‘*Apple*’, in which the former processes the word in experiential and hierarchical schemas and the latter depends on statistical patterns to create correlations.

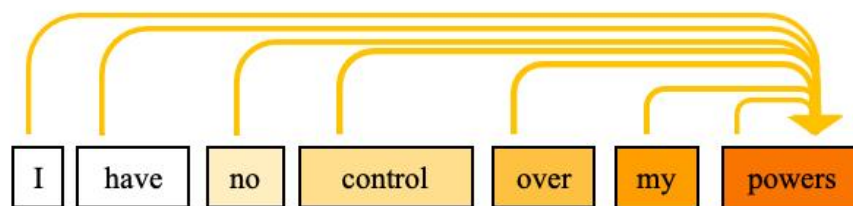
Table 3.*Human brain and LLM categorization of ‘Apple’*

| Human brain | LLM |
|---|---|
| (a) It has associative and hierarchical categories (fruit, food, dessert, nutrition) (b) It has sensory-based categories (natural object), cultural representation (teacher’s gift), symbolism (knowledge), etc. | (c) It has statistically related terms to the general category ‘fruit’ (pear, banana, etc) (d) It has technology related category (MacBook, iPhone, Google, etc) as a result of frequent occurrence in tech-related texts dataset. |

To conclude, Tokenization and word embeddings vectors alone are not what render LLMs intelligent but rather *Transformers* that changed completely the way computers understand language. A group of eight researchers in AI at Google company (June, 2017), launched the starting point of generative AI in the paper entitled ‘*Attention is all we need*’.

4.2.3. *Transformers*

Vaswani et al. (2017) introduced ‘*Transformers*’ that are a deep learning architecture in the paper entitled ‘*Attention is All You Need*’. Transformers are designed to operate on sequences of data such as text with the employment of the mechanism named *Self-attention*. NLP makes use of transformers in tasks as text generation, translation, and summarization, in addition, models as GPT, T5, and BERT function is grounded on transformers. Prior transformers, AI translation tools made use of Recurrent Neural Networks (RNNs), in which each word in a sentence is analyzed and processed successively (Figure 18).

**Figure 18:** RNNs Sequential Analysis of an Individual word

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization

Unlike RNNs (Figure 18), transformers unlatched the capacity to process and generate texts fluently in which large passages are processed entirely at once by examining its chunks and not just focusing on individual words. Processing data simultaneously permits to train the LLMs to become quicker in understanding the patterns, the context, and the translation, which results in generating more correct texts

Self-attention is a central concept of the transformer architecture which permits LLM to comprehend the relationship between words. Transformers scan the words in sentences simultaneously and this what makes the LLMs possess complicated competences to scrutinize language.



Figure 19: Self-attention Mechanism Relating Words in a Sentence

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization.

In Figure 19 each individual word is represented in a node and the arrows demonstrate the *connections* between the words in the sentence. The transformer evaluates the sentence all together at the same time in which the meaning of the word ‘*power*’ is grasped as a noun and synonym to strengths, capacities, or skills in this context, that determines the person’s competences. Shifting to a different usage of the word ‘*power*’ which refers to electrical energy, and due to self-attention, the transformer could make the difference in meaning when the two words are combined in one contextual situation (Figure 20).

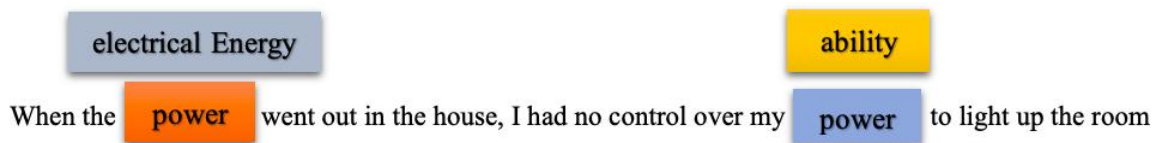


Figure 20: Demonstration of the Transformer Self-attention at Work

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization.

Therefore, self-attention is a pivotal functionality that allows generating texts correctly as the LLMs will not produce in a sentence ‘*electrical energy*’ where ‘*ability*’ is the one needed to complete its meaning. At this stage, language processing is dependent on context which is beyond the boundaries of the sentence and this is what makes the model capable of recognizing where a word is utilized.

In another attempt to understand ChatGPT language processing, a CAPTCHA prompt was used. A CAPTCHA is a kind of test in a challenge-response mode applied in computing to tell if the user is human or bot. The most standard is Text CAPTCHA which exhibits a set of numbers and letters that are distorted and blurred, inserted in colored or white background. In order to pass, the user needs to type the accurate characters in the text field (Mayumi et al., 2013). The model was given instructions to read different CAPTCHAs, and its feedback results are displayed in Figure 21.



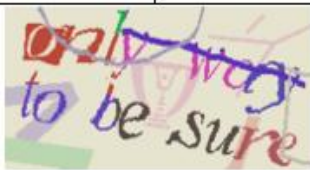
| | |
|--|---|
|  <p><i>1st Trial:</i> A distorted image and text make it difficult for the model to read it correctly.</p> <p><i>2nd trial:</i> The text is Td4eva</p> |  <p>The text presented in the image is qVpXayK</p> |
|  <p>A challenging text to read, it may be: only want to be sure</p> | |

Figure 21: ChatGPT Text-CAPTCHA Processing

Note. Created by the author using OpenAI, ChatGPT (2025) for visualization

In terms of accuracy, ChatGPT faced a challenge of reading the Text ‘Td4eva’ and it responded accurately when using a new prompt. The same for ‘only way to be sure’ that was mistakenly read as ‘only *want* to be sure’ because the model could not recognize the diversity in characters the same way a human does. The text-based CAPTCHA of qVpXayK was read probably as it was not much obfuscated. Therefore, interpreting this kind of text into words can be possible but some types are intentionally made arduous for bots.

5. Discussion

Today’s technology is based on developing AI tools to model the human brain with the application of generative AI; the program that can generate images, texts, and computer coding to reach the human capacity. LLMs are trained on vast amount of text data for the purpose of understanding, generating, and manipulating human language. Through this research, ChatGPT functionality was tested to produce human-like texts that permitted to enlighten perspectives on language processing when the model interacts with human texts. NLP using machine learning enables ChatGPT to analyze texts by extracting significant information from the written prompt, identifying key concepts and interpret meaning; hence, language generation by creating new texts depending on input data.

EFL teachers learning how to prompt effectively with ChatGPT is crucial as it equips them with the medium that helps to guide the students to engage in more interactive ways. Role prompts encourage the students to participate, enhance their critical thinking, use language creatively, and reinforce their grammar and vocabulary. Crafting prompts facilitates an engaging learning experience and to achieve this, teachers can use specific and clear instructions (e.g. write a short story and use six adverbs), employ prompts for diverse purposes (e.g. storytelling, argumentation, comparison, etc), integrating contexts by tying the prompt to real-world situations, and guiding students with examples to inspire and increase their confidence. Another tip that improves the quality of response and interaction with the model is to tell it to ask questions if more details or clarifications are needed.

In the field of linguistics, semantic analysis correlates meanings to given syntactic structures where relationships are built between individual words - extended to other parts of speech as word combinations, phrases, proverbs - and meanings in particular contexts. In generative AI, ChatGPT learns from the large corpus of words (and images) to perceive patterns which results in *predicting* the next word. In this regard, language processing starts

with tokenizing the prompt (encoding input), word embeddings (vectors), self-attention (transformers), leading to produce consistent and well-organized human-like text (encoded output). NLP is based on *Semantic Analysis* which is challenging to be mastered by LLMs. Some methods that the model goes through include '*lexical analysis*' which looks at the meaning of individual words in a given setting. Furthermore, words vary in meaning and through '*word sense disambiguation*' the model selects the most convenient to the context and better understood by the human user. For NLP, to grasp the meaning portrayed in text, it follows the connection established between entities such as individuals, locations, etc, that is, *semantic tagging* (Nivre, 1998).

A system like ChatGPT processes the text inserted in CAPTCHAs with difficulty as the image consists of distorted or blurry words. In an attempt to interpret the text, the visual image is converted into a machine readable-text with the use of Optical Character Recognition (OCR) technology that differentiates characters from images Mayumi et al. When the text is retrieved from the CAPTCHA, the model utilizes semantic analysis in order to understand the meanings associated with the words which involves word-recognition (identification of individual words or characters) and context interpretation (understanding language patterns depending on the context even if the words are obscured or misspelled).

EFL teachers understanding ChatGPT language processing framework can develop their skills to design better prompts for more effective output. In '*prompt response generation*', the model generates texts depending on the clarity and specificity of the input. For instance, instead of prompting 'Explain past tense', it is better to use '*Explain the use of the past simple tense with 3 examples related to daily activities*'.

In terms of '*tokenization*', when teachers recognize that LLM breaks down speech into tokens or smaller units, they may try to avoid overly ambiguous, complicated or multi-layered prompts, as these structures may bewilder the tokenization process. In lieu of asking 'What are examples of different uses of modal verbs in formal and informal language?', it may be better to employ '*What are formal examples of modal verbs? What are informal examples?*' by breaking it down into smaller prompts.

In reference to '*vectorization*', teachers' knowledge that the model converts the text including words and punctuation, into numerical values, enlightens them to utilize straightforward language so the model can interpret accurately the intended context. For example, as a substitute to 'Explain article usage', it is more efficient to use '*Explain the difference between 'a', 'an', and 'the' with 2 examples for each*'.

Being aware of ChatGPT processing information contextually through self-attention mechanism of '*transformer*', teachers can structure prompts by providing context to ensure the generation of more relevant responses. In light of this, an alternative way to ask 'What is the meaning of the word 'run'?', is '*In the sentence 'She runs her own business', what does 'run' mean?*'. LLM focuses on assigning meaning to lexical entities based on relationships between words, thus, bearing in mind this fact, teachers can provide prompts with examples or contextual details as rather asking 'What are the synonyms of the word 'happy'', they can say '*List synonyms for 'happy' that can be used in formal writing, such as essays*'.

Regarding EFL teaching, teachers gaining skills in AI prompting allows them to enhance lesson planning by creating well-structured content and language-focused tasks. Comprehending how the model processes input, teachers will be able to design interactive role-plays, dialogues and vocabulary building exercises that meet students' needs. Teachers can guide the students to use LLM for error correction of their writings, and due to ChatGPT fine-tuning prompts, teachers can gather responses for diverse proficiency levels from beginners to advanced.

In summary, tokenization and word understanding, contextual interpretation, and semantic- response generation, permit ChatGPT to comprehend deeply the meaning of texts, realize the intent of the teacher-user, deal with ambiguities, and provide appropriate answers for the context, which is intelligible and meaningful to the ongoing conversation. Therefore, semantic understanding is the key to achieve interactions between LLMs and the human user in a way that sounds more intelligent and natural.

6. Implications of the Study

Teaching and learning EFL in the age of AI requires keeping oneself constantly updated about the new innovations. The research suggests implications in relation to AI in EFL teaching and learning:

- Teachers and learners mastery of LLM's prompt engineering to enhance digital literacy can result in a more personalized EFL learning that fits their needs.
- AI digital literacy can equip them with the skill to critically evaluate LLM responses in terms of accuracy, consistency, and relevance to the prompt meaning.
- Teachers' understanding of AI utility and limitations in education can enable to bridge the gap between LLMs and EFL learning, which permits to develop its effective use in the classroom.
- EFL teachers' awareness of how ChatGPT processes input helps them to develop ethical considerations when interacting with the LLM.
- Teachers control over the employment of AI can assist in collaborative learning which promotes learners' engagement, peer discussions, and group problem solving.
- Integrating ChatGPT as a pedagogical strategy in lesson planning, interactive language exercises, and assessment can develop EFL teaching and learning

Finally, training EFL teachers and learners on LLMs integration in education can prepare them for the evolving role of AI in FL learning. More research is needed in this field to cope with EFL teaching challenges and provide a more effective learning experience.

7. Conclusion

The study demonstrated the relationship between the user's prompt and ChatGPT's responses generation in which specific input instructions can shape the output. Through the research, we observed that the LLM interaction is not just a mechanical process but it includes understanding and contextual awareness. EFL teachers' knowledge of a well-structured prompt can result into more intended and accurate responses compared to vague or ambiguous query can lead to a non-satisfactory AI completion. Educators can guide their students as well through the process and expand their digital skills in the art of prompting in order to benefit the most from a successful AI learning experience.

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