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Research Division: Information Technology

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**DEVELOPMENT OF THE STUDYEASE ONLINE LEARNING PLATFORM FOR
FOREIGN LANGUAGE STUDIES**

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INTRODUCTION

The relevance of this work lies in the fact that, in today's world of globalization and the rapid development of information and communication technologies, proficiency in a foreign language is becoming increasingly essential — not only as a means of communication but also as a key factor in professional and personal development. In particular, English often serves as the language of international communication, science, business, and the information sphere. The project is a constantly evolving platform; therefore, German and Czech have now been added on a trial basis, with plans to expand the range of languages in the future.

Distance learning technologies create new opportunities for independent learning. In this regard, a problem arises with many platforms that focus on memorizing pre-compiled vocabulary lists but do not sufficiently account for the context of words in real-life language situations, syntactic relationships, grammatical roles, and frequency of use. “As recent studies show, it is context-based learning that significantly influences the acquisition and retention of vocabulary among students learning English as a foreign language at an above-average level.” [2, p. 9]

The object of this study is the process of context-based learning of English vocabulary from Ukrainian language.

The subject of this study is the StudyEase online learning platform for studying English, German, Ukrainian, and Czech vocabulary. Moving forward, the study will focus specifically on the English language, particularly due to its global popularity.

The objective of the study is to improve the effectiveness of the English vocabulary learning process through the use of DeepSeek-API methods.

Research hypothesis: It is hypothesized that the use of artificial intelligence technologies will increase the effectiveness of vocabulary learning, provide quick access to translations,

usage examples, and grammatical information, and contribute to the formation of stable cognitive associations in students' memories.

In accordance with the research objectives and hypothesis, the following **tasks** have been identified:

1. To analyze the theoretical foundations of context-based learning of English vocabulary and determine its role in the formation of stable cognitive associations.
2. To investigate the capabilities and operating principles of artificial intelligence technologies, specifically DeepSeek-API, in the process of learning foreign vocabulary.
3. To develop the structure and functional capabilities of the StudyEase online platform, which is designed for the contextual study of English vocabulary.
4. To evaluate the effectiveness of StudyEase in the learning process through testing, analysis of vocabulary acquisition results, and user feedback.

To address the objectives set forth in this paper, the following research methods were used: theoretical analysis, comparison, and generalization of learning platforms; and teaching methods that incorporate ICT.

The scientific novelty lies in the fact that, for the first time, the methods of the DeepSeek-API generative language models have been applied to address the problem of improving the effectiveness of context-based English vocabulary acquisition. This work is the first to justify and implement an approach in which artificial intelligence automatically generates contextually relevant translations, usage examples, and grammatical hints, ensuring personalized and adaptive interaction with the learning material. The platform's intelligent capabilities are based on the principles of generative transformer models, which analyze text through multi-level encoding of semantic and syntactic relationships, predict word meanings within a sentence, and generate the most likely linguistic variants. This enables a flexible contextual analysis mechanism capable of adapting to each user's individual style and proficiency level.

The theoretical significance lies in clarifying the capabilities of generative models as a foundation for creating effective context-based lexical learning systems, as well as in

determining their potential for shaping adaptive, personalized, and intelligently managed educational environments.

The practical significance of this work lies in creating opportunities for the effective and efficient mastery of the English language through the integration of innovative artificial intelligence tools into the modern educational process. The developed web platform can be used both in general education institutions and in language courses, serving as a supplementary tool for studying vocabulary, grammar, and the contextual use of language units. In addition, StudyEase can serve as a foundation for the further development of educational IT products with integrated features for adaptive and personalized learning, user progress analytics, and support for multilingual learning programs, opening up prospects for the comprehensive development of language proficiency and the improvement of the quality of the educational process.

CHAPTER 1

THEORETICAL FOUNDATIONS FOR THE USE OF ELECTRONIC DICTIONARIES IN FOREIGN LANGUAGE LEARNING

1.1. Modern Approaches to Vocabulary Learning Using Information Technology

When learning a foreign language, vocabulary is a fundamental element that enables text comprehension, the formation of utterances, and effective communication. Modern experts emphasize that to fully master vocabulary, one must not only know the translation but also understand the context of its use, typical word combinations, grammar, and various nuances of meaning.

Contextual vocabulary learning is one of the most effective methods for acquiring new words in a foreign language. It is based on the principle that the meaning of a word is better retained if it is perceived not in isolation but within a real textual context. This approach has been supported by researchers such as Michael Lewis (M. Lewis), who developed the Lexical Approach and emphasized the importance of studying lexical units in relationships and contexts, rather than in isolation. Nation (I. S. P. Nation) also noted that context facilitates a better understanding of a word's semantics, activates memory processes, and allows learners to independently deduce meaning from the situation.

According to the findings of Schmitt (N. Schmitt), context-based learning helps students form cross-linguistic associations and develop deep processing skills, leading to the long-term retention of vocabulary in memory [2, p. 2]. Krashen (S. Krashen), in his Input Hypothesis, emphasized that words are effectively acquired when students encounter them in a comprehensible and interesting context—that is, through “comprehensible input.”

Recent research in the field of IT education (Balázs Fajt, Mátyás Bánhegyi, and Katalin P. Márkus) [3] shows that combining digital technologies with a contextual approach significantly improves the quality of vocabulary retention and motivation in language learning.

Contextual learning helps students quickly recognize the meanings of words in various situations, reduces the number of translation errors, encourages student independence, and increases their motivation to learn a language.

Thus, contextual learning promotes the formation of long-term memory, as the brain memorizes a word along with its context. The “word + context” approach reduces cognitive load, increases student motivation, and helps avoid rote memorization without understanding the meaning. Studies have shown that teaching vocabulary in context significantly influences students’ learning and retention of vocabulary [2, p. 9].

1.2 An Analysis of Popular Online Dictionaries

Electronic dictionaries, online platforms, and mobile apps greatly simplify access to language materials. They help users quickly find translations, pronunciations, usage examples, and grammatical information. According to research by Rahimi & Miri, the use of mobile dictionaries has a positive effect on student motivation, provides instant feedback, and allows students to learn vocabulary anywhere [1, p. 1, p. 5].

At the same time, traditional electronic dictionaries often encourage superficial memorization. Students typically choose the first translation option without analyzing the context, which leads to incorrect word usage. A study by Lew, Grzelak, & Leszkowicz (2013) found that participants with lower proficiency often ended their search after finding the first match in the dictionary, without exploring all the meanings of the word [4, p. 25].

Additionally, a study by Aslan, N. A, the limitations of mobile dictionaries in vocabulary learning were identified: insufficient translations of words with multiple meanings, a lack of synonyms and antonyms, insufficient explanations of word usage (e.g., verbs and inflectional suffixes), and insufficient explanations of idioms [5, p. 5].

Personalized learning deserves special attention, as it ensures that the material is adapted to the user’s level and needs. Such approaches are implemented in mobile apps such as Quizlet, Duolingo, Busuu, and Memrise; however, they focus on teaching phrases and texts selected by the developers and thus largely fail to account for the semantic (meaning, content, and context-related) context of other texts.

Traditional printed dictionaries cover a wide range of lexical meanings but do not ensure the correct choice of translation in a specific context, which results in significant time expenditure when using them. Modern electronic dictionaries, online platforms, and mobile apps significantly facilitate access to linguistic material and speed up the process of working with it; however, they also do not guarantee the accuracy of translations of individual words and, for the most part, are not adapted to accurately reproduce idiomatic expressions.

Our study focused on the following popular electronic dictionaries: Click Dictionary, Google Dictionary, Definer – Ask AI, Deepl, and the Smart Book mobile app.

The widely used electronic dictionaries Click Dictionary and Google Dictionary (see Fig. 1, Fig. 2) speed up the translation search process but remain limited.

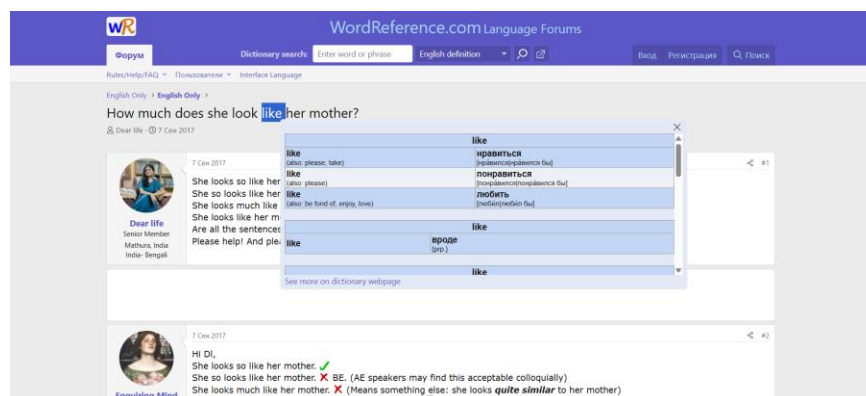


Fig.1.2.1

Example of using Click Dictionary — Chrome.



Fig. 1.2.2

Example of Using Google Dictionary (by Google) — Chrome

Other modern solutions, including Definer – Ask AI, DeepL, and the Smart Book mobile app (see Fig. 1.2.3, Fig. 1.2.4, Fig. 1.2.5), use algorithms that return the first words from their database. For example, in a sentence where the word “LIKE” is used to mean “as,” Definer and DeepL translated it as “to like,” while Smart Book, when encountering the meaning “to like,” first displayed the word “as” and then listed all the meanings of that word.

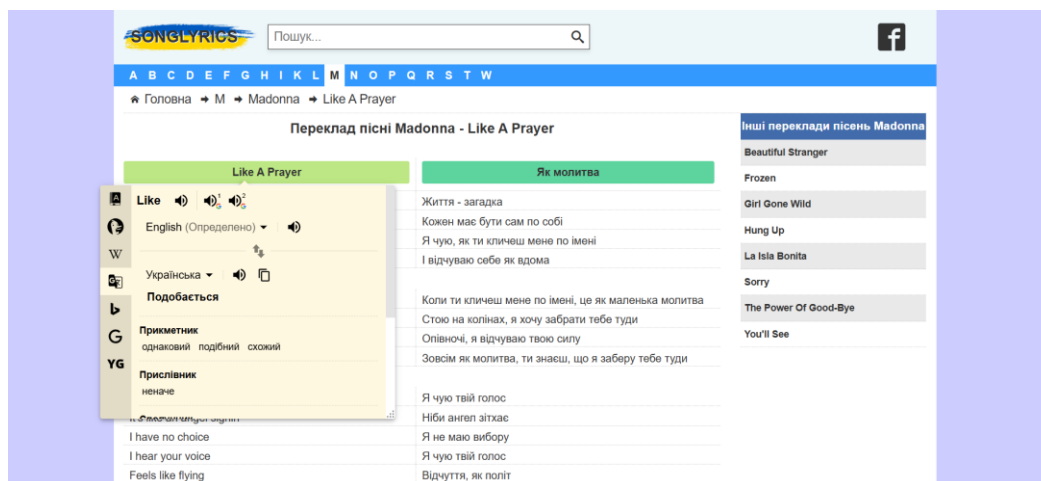


Fig. 1.2.3

Examples of how to use Definer – Ask AI, Translate Websites, Look Up Words — a Chrome extension with advanced features (AI support, translation, pop-up dictionary).

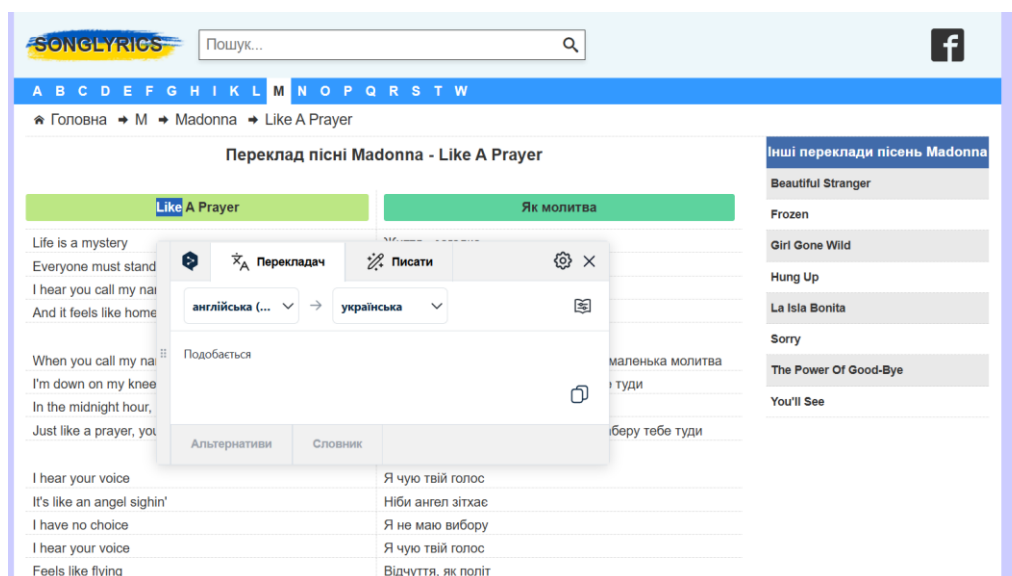


Fig. 1.2.4

Example of using DeepL: translate and write with AI



Fig. 1.2.5

Example of Using the Smart Book Electronic/Interactive Book

The examples described demonstrate that even modern platforms do not always process context in a detailed manner. Their algorithms are primarily based on statistical frequencies of usage or automated machine translation without an in-depth analysis of a word's grammatical role in a sentence. This approach limits translation accuracy and does not foster the development of contextual thinking skills in users.

Therefore, effective vocabulary acquisition requires combining the technological capabilities of electronic dictionaries with contextual learning methods that take into account the semantic, grammatical, and pragmatic features of word usage. The integration of artificial intelligence, adaptive algorithms, and contextual analysis into language platforms opens up prospects for creating intelligent vocabulary-learning systems capable not only of translating but also of teaching the correct use of words in real-life communicative situations.

CONCLUSIONS OF CHAPTER 1

The contextual approach to vocabulary learning is based on the principle of linking a word to its real-life context, which enables students to understand the meaning, grammatical function, and typical word combinations in specific situations. Theoretical research (M. Lewis, I. S. P. Nation, N. Schmitt, S. Krashen) confirms that context-based learning promotes the formation of long-term memory, activates cognitive processes, and increases student motivation.

When combined with electronic dictionaries, mobile apps, and online platforms, the context-based approach allows learners not only to quickly access translations and usage examples but also to acquire lexical items in real-life communicative situations. However, the modern digital resources analyzed in this study—Click Dictionary, Google Dictionary, Definer – Ask AI, DeepL, and Smart Book—are often limited in their contextual analysis, which can lead to incorrect translations and superficial memorization.

Therefore, effective vocabulary acquisition requires integrating a contextual approach with technological tools, particularly adaptive algorithms and intelligent systems capable of accounting for the semantic, grammatical, and pragmatic features of words. Such an approach fosters a deep understanding of vocabulary and the development of communicative competence.

CHAPTER 2

DEVELOPMENT AND OPERATION OF THE STUDYEASE WEB PLATFORM

2.1. Features of StudyEase

Modern digital education focuses on combining linguistics, educational psychology, and innovative technologies. This led to the idea of creating StudyEase—a web platform for learning English vocabulary in context. Its concept involves integrating electronic dictionaries, modern methods of contextual analysis, and artificial intelligence.

The scientific novelty of the web platform lies in the use of generative language models (LLMs) via the DeepSeek API for automatic contextual analysis, semantic interpretation, and the generation of the most relevant translation of a sentence or text fragment. The model not only returns the meaning of a word but also performs semantic mapping, recognizes grammatical roles, identifies collocations, and generates phonetic transcriptions.

StudyEase's goal is to help users not just translate words, but to understand them in the context of real-world situations, learn idiomatic expressions, and grasp grammatical nuances. This is the key difference from traditional solutions.

The platform allows you to perform a number of processes:

1. upload users' own texts (for example, excerpts from literary or academic materials);
2. select texts by difficulty level (A1–C2);
3. receive a contextual translation of any word generated by the LLM model;
4. view the phonetic transcription generated by AI based on dictionary examples.

Thus, StudyEase combines the functions of an electronic dictionary, a language trainer, and an intelligent tool for semantic text analysis. This allows users to create their own learning materials and interact with them in real time, thereby improving the effectiveness of new vocabulary acquisition. The platform we have developed allows users to freely choose texts for

study and automatically determines the relevant translation for each word based on its semantic context.

The website is available at the following URL: <https://study-ease.com>.

StudyEase was developed using modern web technologies:

1. Frontend: HTML, CSS, JavaScript;
2. Backend: Python, Django;
3. Translation API: DeepSeek API.

This combination of technologies ensures the website's adaptability and the interactivity of the educational content.

StudyEase's architecture is built on the "frontend-backend-AI API" principle.

The frontend (user interface) uses HTML, CSS, and JavaScript. Text that the user enters or uploads is broken down into individual words. Each word is wrapped in a special `<span>` tag, which enables interactivity. For example:

`<span class="span-learn" data-ua="слово" data-tr="[w3:d/]">word</span>`

When a user clicks on or hovers over a word, the `Translator.translate` function is triggered, where a structured request to the DeepSeek API is generated at the server level via the Django server. This request includes the sentence context, the highlighted word, a request to provide a single semantically relevant meaning, identify possible collocations, return a phonetic transcription, and avoid ambiguous or incorrect interpretations. Upon receiving the query, the model performs a sequential contextual analysis: it calculates the meaning of the word within a specific sentence, determines the most relevant translation option, establishes its grammatical function, generates a phonetic transcription, and, if necessary, suggests contextually relevant synonyms. The use of such artificial intelligence methods constitutes a practical innovation of the development and is a key component of the conducted research.

The model performs a sequential set of computational operations, encompassing contextual semantic analysis to determine the meaning of a word within a sentence, followed by the selection of the most relevant translation by resolving contextual ambiguity, identifying the word's grammatical function, generating a phonetic transcription, and, if necessary,

generating synonymic equivalents relevant to the context. The combination of these artificial intelligence methods constitutes the practical novelty of the development and is a key element of the research conducted.

On the page for entering custom text, the StudyEase platform prompts the user to provide a title for the text. If this feature is used, the system automatically displays an image corresponding to the text's topic.

To search for and display an image, we developed a special Wikipedia parsing algorithm that finds and downloads the corresponding photo based on the entered title. The algorithm works as follows: the user enters the text's title; the program then searches Wikipedia for an article with the same title, finds the image tag, and displays it on the page.

The algorithm is implemented using the Python libraries ``requests`` and ``parsel``. Thus, StudyEase combines the functions of a dictionary, a practice tool, and an analytical tool for teachers and students.

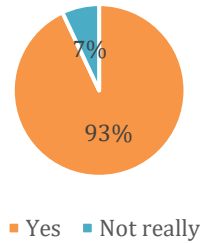
You can learn more about how it works by checking out the open-source code uploaded to GitHub for our project titled “Small Wikipedia Bot” at the following link: https://github.com/ShDmytros/Wikipedia_Bot

2.2 Context and Accuracy in StudyEase

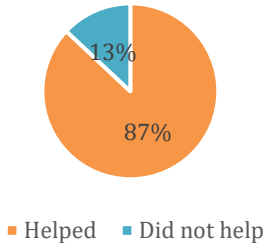
The process of designing the web platform included identifying user categories based on their educational needs, creating an interface prototype to ensure ease of use, developing a contextual translation algorithm capable of accurately reproducing the meaning of words in various linguistic contexts, as well as testing the platform on a pilot group of 15 participants to evaluate its effectiveness and functionality.

Preliminary testing of StudyEase was conducted among English teachers and schoolchildren. The survey showed that:

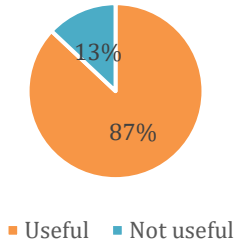
1. 93% respondents noted the user-friendliness of the interface;



2. 87% said that contextual translation helped them better understand the meaning of words;



3. 87% consider StudyEase a useful tool for self-study.



Teachers emphasized the potential of using StudyEase as a supplementary tool during lessons to explain lexical nuances and idioms. It was also noted that the platform encourages students to work with authentic texts, rather than just textbooks.

Unlike Click Dictionary, Google Dictionary, Definer, Deepl, and Smart Book, StudyEase has a number of advantages that provide a unique approach to learning (Table 2.2.1).

Table 2.2.1

№	Criteria	Traditional dictionaries	StudyEase
1	Translation type	Dictionary-based	Context-based

2	Grammar support	Partial	Full
3	Ability to upload your own texts	Partial	Yes
4	Use of artificial intelligence	Partial	Yes
5	Interface adaptability	Partial	Full

During testing, it was observed that StudyEase is capable of correctly identifying the meanings of words even in complex constructions. For example, in the sentence “He kicked the bucket,” the system does not translate it literally (“he hit the bucket”), but recognizes the idiom and provides the correct translation—“he passed away.” In the sentence “She made up her mind,” the system does not translate it literally (“she made up her mind”), but recognizes the idiom and provides the translation “she made a decision.”

This contextual accuracy ensures not only correct understanding but also the formation of lasting associations in the user’s memory.

StudyEase can be used in various learning formats:

1. as a standalone tool for reviewing and expanding vocabulary;
2. as a supplementary platform during lessons or classes at universities;
3. as an interactive tool for homework assignments when students work on their own texts.

In addition, teachers can use StudyEase to create educational materials, analyze texts, or check the accuracy of translations. The system is also well-suited for distance learning, which is particularly relevant in blended or online educational settings.

Thus, testing has shown that StudyEase effectively combines a contextual approach to translation with the capabilities of modern digital technologies. The system ensures accurate recognition of word meanings even in complex constructions and idioms, which helps form lasting associations in users’ memories and promotes a correct understanding of the text. Unlike traditional electronic dictionaries, the platform supports full contextual analysis, an adaptive interface, and artificial intelligence integration, making it a versatile tool for both self-study and use during classroom lessons or distance learning. StudyEase’s future development plans

include the introduction of modules for spaced repetition, an AI assistant, multilingual support, and progress analytics, opening up opportunities to create a personalized learning environment and fully develop foreign language proficiency. Thus, StudyEase demonstrates significant potential to become a comprehensive tool for effective foreign language learning.

CONCLUSIONS OF CHAPTER 2

StudyEase is an innovative web platform built on a combination of linguistic analysis and modern artificial intelligence methods, providing a fundamentally new approach to learning English vocabulary in context. Its operation is based on the integration of generative language models capable of performing automatic contextual analysis, determining the semantic nuances of a word, identifying grammatical roles, and generating phonetic transcriptions. Within the “frontend–backend–AI API” architecture, an algorithm has been implemented that ensures a semantically relevant translation choice based on the linguistic context, as well as interactive user engagement with the text. The combination of web development tools, parsing algorithms, and the capabilities of a large language model creates a platform that goes beyond traditional electronic dictionaries and serves as a language trainer, an analytical tool, and an intelligent text processing system. Thus, StudyEase not only expands the possibilities of self-directed learning but also lays the foundation for deeper vocabulary acquisition through context-dependent data processing, which determines its scientific and practical significance.

CONCLUSIONS

The contextual approach to developing lexical competence is one of the most effective approaches in modern language teaching, as it ensures that words are understood within their natural linguistic context and promotes a deep understanding of linguistic units. Theoretical work by leading researchers M. Lewis, I. S. P. Nation, N. Schmitt, and S. Krashen demonstrates that learning vocabulary in context activates mechanisms of deep cognitive processing of information, ensures long-term retention of lexical units, and promotes the formation of strong associative connections. In particular, M. Lewis emphasizes the role of collocations as basic structures of speech; I. S. P. Nation stresses the need for repeated exposure to words in authentic contexts; N. Schmitt describes the process of vocabulary consolidation through context-dependent semantic connections; S. Krashen substantiates the importance of an accessible and understandable language environment for the natural acquisition of vocabulary. Taken together, these positions demonstrate that context is a central—rather than a secondary—factor in effective lexical development.

An analysis of digital resources such as Click Dictionary, Google Dictionary, Definer – Ask AI, DeepL, and Smart Book has shown that, despite their wide range of features, most of them remain tools for superficial translation. They mostly offer the first available meaning without taking into account grammatical function, semantic nuances, pragmatic features, or typical collocations. In cases where a word has multiple meanings, the lack of a comprehensive contextual analysis often leads to misinterpretations, which reduces the effectiveness of memorization and can result in the development of incorrect language skills. This highlights the need to develop a new generation of tools capable of providing in-depth semantic processing of information.

The StudyEase web platform we have developed is an innovative educational product that combines linguistic principles with artificial intelligence tools. The web application

performs automatic contextual analysis, identifies the grammatical functions of words, determines semantically relevant translations, and generates phonetic transcriptions tailored to the specific linguistic context. The technological architecture, which integrates the front end, back end, and AI API, ensures adaptability, flexibility, and accuracy in processing linguistic material, while parsing and contextual modeling algorithms take StudyEase beyond the scope of conventional electronic dictionaries, transforming it into an intelligent language trainer.

Experimental testing of StudyEase, conducted among 15 participants—namely, English teachers and students from Class 11-B at Kherson Lyceum No. 1—demonstrated that the web platform provides a high level of accuracy in contextual translation and a user-friendly experience.

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