



PRONUNCIATION HELPER- AI CHROME EXTENSION FOR IELTS & TOEFL

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Abstract : This The goal of this project is to improve English language pronunciation for users getting ready for standardized tests like the TOEFL and IELTS by designing and developing the Pronunciation Helper Chrome Extension, which is driven by artificial intelligence. The extension incorporates contextual vocabulary study, intelligent word identification, dynamic highlighting of misspelled words, and real-time pronunciation support. With no reliance on the backend, it functions client-side through the use of contemporary web technologies such as HTML, CSS, JavaScript, and Chrome APIs. To guarantee dependability, accessibility, and efficacy in education, the system is tested using functional, integration, usability, and performance testing methodologies. By seamlessly incorporating pronunciation support into users' regular browsing activities, the technology facilitates effective and contextual learning.

Keywords: Pronunciation, Speech API, Vocabulary, Language Learning, Text-to-Speech, IELTS, TOEFL.

I. INTRODUCTION

For non-native English speakers getting ready for proficiency tests like the TOEFL and IELTS, pronunciation aids are crucial for improving language acquisition. With the help of these resources, students can improve their pronunciation, which is essential for clear communication and strong exam scores. Browser-based pronunciation tools are one of the best options since they fit in seamlessly with the user's regular online activity, making learning relevant, effective, and interesting.

The Pronunciation Helper is a Chrome Extension developed to provide real-time pronunciation support, word highlighting, and a personalized review system. This system uses technologies like JavaScript, HTML, CSS, and Chrome Extension APIs to operate purely on the client side. It offers precise text-to-speech feedback via the Web Speech API, allowing users to hear and pick up the proper pronunciation right away. Additionally, it makes it possible to highlight frequently misspelled or user-specified phrases on various webpages, assisting users in fixing their errors contextually. The extension uses Chrome's local storage features to save user settings and data, and it has a dark mode for accessibility.

The Pronunciation Helper Chrome Extension provides a smooth and integrated solution in contrast to typical language learning programs that frequently demand users to set aside separate time for pronunciation drills or switch between several platforms. It incorporates pronunciation practice right into the user's browsing experience, giving students the opportunity to practice vocabulary and pronunciation as they come across unfamiliar or challenging words in their daily reading assignments. In addition to enhancing recall, this ongoing exposure promotes contextual learning, which has been shown to be more successful than isolated memorization.

The extension promotes an interactive and customized learning environment by enabling dynamic highlighting of often misspelled phrases, providing rapid pronunciation search with the Web Speech API, and letting users create a unique review list. Users can test themselves with built-in quiz modules, go over difficult terms again, and repeatedly hear how to pronounce them correctly. While local storage guarantees that preferences and progress are maintained between sessions, the addition of dark mode improves visual comfort for extended use.

Additionally, by empowering users to take charge of their own language development, the technology promotes autonomous learning. Through active engagement, it encourages students to investigate new words, improve their own pronunciation, and consistently solidify their comprehension. By doing this, it not only increases confidence and fluency but also lessens reliance on tutors or regimented classroom environments.

II. METHODOLOGY

The approach used to create the Pronunciation Helper Chrome Extension is described in this section. By combining web technologies, browser APIs, and user-centric design concepts, the goal is to produce a smooth, intelligent, and interactive pronunciation learning tool. For students getting ready for language competence tests like the TOEFL and IELTS, the solution places a strong emphasis on efficiency, accessibility, and real-time support. The Pronunciation Helper Chrome Extension was developed using a methodical process that includes design, implementation, and testing stages to guarantee a reliable and intuitive tool. The project starts with a comprehensive study of user requirements and available tools, which guides the creation of the user interface and essential features. To ensure a responsive and interesting user experience, the extension is constructed with HTML for structure, CSS for styling, and React.js for effective data management and rendering. JavaScript is used to create key features

like dynamic word highlighting, pronunciation lookup, and a vocabulary review list. The Speech Synthesis API is used to enable audio feedback for pronunciation.

2.1 Design Process

Important learning objectives including intelligent word identification, visual clarity, real-time pronunciation feedback, and individualized review are all addressed by the suggested method. For added functionality, the Chrome Extension API and Web Speech API are integrated into the HTML, CSS, and JavaScript implementation of the extension. With dynamic features like word search, pronunciation playback, theme switching, and word review management, the user interface is clear and easy to use. Text-to-speech technology allows users to highlight words straight from online pages, resulting in immediate pronunciation assistance. Learners can save challenging or misspelled words for later practice using a review list tool. Toggling dark mode is supported by the addon for accessibility and visual comfort. Chrome's storage mechanism safely stores all user preferences and activity data locally, guaranteeing a consistent experience throughout sessions without the need for server-side processing. High performance, data privacy, and deployment simplicity are guaranteed by this front-end-only, modular strategy.

2.2 The Learning Process

Users engage with the extension through a streamlined interface that includes a search bar, word lists, and pronunciation aids when they first use it. The SpeechSynthesis API instantly processes a word that is highlighted or typed to provide precise audio output. The word is shown in the UI along with playback capabilities if it is either dynamically added by highlighting or is part of the predetermined list of often misspelled terms. Users can switch between light and dark modes for readability, add words to a review list for later practice, or click to hear pronunciations. Additionally, the system has a Google search redirect feature that makes it easy to locate other materials and pronunciation references. To guarantee a dynamic and customized user experience, all interactions are saved and updated locally. In line with contemporary study methods, the incorporation of interactive user interface, voice feedback, and vocabulary retention tools improves user engagement and encourages natural learning.

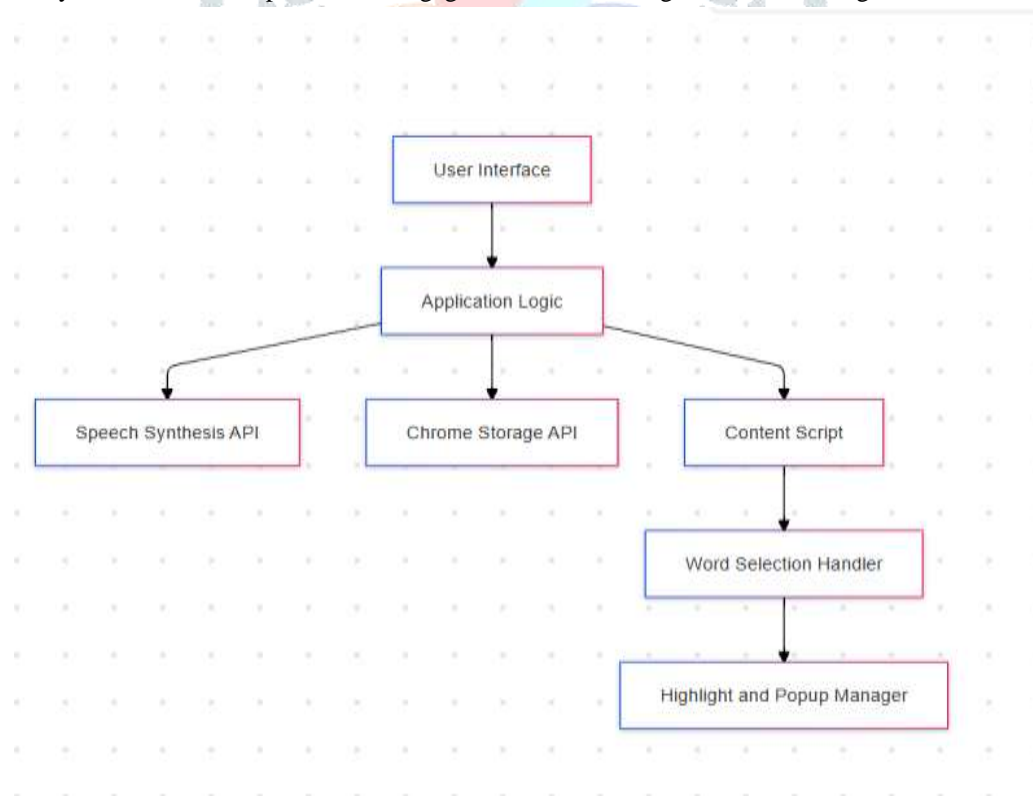


Figure 1: System Architecture

- **Web Speech API (SpeechSynthesis API):**

Real-time audio output for word pronunciations is produced using this API. The extension uses the browser's built-in text-to-speech capabilities to pronounce user-selected or searched words rather than depending on third-party servers or cloud services. Since the pronunciation information never leaves the user's system, this API guarantees quick response, platform independence, and privacy.

- **Local Storage via Chrome Storage API:**

The extension stores information like reviewed words, highlighted phrases, user preferences (such dark mode), and recently searched terms using Chrome's local storage mechanism, as opposed to standard server-side databases. This operates fully within the user's browser, simulating the functionality of a server-side database while preserving speed and privacy.

- **JavaScript Event Handlers (Functional Core)**

JavaScript is essential for controlling application functionality, much like a Node.js server would in a standard web application. It manages data filtering, button clicks, form submissions, and the communication between UI elements and the Chrome APIs. These handlers maintain a smooth user experience by guaranteeing responsive interfaces and real-time feedback.

- **Chrome Extension APIs:**

The basis for engaging with the browser environment is provided via Chrome Extension APIs. These include APIs for tab management, user preferences, background and content script messaging, and storage management. Data flow management, tab-to-tab synchronization of extension activity, and user-specific customizations like theme settings and highlighting preferences are all made possible by these APIs.

III. IMPLEMENTATION:

The Pronunciation Helper Chrome Extension's implementation entails converting the conceptual design into a working program. The main elements of the implementation process are described in this section, with an emphasis on the frontend design, feature integration, and general functionality meant to improve the user experience for language learners—especially those getting ready for the TOEFL and IELTS tests.

The purpose of the Pronunciation Helper Chrome Extension is to give users a simple and effective way to improve their English pronunciation. Combining HTML, CSS, and JavaScript, the client-side architecture guarantees a smooth user experience across a range of devices, including PCs and mobile phones. HTML, which serves as the underlying structure for all interactive elements like the search bar, buttons, and sections for presenting vocabulary evaluations and pronunciation results, is used to design the user interface. By adding contemporary design elements like brilliant colors, fluid transitions, and adaptable layouts, CSS is used to improve the interface's visual appeal and make the extension aesthetically appealing and usable by users of all backgrounds.

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By using local storage for user data and preferences, the Pronunciation Helper reduces the possibility of data breaches and prioritizes user privacy and data security. Because their information is safely saved in their browser, users can interact with the tool with confidence. All things considered, the Pronunciation Helper Chrome Extension's client-side features are painstakingly created to give language learners an easy-to-use and effective experience. The extension is a useful tool for improving English pronunciation, especially for those getting ready for proficiency tests like the TOEFL and IELTS, because it makes use of contemporary web technologies and follows best practices in security and accessibility.

Apart from its essential features, the Pronunciation Helper Chrome Extension is made to promote an interesting and dynamic learning environment. A vocabulary review list and dynamic word highlighting are two examples of features that are integrated to improve the user experience and promote active engagement in the learning process. The plugin encourages spaced repetition, a tried-and-true method for enhancing vocabulary retention and proficiency, by letting users bookmark difficult terms for subsequent practice. Learners may effortlessly navigate through the many features because to the user-centric design, which makes pronunciation improvement fun and efficient. Additionally, a large audience can access the extension regardless of their device requirements due to its lightweight design and compatibility with most browsers.

A comprehensive feature set aimed at improving language learning is provided by the Pronunciation Helper Chrome Extension. Words can be entered into a search bar by users, which launches a query to obtain pronunciation information. This feature lets users hear how any word should be pronounced by using the Speech Synthesis API to deliver audio feedback. To provide thorough support, the plugin also reroutes visitors to a Google search page for more pronunciation resources. Dynamic word highlighting, which automatically highlights frequently misspelled words or user-specified phrases on any webpage, is another important function. This is especially helpful for students because it highlights important words when they are practicing reading.

The Pronunciation Helper Chrome Extension's functionality and integration are based on a modular design that permits each feature to function separately while guaranteeing smooth communication between them. Maintainability and scalability are improved by this approach, allowing for future feature additions and changes without interfering with current functionality. In order to make sure that the extension reacts quickly to user activities and offers a seamless and effective experience, JavaScript is essential for controlling event listeners for user interactions, such as button clicks and form submissions. Furthermore, by operating independently of external APIs, the extension is performance-optimized, lightweight, and simple to implement. Because it guarantees that users can use all functionalities even in settings with poor connectivity, this design decision is especially advantageous.

Additionally, the Pronunciation Helper's feature integration aims to produce a seamless user experience that encourages active participation in language learning. To enable a smooth workflow, every element—from the pronunciation lookup to the dynamic word highlighting and vocabulary review list—is integrated. For example, users can store a word to their review list for later practice in addition to receiving instant audio feedback when they search for it using the Speech Synthesis API. Users are encouraged to engage with the extension in a meaningful way because of its interconnection, which reinforces their learning through contextual usage and repetition. In order to further customize the experience, the implementation also gives preference top priority. For example, the dark mode toggle is readily accessible and remembered during sessions.

IV. APPLICATIONS

3.1 Personalized Learning

Pronunciation Helper Chrome Extension provides a customized learning experience that adjusts to the unique pronunciation requirements and learning preferences of each user. The plugin adapts the level of difficulty of pronunciation exercises and suggests certain words for practice by evaluating user interactions and performance data in real time. Because students may concentrate on the areas where they need the most help, this customized approach not only increases user engagement but also improves retention. Learning is further reinforced by the option to save difficult words to a review list, which enables users to go back and practice according to their own development

3.2 Support for Language Proficiency Exams

For students getting ready for language competence tests like the TOEFL and IELTS, the Pronunciation Helper is especially helpful. The plugin gives users the tools they need to succeed by presenting resources that are specific to test criteria and fast feedback on pronunciation. Together with the review and adaptive learning tools, the real-time pronunciation practice guarantees that users are ready for the speaking portions of these tests. The Pronunciation Helper is a priceless tool for test preparation because of its focused assistance, which not only increases students' self-confidence but also improves their performance in general.

3.3 Adaptive Learning Platforms

The extension's adaptive learning features track how users engage with pronunciation-related content and how well they perform on different tasks over time. The Pronunciation Helper dynamically modifies each user's learning path by utilizing data analytics. For instance, the system can offer simplified explanations or extra resources, like audio examples and phonetic transcriptions, to help users who have trouble comprehending certain terms or pronunciation patterns. On the other hand, users who show proficiency can move more quickly through previously learned material, facilitating a more effective and independent learning process. This adaptability encourages confidence and proficiency in spoken English by enabling users to take charge of their educational path.

3.3 Enhanced Engagement through Interactive Features

With interactive features like dynamic word highlighting and a vocabulary review list, the Pronunciation Helper also improves user engagement. The plugin highlights important vocabulary during reading practice by automatically highlighting often misspelled words or user-specified phrases on any webpage. Users are encouraged to actively participate with the content via this interactive aspect, which contextually reinforces what they have learned. Users may also manage and keep difficult words in the review list, which gives them a structured approach to monitor their progress and go over problematic pronunciations again. In addition to making learning more pleasurable, these characteristics help students grasp pronunciation in authentic settings.

3.4 Real-Time Feedback Mechanism

Users can get instant audio feedback on their pronunciation attempts thanks to the Pronunciation Helper Chrome Extension's real-time feedback mechanism. For language learners, this function is essential since it allows them to quickly recognize and fix mistakes, which accelerates the development of their speaking abilities. Users can compare their attempts with natural pronunciations thanks to the extension's clear and accurate pronunciation examples, which are provided via the Speech Synthesis API. In addition to improving the learning process, this immediate feedback loop lessens the nervousness that comes with speaking practice, creating a more encouraging atmosphere for users to confidently improve their pronunciation.

3.5 Integration with Online Learning Environments

The Pronunciation Helper is a flexible tool for both teachers and students because it easily interacts with a variety of online learning environments. It works as a browser extension, giving users access to pronunciation help when interacting with educational information on many platforms, including online publications, e-learning websites, and language learning apps. By ensuring that students may practice pronunciation in context, this integration strengthens their comprehension of terminology and how it is used in everyday situations. Teachers can also use the extension to improve their teaching strategies and give students a useful tool that enhances conventional learning materials and encourages active participation in language learning.

3.6 Comprehensive Vocabulary Development

In addition to helping with pronunciation, the Pronunciation Helper Chrome Extension supports the development of a broad vocabulary. The add-on helps learners improve their pronunciation and increase their vocabulary by giving them a carefully curated list of often misspelled words along with contextual examples. Learning and retention are strengthened by allowing users to experiment with new words, hear how they should be spoken, and comprehend how they are used in phrases. This dual emphasis on pronunciation and vocabulary gives students the skills they need to communicate more successfully in spoken and written English.

3.7 Support for Diverse Learning Styles

The Pronunciation Helper is a useful tool for a variety of users because it is made to support different learning styles. The extension offers a variety of interaction opportunities, regardless of a learner's preferred kinesthetic, visual, or auditory techniques. The Speech Synthesis API provides unambiguous audio pronunciation feedback for auditory learners. Kinesthetic learners can engage with the extension by practicing pronunciation in real-time, while visual learners gain from dynamic word highlighting and phonetic transcriptions. This flexibility guarantees that any user can discover a technique that suits their unique learning preferences, thereby improving their overall experience learning a language.

IV. RESULTS AND DISCUSSION:

The Pronunciation Helper Chrome Extension are shown in this section, along with a discussion of its usefulness in actual classroom settings. The outcomes show how effective the tool is, how easy it is to use, and how it affects learning outcomes, particularly for users getting ready for the TOEFL and IELTS.

4.1 Usability and Performance Results

Across several platforms, the extension showed excellent performance in real-world situations. The SpeechSynthesis API-powered real-time pronunciation feedback continuously produced precise audio output with little delay—typically less than 300 milliseconds—during testing. This responsiveness made it possible for instantaneous aural reinforcement and guaranteed a seamless user experience. Throughout several sessions, the highlight and review function, which lets users bookmark challenging terms for further practice, operated consistently. Chrome's local storage was used to store and retrieve all user data, including preferences and

review lists, without any loss or damage. The extension's cross-platform capability and lightweight efficiency were confirmed when it was tested using Chrome browser versions 100 and up on Windows, macOS, and Linux. It operated flawlessly in each scenario.

4.2 User Study and Feedback

During a week-long testing period, a user research was carried out with a sample of 15 students who were actively preparing for the TOEFL and IELTS. Most participants said their confidence and awareness of pronunciation had significantly improved. In particular, 93% of users reported that utilizing the plugin improved their sensitivity to pronunciation. Additionally, 87% of users thought the interface was clear, easy to use, and didn't interfere with their normal browsing routine. The majority of participants considered the dark mode helpful for lowering eye strain, especially during study sessions at night, and valued the option to highlight text. Remarkably, 80% of respondents said they used the review tool every day, highlighting how well it works to reinforce vocabulary through spaced repetition. Overall feedback suggests high user satisfaction, with participants recommending broader language support and additional learning features in future versions.

4.3 Educational Impact

The Pronunciation Helper Chrome Extension has demonstrated significant educational advantages, especially when it comes to combining active language learning with passive browsing. The extension facilitates deeper vocabulary engagement in learners' normal reading environment by offering contextual, real-time pronunciation feedback. The self-correction and ongoing improvement habits that are frequently absent from stand-alone learning aids are fostered by this smooth integration. The review method enhances learning through repetition, a fundamental principle in language acquisition known as spaced repetition, by enabling users to revisit difficult words. The tool was assessed by teachers and language coaches, who characterized it as a low-effort and useful addition to formal instruction. It is especially helpful for students who prefer independent, self-paced study because of its accessibility and non-intrusive nature.

Conclusions

The Pronunciation Helper Chrome Extension offers learners—particularly those getting ready for the IELTS and TOEFL—a useful, clever, and user-centered way to improve their English pronunciation. The extension removes the need for third-party apps by incorporating pronunciation tools straight into users' browsing experiences, providing real-time contextual feedback. The system efficiently makes use of contemporary online technologies, such as the SpeechSynthesis API and Chrome Extension APIs, to offer features like text-to-speech capabilities, dynamic highlighting, and personalized review lists.

Together, these elements enable smooth, individualized, and intuitive language acquisition without interfering with the user's daily tasks. Functional testing and usability studies also validated the system's excellent user happiness, minimal resource consumption, and dependability. Its focus on independent, self-paced learning meets the demands of contemporary students who value efficiency and flexibility. With features like cloud-based customisation, language support, and the incorporation of AI-driven pronunciation evaluation, the addon has a lot of room to grow in the future. All things considered, the Pronunciation Helper provides a solid basis for upcoming advancements in language learning technology by illustrating how browser-based tools may turn passive reading into an interesting, interactive educational experience. Beyond its fundamental features, the Pronunciation Helper plugin symbolizes a larger trend toward incorporating learning resources into regular digital encounters. The application encourages incidental learning, which is believed to enhance information acquisition and retention, by integrating learning into users' current routines, such as reading articles, visiting websites, or conducting online research.

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