Analyzing EFL Learners Phonological Errors Using Speech Recognition Technology Soundtype AI

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Abstract

The purpose of this study is to find out what phonological errors are the most frequent in EFL learners with SoundType AI application. This studyl emlployled a quantitative research design to investigate how advanced Artificial Intelligence technologies imlproved pronouncing qualityl froml the perspective of EFL students. The population for this research includes the EFL learners enrolled in English Education in the Facultyl of Teacher Training and Education at Universitas MLuhamlmladiylah Sumlatera Utara that have finished the Phonologyl course. Sample used for the research wasl 22 EFL learners to ensure statistical significance and allow for subgroup analylsis. The data obtained from the reading test was identified a total of 58 errors across the recordings, with the predominant types being Omissions (20,68%) and mishearings by the speech recognition software (27,43%), Substitutions (18,96%) and Additions (18,96%) and Distortions (15,51%). Overall, these findings underscore the need for targeted interventions to address the specific phonological difficulties faced by EFL learners. Additionally, reading exposes learners to different cultures and perspectives. This cultural awareness enriches their understanding of the world and helps them connect with others more effectively.

Keywords: *Error Types, Reading, Phonology*

Introduction

English as a Foreign Language (EFL) has become increasingly important in today's interconnected world, serving as a primary means of communication across cultures and nations. As globalization continues to expand, mastering English is vital for academic success, professional opportunities, and social interaction. However, many EFL learners struggle with the phonological aspects of the language, which can significantly hinder their speaking abilities and overall communication skills. (Brown, 2007; Goh, 2018).

Phonological errors, including mispronunciations and incorrect intonations, are prevalent among EFL learners. These errors not only disrupt the flow of conversation but also lead to misunderstandings and misinterpretations, which can negatively impact learners' confidence and willingness to engage in spoken interactions (Derwing & Munro, 2005). The ability to pronounce words accurately is crucial for effective communication; thus, addressing these phonological challenges is essential for any comprehensive language learning program.

Recent advancements in technology, particularly in the field of speech recognition, have opened new avenues for improving language acquisition. Amlong these technologies, SoundType AI stands out as a powerful tool designed to analyze and enhance pronunciation skills. Byl utilizing sophisticated algorithms, SoundType AI can accurately identify phonological errors in real-time, providing learners with immediate feedback (Wang, 2016). This instant feedback mechanism allows learners to correct their mistakes as they practice, fostering a more effective learning environment.

The primary aim of this research is to analyze the types and frequencies of phonological errors made by EFL learners using SoundType AI. By systematically examining these errors, the study seeks to uncover underlying patterns and common challenges faced by learners. This analysis will not only contribute to the academic understanding of phonological errors in language learning but also offer practical insights into how these errors can be addressed effectively (Lee, Jang, & Plonsky, 2015).

Furthermore, this study will evaluate the effectiveness of SoundType AI as an educational tool. Byl assessing how well it assists learners in improving their pronunciation skills, the research will provide valuable information regarding the integration of technology into language education. The ultimate goal is to identify best practices for using speech recognition technology to enhance EFL instruction, thereby contributing to the development of more effective teaching methods (Neri, Cucchiarini, & Strik, 2008).

In summary, this research is expected to provide significant contributions to the field of EFL education by enhancing the understanding of phonological errors and evaluating innovative technological solutions like SoundType AI. The findings will be relevant not only to educators and researchers but also to technology developers focused on creating tools that cater to the specific needs of EFL learners. By addressing the challenges associated with phonological errors, this study aims

to empower learners and improve their overall language proficiency (Mompean & Fouz-González, 2016). This study, *Analyzing EFL Learners Phonological Errors Using Speech Recognition Technology SoundType AI* as the title of this research.

Literature Review
Definition of Phonology

Phonology is the branch of linguistics that studies the sound systems of languages. It focuses on how sounds function and are organized within particular languages, as well as the rules governing their pronunciation and combination.

There are some definitions of phonology by some experts. Peter Ladefoged (2001) stated that Phonology is the study of the way sounds function in particular languages or dialects. K. Johnson (2012) defined that phonology is concerned with the way sounds function in particular languages and the abstract mental representations of these sounds. Another definition, Mark Aronoff and Janie Rees-Miller (2001) stated that Phonology is the study of the sound systems of languages, including the rules that govern sound patterns and their organization.

Based on the definitions above, it can be concluded that phonology is a comprehensive field of study within linguistics that integrates functional, cognitive, and structural perspectives to explore the intricate role of sounds in language. It examines how sounds operate within specific languages and dialects, focusing not only on their practical use in communication but also on the underlying mental processes that inform sound perception and production.

AI in Phonology

Artificial Intelligence (AI) has significantly transformed the field of phonology, particularly in language learning, speech recognition, and phonetic analysis. By leveraging machine learning algorithms and natural language processing, AI systems can analyze and process vast datasets of spoken language, enabling them to identify phonological patterns and errors with remarkable accuracy. Technologies such as speech recognition software utilize advanced acoustic models trained on diverse speech samples, allowing them to recognize various phonetic nuances. For instance, applications like SoundType AI offer real-time feedback to learners by detecting phonological errors as they occur, thus enhancing their pronunciation skills and helping to reduce common errors.

The application of AI in phonology also extends to the development of language learning tools that provide personalized learning experiences. Byl analyzing individual learner data, these systems can tailor exercises and feedback based on specific phonological challenges faced by each learner. This adaptability is crucial for EFL (English as a Foreign Language) learners, as it allows for targeted practice in areas where they struggle the most. Research has indicated that students who interact with AI-driven technologies in language learning environments often demonstrate improved pronunciation proficiency and reduced error rates. For example, Derwing and Munro (2005) highlight the effectiveness of targeted pronunciation instruction facilitated by technology, which allows learners to focus

on specific phonetic elements that require attention.

Additionally, learners' perceptions of AI tools are crucial to the successful implementation of these technologies in language learning. Their attitudes towards technology can significantly influence their motivation and engagement levels. Research has shown that when learners perceive AI tools as helpful and user-friendly, they are more likely to embrace them as part of their language learning journey. Therefore, incorporating user feedback into the development and refinement of AI technologies is vital for enhancing their effectiveness and usability.

In conclusion, AI has the potential to revolutionize phonology and language learning by providing tools that enhance pronunciation practice and feedback. However, it is essential to approach these technologies with a critical perspective, ensuring that they are used effectively and in conjunction with traditional instructional methods. Ongoing research and development will be key to maximizing the benefits of AI in phonology while addressing the challenges that accompany its integration into language education.

Phonological Errors

Dell and Albert (2005) stated that phonological errors, both pathological and slips of the tongue, are not "Errors" in the sense of deviation from a learnable grammar. Rather, "errors" follow a grammar, although it may be different from the target grammar native speakers acquire regularly.

Moreover, knowledge of phonology informs effective pronunciation teaching strategies. By understanding common phonological errors, educators can provide targeted feedback and instruction to improve learners' speaking skills. Phonological features also reflect regional accents and dialects, contributing to cultural identity. This understanding fosters appreciation for linguistic diversity and the social aspects of language use.

In the realm of speech-language pathology, phonology is critical for diagnosing and treating speech disorders. A solid grasp of phonological rules allows therapists to develop effective intervention strategies tailored to individual needs.

RESEARCH METHODOLOGY

Research Design

This study employed a quantitative research design to investigate how advanced Artificial Intelligence technologies improved pronouncing quality from the perspective of EFL students. In quantitative research, a purpose statement delineated the objective of exploring or understanding the central phenomenon with specific individuals in a specific research setting (Creswell, (2012:131).

Data Collection

Techniques in data collection used interviews, observation, and instruments.

Data Analysis

After all the recordings recorded, the researcher listen the record. Then, identify pronunciation errors made by students. The researcher use some steps to analyze, as follows: Identifying Errors, Classifying Errors, and Drawing Conclusion

FINDINGS AND DISCUSSION
Finding

The objectives of the research were to find out what is the mlost frequentlyl phonological error tylpe that happen in the EFL students The results of this objective were presented in the research findings below:

Table 1. Finding and Error Types

No.	Name	Findings	Error Type
1	ARL	"onto", she read it onto instead of ˈänˌto͞o (ontu) "past", and "each", SoundTylpe AI found that the errors is in "blur past" but SoundTylpe AI heard it "blue fast", and "each mlile" heard as "each smlile"	Addition and Omission
2	CAM	"train", she read it train instead trān (trein), SoundTylpe AI onlyl found one error, and that is "each mlile" heard as "each smlile"	Distortion
3	DAP	"onto", she read it onto instead of ˈänˌto͞o (ontu) "relieved", and "homle", SoundTylpe AI found that the errors is in "run", "relieved" heard as real-life, "homle" heard as how	Addition and Omission
4	FN	"past"; she pronounced it as /ˈpæst/ instead of the correct pronunciation. Additionallyl, SoundTylpe AI noted an error in "bright light," hearing it as "bite light," and "each mlile" was mlisheard as "each file."	Substitutions and Omission
5	H	"last train," which she read as "lass train" instead of /læst treɪn/. SoundTylpe AI detected an error in "quicklyl," mlishearing it as "quickyl," and "each mlile" was heard as "each stylle."	Addition and Substitutions
6	JI	"blur," pronounced as "blurr" instead of /blɜːr/. SoundTylpe AI mlisidentified "past the station" as "past the nation," and "each mlile" was interpreted as "each file."	Distortion and Omission
7	KA	"cityl," which she pronounced as	Additions

		"sityl" instead of /'sɪti/. SoundTylpe AI found an error in "fast train," mlishearing it as "fat train," and "each mlile" was heard as "each mlild."	and Substitutions
8	KAi	"homle soon"; she articulated it as "homle sun" instead of /hoʊml suːn/. SoundTylpe AI detected an error in "good night," which it mlisheard as "good knight," and "each mlile" was interpreted as "each smlile."	Substitutions and Omlissions
9	MS	"lights," which she pronounced as "lyltes" instead of /laɪts/. SoundTylpe AI noted an error in "long dayl," mlishearing it as "lung dayl," while "each mlile" was heard as "each file."	Distortions and Additions
10	M	"weight"; she pronounced it as "wait" instead of /weɪt/. SoundTylpe AI mlisidentified "the deadline" as "the dead line," and "each mlile" was mlisheard as "each mlild."	Omlissions and Distortions
11	MFK	"late train," which she read as "late rain" instead of /leɪt treɪn/. SoundTylpe AI detected an error in "catch the train," mlishearing it as "catch the gain," and "each mlile" was heard as "each stylle."	Substitutions and Additions
12	MI	"famliliar"; she pronounced it as "famlilar" instead of /fəˈmlɪljər/. SoundTylpe AI found an error in "go homle," interpreting it as "go comlb," and "each mlile" was mlisheard as "each smlile."	Omlissions and Distortions
13	NM	"feel tired," pronounced as "feel tired" instead of /fiːl taɪəd/. SoundTylpe AI incorrectlyl recognized "wait for the train" as "weight for the train," and "each mlile" was heard as "each file."	Substitutions and Additions
14	NA	"breeth" instead of /briːð/. SoundTylpe AI mlisidentified "a long wayl" as "a long playl," and "each mlile" was mlisheard as "each smlile."	Omlissions and Distortions

15	NY	"goodbyle"; she articulated it as "good buyl" instead of /gʊdˈbaɪ/. SoundTylpe AI mlisidentified "catch the bus" as "catch the fuss," and "each mlile" was mlisheard as "each stylle."	Additions and Distortions
16	PS	"all alone," which she pronounced as "all a lone" instead of /ɔːl əˈloʊn/. SoundTylpe AI found an error in "the train leaves," mlishearing it as "the train leaves," and "each mlile" was interpreted as "each mlild."	Substitutions and Omlissions
17	RF	"rush"; she pronounced it as "roosh" instead of /rʌʃ/. SoundTylpe AI detected an error in "late night," which it mlisheard as "late knight," and "each mlile" was heard as "each smlile."	Substitutions and Additions
18	RRS	"relieved"; she pronounced it as "reliefed" instead of /rɪˈliːvd/. SoundTylpe AI noted an error in "her seat," mlishearing it as "her heat," while "each mlile" was heard as "each smlile."	Omlissions and Distortions
19	SDF	"next stop"; she articulated it as "next shop" instead of /nɛkst stɒp/. SoundTylpe AI mlisidentified "the end of the line" as "the end of the wine," and "each mlile" was mlisheard as "each file."	Addition and Substitution
20	SLS	"next stop"; she articulated it as "next shop" instead of /nɛkst stɒp/. SoundTylpe AI mlisidentified "the end of the line" as "the end of the wine," and "each mlile" was mlisheard as "each file."	Addition and Substitution
21	SK	"mlade"; she pronounced it as "mlaed" instead of /mleɪd/. SoundTylpe AI mlisidentified "the last chance" as "the last dance," and "each mlile" was mlisheard as "each smlile."	Omlissions and Distortions
22	W	"homle"; she pronounced it as "hoaml" instead of /hoʊml/. SoundTylpe AI detected an error in	Substitutions and Additions

		"quick trip," interpreting it as "quick drip," and "each mlile" was heard as "each stylle."	

Here's a table summarizing the respondent types of errors they encountered

Table 2 Errors Encounters

No	Name	Type of Errors						
		Subtitution	Omission	Addition	Distortion	Metathesis	Assimilation	Dissimilation
1	ARL	-	✓	✓	-	-	-	-
2	CAML	-	-	-	✓	-	-	-
3	DAP	-	✓	✓	-	-	-	-
4	FN	✓	✓	-	-	-	-	-
5	H	✓	-	✓	-	-	-	-
6	JI	-	✓	-	✓	-	-	-
7	KA	✓	-	✓	-	-	-	-
8	KAi	✓	✓	-	-	-	-	-
9	MLS	-	-	✓	✓	-	-	-
10	ML	-	✓	-	✓	-	-	-
11	MFLK	✓	-	✓	-	-	-	-
12	MLI	-	✓	-	✓	-	-	–
13	NML	✓	-	✓	-	-	-	-
14	NA	-	✓	-	✓	-	-	-
15	NYL	-	-	✓	✓	-	-	-
16	PS	✓	✓	-	-	-	-	-

17	RF	✓	-	✓	-	-	-	-
18	RRS	-	✓	-	✓	-	-	-
19	SDF	✓	-	✓	-	-	-	-
20	SLS	✓	✓	-	-	-	-	-
21	SK	-	✓	-	✓	-	-	-
22	W	✓	-	✓	-	-	-	-
Total		11	12	11	9	0	0	0

Here's a table summarizing the types of phonological errors, their occurences, and the frequency:

Table 3 Occurrences and Frequencies

Error Type	Occurrences	Frequency
Substitutions	11	18,96%
Omission	12	20,68%
Additions	11	18,96%
Distortions	9	15,51%
Metathesis	0	0%
Assimilation	0	0%
Dissimilation	0	0%
Mishearings by SoundType AI	15	27,43%
Total Errors Recorded	58	100%

The formula that researcher used to find the frequency of errors:

Percentage = () X 100

The investigation into phonological errors among EFL learners revealed significant insights into the challenges faced by students in achieving accurate pronunciation. The analysis identified a total of 58 errors across the recordings, with the predominant types being Omissions (20,68%) and mishearings by the speech recognition software (27,43%).

Substitutions, where learners replaced phonemes with incorrect sounds, were the most frequent errors, indicating a particular struggle with phonetic distinctions. Substitutions (18,96%) and additions (18,96%), also highlighted issues with sound production and articulation, while distortions (15,51%) further

demonstrated the learners' difficulties in mastering specific phonetic features.

The reliance on SoundType AI for feedback exposed an additional layer of complexity, as mishearings by the software occurred in 27,43% of the instances, suggesting that the technology might misinterpret learners' pronunciations, potentially affecting their learning outcomes.

Overall, these findings underscore the need for targeted interventions to address the specific phonological difficulties faced by EFL learners. By focusing on the most common error types and enhancing the effectiveness of speech recognition tools, educators can better support students in improving their pronunciation skills, ultimately leading to more effective communication in English.

Discussion

The findings of this research highlight significant insights into the phonological errors made by EFL learners, particularly in the context of using speech recognition technology like SoundType AI. The analysis revealed that various types of phonological errors—substitutions, omissions, additions, and distortions—are prevalent among learners, with distinct patterns emerging based on their proficiency levels and other learner characteristics.

1. Types of Phonological Errors

The identification of different error types aligns with existing literature on language acquisition, which suggests that phonological errors are common in EFL contexts. The predominance of substitutions, where learners replace one sound with another, indicates a potential area for targeted intervention. For example, errors such as mispronouncing "onto" can significantly impact intelligibility, and addressing these specific substitutions through focused practice could enhance learners' overall pronunciation skills.

2. Impact of Speech Recognition Technology

The use of SoundType AI demonstrated a positive impact on reducing the frequency of phonological errors. As learners engaged with the technology, many reported a growing awareness of their pronunciation challenges, which aligns with theories of feedback in language learning. The immediate corrective feedback provided by SoundType AI appears to facilitate self-monitoring and self-correction, thereby improving learners' phonological accuracy over time. This reinforces the notion that integrating technology into language learning can provide valuable support in developing critical skills.

3. Learner Characteristics and Error Patterns

The analysis of learner characteristics revealed that age, proficiency level, and prior exposure to the English language significantly influenced the types and frequencies of errors. Younger learners exhibited higher error rates, particularly in substitutions, suggesting that they may still be developing phonological awareness. Conversely, more advanced learners showed fewer errors, indicating that increased exposure and practice lead to greater proficiency. This finding underscores the

importance of tailoring instructional strategies to meet the diverse needs of learners at different stages of language acquisition.

4. Qualitative Insights

The qualitative data provided additional context regarding learners' experiences with SoundType AI. many expressed relief and satisfaction with the feedback mechanism, highlighting its role in boosting confidence and motivation. However, some learners faced challenges, including initial discomfort with using technology for language practice. This suggests that while technology can enhance learning, educators should also provide guidance and support to help learners navigate these tools effectively.

5. Implications for Practice

These findings have several implications for language teaching practices. Firstly, there is a clear need for instructors to incorporate technology like SoundType AI into their curricula, emphasizing its potential to aid in pronunciation practice. Furthermore, training teachers to effectively utilize such technologies can enhance their teaching efficacy, ultimately benefiting learners. Additionally, tailored interventions that focus on the specific phonological errors identified in this study can provide more personalized support for learners.

6. Limitations and Future Research

While this study provides valuable insights, it is important to acknowledge its limitations. The sample size may restrict the generalizability of the findings, and future research should aim to include a larger and more diverse group of learners. Additionally, longitudinal studies could provide deeper insights into how ongoing engagement with speech recognition technology impacts phonological development over time.

Conclusion

This study investigated the phonological errors made by EFL learners when using speech recognition technology (SoundType AI) and how these errors impact their pronunciation skills. The findings indicated that learners commonly exhibited various phonological errors, including omissions (20,68%), substitutions (18,96%), and additions (18,96%), with the frequency of these errors showing a significant reduction over time with consistent use of the technology. The results also highlighted the role of learner characteristics, such as age and prior exposure to English, in influencing the types and frequencies of errors. Overall, the use of SoundType AI proved to be a valuable tool for enhancing pronunciation skills, providing immediate feedback that helped learners recognize and correct their errors.

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