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YILDIZ TECHNICAL UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF FOREIGN LANGUAGES EDUCATION
ENGLISH LANGUAGE TEACHING PROGRAM

MASTER'S THESIS

AI TEXT-TO-SPEECH TECHNOLOGY AND ITS IMPACT ON EFL READING COMPREHENSION

ALARA GÜLER
227C5017

THESIS ADVISOR
ASST. PROF. DR. GÜLÜMSER EFEOĞLU

2025

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Alara GÜLER tarafından hazırlanan "Yapay Zeka Metinden Sese Teknolojisi ve İngilizce Okuduğunu Anlama Üzerindeki Etkisi" başlıklı çalışma, **16/05/2025** tarihinde yapılan savunma sınavı sonucunda oybirliği ile başarılı bulunmuş ve jürimiz tarafından Yabancı Diller Eğitimi Ana Bilim Dalı İngiliz Dili Eğitimi Programında **YÜKSEK LİSANS** tezi olarak kabul edilmiştir.

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ABSTRACT

AI TEXT-TO-SPEECH TECHNOLOGY AND ITS IMPACT ON EFL READING COMPREHENSION

This study investigates the impact of AI text-to-speech technology (Natural Reader) on the reading comprehension skills of B1 level Turkish EFL students. Using a mixed-methods research design, quantitative data was collected through pre-test and post-test measurements, while qualitative data was gathered through focus group interviews. The study involved 95 students enrolled in a state university's English preparatory program. Participants were divided into a control group and two experimental groups (normal speed x1.0 and reduced speed x0.81). During the four-week intervention process, the control group read the texts using single-mode reading (text-only) without audio support, while the experimental groups used the Natural Reader application at different speed settings. Quantitative findings revealed that Natural Reader usage did not create a statistically significant difference in reading comprehension scores. Similarly, no significant difference was found between different playback speeds. However, qualitative findings showed that Natural Reader provided benefits in pronunciation learning (50%), vocabulary development (25%), and increased concentration (25%). Participants in the experimental groups reported that the application contributed particularly to listening skills (66.7%) and pronunciation skills (50%). Nevertheless, challenges such as simultaneous listening and reading difficulty (58.3%), speaker speed (33.3%), and note-taking limitation (25%) were also identified. These findings indicate that cognitive load factors need to be considered, and the multi-sensory approach needs to be applied in a balanced way when using text-to-speech technology in language learning. In conclusion, while AI-supported text-to-speech technology may not directly increase reading comprehension scores, it has the potential to contribute to the development of various language skills.

Keywords: Artificial Intelligence, Text-to-Speech Technology, Reading Comprehension, EFL Teaching, Cognitive Load

ÖZET

YAPAY ZEKA METİNDEN SESE TEKNOLOJİSİ VE İNGİLİZCE OKUDUĞUNU ANLAMA ÜZERİNDEKİ ETKİSİ

Bu çalışma, yapay zeka destekli metin-okuma teknolojisinin (Natural Reader) B1 seviyesindeki Türk öğrencilerin İngilizce okuma anlama becerileri üzerindeki etkisini incelemeyi amaçlamaktadır. Karma yöntem araştırma deseni kullanılan çalışmada, nicel veriler ön test-son test ölçümlerinden, nitel veriler ise odak grup görüşmelerinden elde edilmiştir. Araştırmaya bir devlet üniversitesinin İngilizce hazırlık programına kayıtlı 95 öğrenci katılmıştır. Katılımcılar kontrol grubu ve iki deney grubuna (normal hız x1.0 ve yavaşlatılmış hız x0.81) ayrılmıştır. Dört haftalık uygulama sürecinde, kontrol grubu metinleri ses desteği olmaksızın tek-modlu okurken, deney grupları Natural Reader uygulamasını farklı hız ayarlarında kullanmıştır. Nicel bulgular, Natural Reader kullanımının okuma anlama puanlarında istatistiksel olarak anlamlı bir fark yaratmadığını göstermiştir. Benzer şekilde, farklı oynatma hızları arasında da anlamlı bir fark bulunmamıştır. Bununla birlikte, nitel bulgular Natural Reader'ın telaffuz öğrenme (%50), kelime bilgisi geliştirme (%25) ve konsantrasyon artışı (%25) gibi alanlarda fayda sağladığını ortaya koymuştur. Deney gruplarındaki katılımcılar, uygulamanın özellikle dinleme (%66.7) ve telaffuz becerilerine (%50) katkı sağladığını belirtmiştir. Ancak, eş zamanlı dinleme ve okuma zorluğu (%58.3), konuşmacı hızı (%33.3) ve not alma sınırlılığı (%25) gibi zorluklar da tespit edilmiştir. Bu bulgular, metin-okuma teknolojisinin dil öğreniminde bilişsel yük faktörünün dikkate alınması ve çoklu duyusal yaklaşımın dengeli bir şekilde uygulanması gerektiğini göstermektedir. Sonuç olarak, yapay zeka destekli metin-okuma teknolojisi, okuma anlama puanlarını doğrudan artırmasa da, farklı dil becerilerinin gelişimine katkı sağlama potansiyeline sahiptir.

Anahtar Kelimeler: Yapay Zeka, Metin-Okuma Teknolojisi, Okuduğunu Anlama, İngilizcenin Yabancı Dil Olarak Öğretimi, Bilişsel Yük

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ABBREVIATIONS

AI	: Artificial Intelligence
ASR	: Automatic Speech Recognition
AWE	: Automated Writing Evaluation
CALL	: Computer Assisted Language Learning
CDA	: Computerized Dynamic Assessment
CIRC	: Cooperative Integrated Reading Composition
DDL	: Data-Driven Learning
EFL	: English as a Foreign Language
IELTS	: International English Language Testing System
ITS	: Intelligent Tutoring Systems
LLM	: Large Language Model
LWR	: Listening While Reading
MALL	: Mobile-Assisted Language Learning
NLP	: Natural Language Processing
RR	: Repeated Reading
SPSS	: Statistical Package for the Social Sciences
TELL	: Technology Enhanced Language Learning
TTS	: Text-to-Speech

1. INTRODUCTION

1.1. Background of the Study

Technological developments have led to significant changes in foreign language teaching, as in many areas of education (Fitria, 2021; Widyana et al., 2022; Son et al., 2023). Particularly with the proliferation of artificial intelligence (AI) supported applications, language learning processes have become more personalized and interactive. Among these technological developments, text-to-speech (TTS) technology provides language learners with multi-sensory learning opportunities by converting written texts into audio content.

Although TTS technology was initially developed for visually impaired individuals, it has become an important tool in language learning over time (Fitria, 2023). This technology can be particularly effective in developing reading skills, pronunciation practice, and supporting multi-sensory learning experiences. Today, advanced AI-supported TTS applications such as Natural Reader, Google TTS, and Amazon Polly can produce outputs of near-human voice quality and offer different accents, speeds, and tones.

In teaching English as a foreign language (EFL), reading skill is considered a fundamental language skill for students to succeed in their academic, social, and professional lives (Ornstein & Levine, 1993). Reading skill encompasses not only the process of deriving meaning from text but also the ability to analyze, evaluate, and examine ideas from a critical perspective. However, students learning EFL encounter various challenges such as limited vocabulary knowledge, inability to grasp text meaning, and errors in word recognition and pronunciation (Al-Othman, 2024).

The multi-sensory learning approach stands out as an effective strategy in overcoming these challenges. This approach makes the learning process more comprehensive and effective by integrating visual, auditory, and textual elements in language teaching. While some students prefer visual learning, others may have auditory or kinesthetic learning styles. The multi-sensory approach considers these individual differences and

provides materials and methods suitable for each student's learning style (Guthrie & Wigfield, 2000).

Within the context of multisensory learning, the potential of TTS technology in foreign language teaching has attracted the attention of many researchers. Researchers such as Biancarosa and Griffiths (2012), Bus and Smeets (2013), and Danaei et al. (2020) have emphasized the potential of TTS tools in enhancing reading skills in second language learning. Additionally, researchers like Marzban (2011) and Valentini et al. (2018) have examined how Mobile Assisted Language Learning (MALL) and AI-supported tools support multi-sensory approaches and provide students with both written and auditory input.

Research on the effectiveness of AI technologies in language learning shows that these technologies offer various advantages. Fitria (2021) demonstrated that AI positively affects the English learning environment by providing personalized learning experiences and supporting the development of language skills. Similarly, Nugrahawati (2024) found that AI effectively develops reading skills through personalized learning experiences, adaptive assessment, and feedback, and promotes lifelong learning.

However, from the perspective of cognitive load theory, careful evaluation is required for the effective use of AI technologies. Kundu and Bej (2024) noted that students experience high cognitive load, particularly when interacting with AI tools. Wang (2024) emphasized that AI tools can increase students' cognitive load. These findings indicate that cognitive factors need to be considered for the effective use of AI technologies in language learning.

In this context, the present study examines the impact of Natural Reader, an advanced AI-supported TTS application, on the reading comprehension performance of B1-level Turkish EFL students. By comparing three different groups (a control group and two experimental groups using varied playback speeds), the research investigates how TTS technology might affect foreign language reading comprehension for students in a university setting.

1.2. Purpose of the Study

Many studies highlight the potential of TTS tools in enhancing reading skills in second language learning (Biancarosa & Griffiths, 2012; Bus & Smeets, 2013; Danaei et al., 2020). Additionally, scholars have explored how MALL and AI-generated tools support multimodal approaches, thereby giving learners both written and auditory input (Marzban, 2011; Valentini et al., 2018). However, the majority of these investigations have focused on specialized populations (e.g., struggling readers or those with identified learning disabilities), leaving open the question of whether TTS applications can similarly benefit typical EFL learners at the university level (Stodden et al., 2012; Young et al., 2018; Raffoul & Jaber, 2023).

Against this backdrop, the present study examines the impact of Natural Reader—an AI-supported TTS application—on the reading comprehension performance of B1-level Turkish EFL students in a mainstream university setting. By comparing three different groups (a control group and two experimental groups using varied playback speeds), the research aims to determine how TTS technology might enhance reading comprehension for learners without clinically diagnosed reading difficulties. In doing so, this study not only builds upon the literature emphasizing multimodal input and auditory processing but also fills a critical gap: it investigates TTS effectiveness in a population that has not been the primary focus of existing research.

The current study aims to answer the following questions:

1) Does the use of Natural Reader influence the improvement of B1-level Turkish EFL learners' reading comprehension?

2) Does the playback speed on Natural Reader influence the improvement of B1-level Turkish EFL learners' reading comprehension?

3) What are the perceptions of B1-level Turkish EFL learners regarding the use of Natural Reader in EFL reading, compared to single-mode reading?

1.3. Significance of the Study

The research contributes to understanding the role of technological developments in language teaching. It provides valuable information about the advantages and disadvantages of AI-supported TTS technologies compared to traditional reading

methods. This information can help educators and researchers broaden their understanding of technology use in language teaching.

The study fills a significant gap in the literature by focusing specifically on typical English students at the university level. While most existing research has focused on special populations (e.g., students with reading difficulties or identified learning disabilities), this study examines the effect of TTS technology on students without clinically diagnosed reading difficulties.

The research emphasizes the importance of the multi-sensory learning approach in language learning. TTS technology appeals to students with different learning styles by combining visual and auditory inputs. This study sheds light on the role of the multi-sensory approach in developing reading comprehension skills.

The study evaluates the effects of TTS technology from the perspective of cognitive load theory. By examining the effects of different playback speeds on students' cognitive load and reading comprehension performance, it contributes to determining optimal learning conditions.

The research results can guide educators, curriculum developers, and policymakers on technology integration in language teaching. By providing strategies and recommendations for the effective use of TTS technology, it can contribute to the development of language teaching practices.

In conclusion, this study represents an important step toward better understanding the potential and limitations of AI-supported TTS technology in language learning. The research findings can help develop effective strategies to optimize the role of technology in language teaching and improve students' reading comprehension skills.

2. LITERATURE REVIEW

2.1. Technology in EFL

The rapid development of technology has significantly impacted many fields, including education. Particularly in a globalizing world, with increasing trade, education, and tourism activities between countries and continents, technology has become not just an option but a necessity (AbdAlgane & Othman, 2023). In this context, as a requirement of the "information industry" era, education is continuously evolving in terms of pedagogical approaches, subject content, theoretical frameworks, and teaching paradigms (Tikiz-Ertürk & Kurt-Taşpinar, 2023).

Entering the 21st century, many radical changes have occurred in the education system regarding learning inputs, processes, and outputs. Intelligent machines as AI applications are contributing to changing the roles played by schools, teachers, and students (Nugrahawati, 2024). This transformation accelerated particularly during the COVID-19 pandemic, with digital teaching/learning styles becoming widespread globally. This situation has reshaped traditional teaching methods, drawn attention in higher education, and promoted academic English language learning (Chea & Xiao, 2024; Jiang, 2022).

In recent years, technological resources have brought significant opportunities and challenges to language education. The use of technology in language teaching has evolved from basic technological tools and offline software to advanced online tools (Vo et al., 2024). This development process, especially with the continuous advancement of AI technologies, offers educators extensive opportunities to integrate AI-supported tools in teaching and learning processes (Jose, 2024).

Technology-assisted language teaching has numerous advantages. Primarily, it provides lifelong learning opportunities by offering rich multimedia resources, and particularly through portable devices, students can find opportunities to improve their language skills beyond traditional or virtual classrooms. This situation especially provides a private learning space for students who may not have adequate personal

space for accessing a shared computer at home to practice language skills such as pronunciation and speaking (Koç, 2024). Mobile applications and computer software help improve reading fluency and comprehension skills, motivate students, and increase their participation in activities (Amin, 2022). Technology promotes learner autonomy and helps them feel more confident. Additionally, it increases learners' motivation for foreign language learning. Technology-supported teaching systems can present course materials in a more engaging and non-monotonous way and facilitate teaching (Widyana et al., 2022).

AI technologies offer various advantages in English teaching. AI applications can be used particularly for students and teachers and can provide flexibility in learning environments (Son et al., 2023). Technologies such as Automatic Assessment Systems, Neural Network Translation Tools, Intelligent Teaching Systems, AI Chatbots, and Affective Computing enhance different aspects of English learning. These technologies can provide personalized feedback, help develop speaking skills, and increase learning participation in online classes (Fitriani, 2024). Technologies like natural language processing (NLP), machine learning, and adaptive learning systems are transforming language learning by increasing efficiency, personalization, and accessibility. These technologies offer personalized feedback, adaptive learning paths, and immersive experiences in EFL teaching (Kundu & Bej, 2024). Particularly pioneering AI applications powered by LLMs, such as ChatGPT and Gemini, facilitate and encourage real-life use of the English language in various ways. These tools offer students opportunities for real-time language practice, instant feedback, and personalized learning experiences (Jose, 2024).

However, the use of technology in language education also brings certain challenges and limitations. EFL students face various difficulties such as limited exposure to the target language, lack of speaking practice in real-life situations, insufficient resources, rote learning, and cultural-linguistic differences. While technology offers solutions to some of these challenges, it can also create new ones (Kundu & Bej, 2024). Digital inequalities, lack of digital literacy, and distracting factors can negatively affect technology-supported learning processes. These issues can limit learning opportunities, especially for students with restricted access to technology (Jose, 2024). Excessive dependence on technology can reduce students' creativity and lead to laziness (Vo et al., 2024). Therefore, student self-control and teacher supervision

become important in technology use. Additionally, there is no guarantee that each technological tool will meet students' needs or learning objectives (Fitria, 2023). AI technology has transformed English teaching and learning by organizing scientific content, providing various learning resources, and offering personalized instruction. While it helps students improve their English skills, there are still challenges in accessing academic resources. These challenges become more prominent in regions with insufficient digital infrastructure (Chea & Xiao, 2024).

From teachers' perspective, there are various challenges as well. While some teachers easily adapt to technological resources, others struggle with staying current and using these features effectively in the classroom (Espinoza et al., 2024). It is seen as a common problem that EFL teachers cannot sufficiently use potentially valuable technologies to develop students' abilities (Fitria et al., 2023). Teachers' attitudes towards technology use range from positive to cautious. Less experienced teachers often struggle to respond effectively to analytical data, leading to their reluctance and low acceptance. This situation can significantly affect the success of technology integration (Jiang, 2022). The use of technology in education requires teachers to continuously update themselves. Receiving training in technology integration has become a necessary skill for teacher candidates in their future teaching careers. This situation requires teacher education programs to adapt to technological developments as well (Vo et al., 2024).

The ethical dimension is also a significant source of concern. It is noted that technologies bring some ethical issues regarding ethical responsibility, personal data collection, data privacy, and ownership of responsibilities (Espinoza et al., 2024). It is emphasized that language teachers are not yet sufficiently prepared for AI and ethical issues need to be considered (Son et al., 2023).

In conclusion, the integration of technology into language education creates significant changes in learning and teaching methodologies. While traditional EFL teaching methods struggle to meet various needs for English proficiency in a globalized world, technology offers new opportunities in this field (Kundu & Bej, 2024). The rapid development of AI technology is significantly changing traditional teaching methods with intelligent assistants and personalized learning paths. These developments not only improve the learning process but also create revolutionary changes by making education more interactive, flexible, and personalized (Wang, 2024).

However, for this integration process to be successful, both advantages and disadvantages need to be carefully evaluated, and technology needs to be used consciously. In this context, Technology Enhanced Language Learning (TELL), which will be discussed in the next section, provides a more detailed framework for how technology can be effectively used in foreign language education.

2.1.1. Technology Enhanced Language Learning (TELL)

Building on the previous section that addressed the role and importance of technology in education, it is appropriate to examine in detail TELL, which is a specialized application area of technology use in language teaching. In recent years, digital technologies have become a significant focus point both scientifically and practically in the world of English language teaching. As noted by Schmidt and Strasser (2022), international discussions on TELL vary between "enthusiastic proposals," "pessimistic stances," and "views emphasizing that the risks of digital media need to be addressed." Research has shown that technology can influence educational processes and outcomes, and consequently, many countries have begun investing in technological support for teaching and learning (Schmidt & Strasser, 2022).

One of the most important advantages of TELL is making learning more accessible. Physical classroom environment and time limitations in traditional teaching methods have been eliminated thanks to digital tools (Walker & White, 2013). E-learning platforms, distance education programs, and mobile applications enable students to participate in learning processes regardless of their location. This situation presents a great opportunity, especially for individuals who have geographical barriers or lack access to traditional education systems. With an internet connection and a suitable device, almost anyone can access information and receive education from anywhere in the world (Miller et al., 2016). Furthermore, the TELL approach supports learning processes not only inside but also outside the classroom. While learning in traditional teaching methods is usually limited to school hours, digital tools offer students 24/7 learning opportunities. Online libraries, educational videos, interactive course materials, and mobile applications allow students to access information whenever they want (Stockwell, 2022).

The digitalization of learning materials has made it possible to present course content in a more engaging and interactive way. While traditional teaching methods generally

adopt a text-based approach, multimedia elements are widely used in technology-enhanced methods (Schmitt, 2017). Videos, animations, simulations, and interactive applications add visuality and dynamism to learning materials, attracting more student attention. Technology-enhanced English teaching allows students to develop language skills simultaneously using all their senses (Fitria, 2021). Multimedia tools make language learning more attractive with visual, auditory, and interactive materials. Video lessons, audiobooks, and simulations help learners learn the language in a more natural and meaningful way (Guthrie & Wigfield, 2000).

One of the most important opportunities offered by TELL is personalized learning. Each student has different learning speeds, interests, and abilities. While traditional education systems generally offer a standardized curriculum and teaching method for all students, TELL makes it possible to provide personalized learning experiences considering individual differences for each student (Wang & Liao, 2017). AI-supported education platforms can analyze students' needs and provide appropriate course materials and learning strategies. Big Data and sophisticated analytical processes (learning analytics) give hope for a new era of personalized learning, formative assessment, and activating, student-centered, and collaborative forms of learning. Thanks to educational data mining, learning processes can theoretically be highly individualized (Tikiz-Ertürk & Kurt-Taşpinar, 2023).

The integration of technology into teaching methods has also significantly changed the role of teachers. While teachers usually assume the role of information transmitter in traditional classrooms, they emerge as guides and mentors in technology-enhanced methods (Higgins & Moseley, 2001). Using digital tools, teachers can enrich course content and provide students with more creative learning experiences. AI technologies contribute to the development of language skills by providing students with personalized learning environments. However, it is emphasized that technology alone is not sufficient in English teaching, and teachers' guidance role is still important. Technology-enhanced applications can only be effective with teacher guidance and support (Fitria, 2021).

However, it should not be forgotten that technology-enhanced teaching methods also bring some challenges and risks. Inequality in access to technology is one of the biggest obstacles to implementing these methods. In an environment where students and teachers do not have necessary digital tools or a fast internet connection, it is not

possible for everyone to benefit equally from these methods (Schmitt, 2017). Excessive use of digital tools can lead to distraction and digital addiction, and reduce students' social interactions (Guthrie & Wigfield, 2000). Distracting elements of the internet can prevent students from learning efficiently (Leu et al., 2015).

In conclusion, TELL has brought revolutionary changes by making language teaching more effective and accessible. This approach has great potential in enriching learning materials, personalizing learning experiences, and providing new opportunities for students. Using the right methods and integrating digital tools in a balanced way is crucial to best utilize the opportunities offered by technology (Naeb, 2015; Becker et al., 2017; Buendgens-Kosten & Elsner, 2018). Technology enhances language learning through various channels, one of which is mobile devices that have become increasingly prevalent in educational contexts. As a subset of TELL, MALL represents an important application area that has emerged with the proliferation of smartphones and tablets.

2.1.2. Mobile Assisted Language Learning (MALL)

After discussing TELL, it is appropriate to examine Computer Assisted Language Learning (CALL), which is an important application form in this field, and its evolution into MALL with mobile technologies.

CALL has emerged as one of the fundamental components of technology-enhanced language learning. Computer technology, which is present in most modern homes, has had extensive effects in the field of education and has become increasingly common in schools. Students can develop their vocabulary, verbal communication skills, and visual communication abilities using multimedia education and computerized language laboratories (AbdAlgane & Othman, 2023). CALL systems can be used for methodological purposes, such as creating dictation exercises in foreign languages, especially with innovative applications like TTS technology, and such exercises make significant contributions to the development of listening skills (Widyana et al., 2022).

With the rapid development of technology and the proliferation of mobile devices, CALL systems have evolved and gained a new dimension called MALL. CALL and MALL systems have transformed into Smart-CALL and Smart-MALL through the combination of AI, NLP systems, and other current technological developments. While traditional CALL systems only offer limited exercises such as multiple choice,

matching, and fill-in-the-blanks, smart systems can handle more complex exercise types and provide more in-depth feedback according to users' individual characteristics (Koç, 2024).

On the other hand, MALL refers to language learning activities carried out through smartphones, tablets, and other portable digital devices. The impact of mobile devices on language learning has not been limited to accessibility; it has provided new opportunities for students by making the learning process more interactive and personalized (Stockwell, 2022). Mobile applications are particularly effective in improving students' oral reading production, and the use of digital texts on mobile devices motivates students to read and practice fluency (Amin, 2022).

One of the most important advantages of MALL is that, unlike traditional language learning methods, it allows students to learn languages without time and space restrictions. Reading texts, listening activities, grammar exercises, and vocabulary development work can be easily done through mobile devices. These devices make the language learning process more efficient by offering applications that can be customized according to user needs (Cheung & Slavin, 2013). Another important feature of MALL is that it increases students' active participation in learning by providing social interaction opportunities. Through language learning applications, students can communicate with other learners, share texts, and participate in forums and chat rooms to improve their language skills. Such social interactions enable students to practice the language they learn more effectively and make the learning process more enjoyable (Alfaki, 2018).

From teachers' perspective, MALL offers significant advantages. Through mobile devices, teachers can continuously monitor students' progress, create personalized learning plans according to individual needs, and provide immediate support. Students can access assignments provided by teachers through their mobile devices, take online exams, and receive instant feedback. This situation enables overcoming the physical limitations of the traditional classroom environment and provides a more efficient learning experience for students (Cheung & Slavin, 2013).

However, significant problems can arise in applying technology to language education. These problems include the possibility of computer programmers, software developers, hardware manufacturers, and technicians dominating the industry, high costs of software and programs, lack of technical support from practitioners, and

negative attitudes of both students and teachers (AbdAlgane & Othman, 2023). Additionally, teachers and students need to have adequate technological literacy for effective use of CALL and MALL systems. Son et al. (2023) emphasize that technical requirements and pedagogical responsibilities in implementing AI-assisted language learning and teaching need to be discussed further.

The future of MALL is closely related to the development of AI technologies. Today, many AI-supported tools for English reading and writing (such as AI writing assistants, machine translation, and chatbots) have been developed, marketed, and started to be used in language classrooms. These tools are designed based on NLP and machine learning and make the language learning process more effective (Hsiao & Chang, 2024).

In conclusion, in the process from CALL to MALL, MALL has added significant innovations and flexibility to the language learning process. Interactive features, personalized learning experiences, and instant feedback offered by mobile devices enable students to rapidly develop their language skills. However, technical, pedagogical, and economic challenges need to be considered for successful implementation of these technologies. As the importance and impact of MALL in education continues to increase, the integration of AI technologies into this field is also accelerating. In this context, the next section will discuss in detail the role of AI technologies in language teaching.

2.1.3. AI Tools in EFL

The development and proliferation of MALL has paved the way for the increasing role of AI technologies in language teaching. Mobile learning platforms offered by MALL have gradually evolved into more intelligent systems that analyze user behaviors, provide personalized content, and offer real-time feedback (Koç, 2024). This evolutionary process has accelerated with the integration of AI algorithms into MALL applications, particularly with the advancement of NLP and machine learning technologies, transforming MALL platforms from simple mobile applications into adaptive learning systems (Kundu & Bej, 2024). Today, the convergence of MALL and AI has led to the emergence of tools that can analyze students' language usage data, recommend content based on learning styles, and provide pronunciation assessment through speech recognition technologies (Son et al., 2023). The synergy

between mobile accessibility and AI capabilities has created unprecedented opportunities for language learners to receive personalized, context-aware instruction beyond traditional classroom boundaries (Chea & Xiao, 2024). This section will address the place, advantages, and limitations of AI-supported tools in English language teaching.

AI technologies in language education are examined in seven fundamental categories: natural language processing (NLP), data-driven learning (DDL), automated writing evaluation (AWE), computerized dynamic assessment (CDA), intelligent tutoring systems (ITSs), automatic speech recognition (ASR), and chatbots. These categories are interrelated and can be combined or expanded due to the nature of AI (Son et al., 2023).

AI-supported tools are classified into three main categories based on their intended use: (1) Student-focused AI tools (e.g., AI chatbots, Intelligent Tutoring Systems, and Neural Network Translation tools), (2) Teacher-focused systems (tools aimed at reducing teacher workload), and (3) System-focused AI tools (algorithms providing processed data for institutional administrators) (Tikiz-Ertürk & Kurt-Taşpinar, 2023; Schmidt & Strasser, 2022).

The use of AI technologies in EFL classrooms helps students develop critical thinking, discussion, and argumentation skills. AI technology extends learning beyond the classroom environment by enabling students to access educational materials anytime and anywhere (AbdAlgane & Othman, 2023). AI-supported platforms can determine individual learning models and adapt content accordingly by analyzing large amounts of data regarding students' performance and preferences (Daweli & Mahyoub, 2024).

Commonly used AI applications in language education include adaptive learning applications like Duolingo, Rosetta Stone, Hello Talk; large language model (LLM) applications such as ChatGPT and Gemini; AI-powered writing assistants like Grammarly; and speech recognition applications like Speak & Improve, Talk Pal, Elsa Speak (Espinoza et al., 2024). These applications offer various functions including text comprehension, vocabulary learning, summarizing, question answering, translation, and explanation (Chea & Xiao, 2024).

AI technologies provide significant advantages in language teaching. These advantages include:

- Easy access and instant feedback
- Information about learning strengths and areas for improvement
- Personalized practice opportunities
- Better understanding of learning preferences
- Increasing student motivation
- Providing interactive instruction
- Facilitating distance learning
- Supporting language and skill development (Tikiz-Ertürk & Kurt-Taşpinar, 2023; Jose, 2024).

However, the use of AI technologies in language education also brings certain challenges and limitations:

- Requirement for technology-based knowledge, fast internet connection, and financial capacity
- Risk of copying and plagiarism
- Data accuracy, privacy, and algorithmic bias issues
- Potential to hinder critical thinking
- Job loss concerns
- Teachers' difficulties in providing feedback on AI-supported content
- Risk of dulling users' creativity
- Potential to encourage laziness (AbdAlgane & Othman, 2023; Tikiz-Ertürk & Kurt-Taşpinar, 2023; Jose, 2024).

The use of AI technologies in education is also transforming the role of teachers. Systems developed to reduce teachers' workload can handle tasks such as homework assessment and student counseling. However, this situation raises concerns about AI replacing teachers. Experts emphasize that AI should be seen as a supportive tool that needs to be strategically blended with traditional methods rather than a technology that will replace teachers (Daweli & Mahyoub, 2024; Fakher Ajabshir, 2023).

One of the important features of AI-supported systems is their potential to encourage the development of self-regulated and autonomous independent learners. These tools introduce methods that enable students to effectively learn English on their own (Hsiao & Chang, 2024). The role of AI-powered chatbots in language learning is particularly noteworthy. These tools provide rich language input, interaction, and instant feedback by simulating human-like conversations with users. While chatbots have advantages such as reducing anxiety and providing personalized responses, they also have disadvantages such as potentially overwhelming students with information overload and producing incorrect answers (Zheng, 2024).

Ethical concerns regarding the use of AI technologies in education are also an important topic of discussion. Issues such as student privacy, data security, and transparent use of AI tools should be carefully addressed. The "black box" nature of AI systems, meaning the lack of transparency in decision-making processes, prevents teachers and students from understanding how AI makes certain decisions. This situation can reduce trust in AI technology and limit its effective use in educational settings (Wang, 2024; Vera, 2023).

In conclusion, while AI technologies offer significant opportunities in language teaching, they are tools that need to be used carefully and consciously. Successful integration of these technologies requires teachers to develop necessary skills and alignment with language learning theories. AI-supported systems have the potential to provide personalized learning experiences, conduct language assessment, and improve language proficiency. However, technological infrastructure requirements, ethical concerns, and uncertainties about optimal integration models indicate that more research is needed in this field.

TTS tools, which will be discussed in the next section, are one of the important applications of AI technologies in language teaching. TTS technology plays a critical role particularly in developing reading skills and supporting multimodal learning approaches.

2.1.4. Text-to-Speech Tools (TTS)

TTS technology, one of the applications of AI tools in language teaching, plays a significant role in the language learning process, especially with its recent

developments. This section will discuss in detail the structure, features, advantages, and limitations of TTS technology.

TTS technology emerges as an important component of NLP, which combines AI and linguistics. This technology is defined as a system that automatically converts written texts into speech (Schmidt & Strasser, 2022). TTS systems work as a process that first analyzes the input text, then processes and understands it, converts the text to digital sound, and finally produces speech output (Widyana et al., 2022).

Examining the historical development of TTS technology, it was initially developed to assist visually impaired individuals and others with visual disabilities. Over time, this technology has evolved and become applicable in various areas of life, such as language teaching. Modern TTS systems can quickly and accurately convert simple texts, books, news, and articles into audio format. As a significant development, the sound produced by the TTS engine has now acquired a much more natural quality and can produce outputs very close to human voice instead of robot-like sounds (Fitria, 2023).

When examining classroom applications of TTS technology, it is observed that it makes the teaching-learning process more efficient, especially in English laboratories, and supports the learning environment. In the application process, teachers transfer the text to the TTS system, students read the text while listening to the audio recording. This reading experience becomes interactive and personalized through several key features of TTS technology: students can pause, replay, and adjust the speech rate according to their individual comprehension needs; they can select different voice options (male/female, various accents) that best suit their learning preferences; they can highlight specific words or phrases to hear them pronounced in isolation; and they can receive immediate auditory feedback by comparing their own pronunciation with the TTS model. Furthermore, modern TTS systems allow for customization of text difficulty levels and vocabulary focus areas, enabling teachers to tailor reading materials to address specific student weaknesses. This interactive and personalized reading experience is effective in diagnosing and overcoming students' reading difficulties (Fitria et al., 2023). The rapid development of technology in recent years and students' widespread use of high-tech products such as tablets and smartphones have increased the potential of TTS technology in language teaching. This technology has shown steady development among tools developed to facilitate language

acquisition. TTS applications that can be used on mobile devices offer students the opportunity to practice without time and space limitations (Fitria, 2023).

Commonly used TTS tools today include applications such as Google TTS, Dragon NaturallySpeaking, Amazon Polly, IBM Watson TTS, Speechify, and Natural Reader. These tools help English learners practice listening comprehension and pronunciation with their speech synthesis capabilities (Fitria, 2023; Fitriani, 2024; Chea & Xiao, 2024). AI-supported multisensory technology platforms like RightToRead analyze educational content using advanced speech recognition and TTS technologies and transform it into interactive lessons that appeal to different learning styles. Such platforms enrich the learning experience, especially for students with visual and auditory learning styles (Wang, 2024). As another example, Natural Reader application, which supports many languages, especially English, is a free AI-powered TTS service that can be used in language teaching. The application can convert written texts into speech with various accents. Through this application, students can listen to how words/sentences are pronounced with different accents and voices as many times as they want (Fitria, 2023).

TTS systems offer several significant advantages in language teaching environments. With their unlimited vocabulary, these systems can pronounce virtually any word, providing consistent and accurate pronunciation models for learners. The technology also offers flexibility through adjustable speed, intonation, and output sound format options, allowing customization based on individual learning needs. Additionally, TTS applications provide recording capabilities in audio file format, enabling students to save and revisit pronunciations as needed (Fitria, 2021). These features collectively create a versatile tool that accommodates various learning styles and preferences in language education.

Particularly in reading development, TTS technology has demonstrated substantial benefits for improving reading outcomes. The technology effectively supports students' independent reading abilities while increasing reading comprehension, fluency, and motivation (Amin, 2022). From a cognitive perspective, TTS applications help extend attention span and strengthen interaction with long-term memory processes. This cognitive enhancement facilitates better retention as TTS assists in storing learned concepts in memory and developing vocabulary knowledge (Al-Othman, 2024). These reading-specific advantages make TTS particularly valuable for

educators seeking to improve students' reading proficiency in language learning contexts.

However, TTS technology also has some limitations:

- Restrictions in terms of naturalness, pleasantness, and expressiveness
- Potential misunderstandings due to different pronunciation of some words
- Artificial voice usage potentially negatively affecting student motivation (Widyana et al., 2022)
- Technical problems potentially disrupting the learning process (Al-Othman, 2024)
- Difficulties in receiving accurate feedback for individuals with non-standard accents or speech patterns (Fakher Ajabshir, 2023)

In summary, TTS technology is a tool that offers significant advantages in language teaching but also has some limitations. This technology is particularly effective in developing reading skills, pronunciation practice, and providing personalized learning experiences. However, disadvantages such as technical problems, naturalness limitations, and difficulties with non-standard accents should also be considered. Effective use of TTS technology requires balanced evaluation of these advantages and limitations and development of strategies appropriate to learning objectives.

The effect of TTS technology on reading skills discussed in this section is directly related to "Reading Skill in EFL" which will be examined in the next section. Particularly, the role of TTS technology in the reading comprehension process and the importance of the multimodal approach shed light on how technology-supported methods can be used in developing reading skills. In this context, the next section will examine in detail the development of reading skills in EFL, with a particular emphasis on reading comprehension in EFL, the importance of the multimodal approach, and cognitive load theory.

2.2. Reading Skill in EFL

Reading is a complex process requiring various cognitive and linguistic abilities. Individual differences in socio-cognitive abilities affect how we interpret and interact with narrative content (Chea & Xiao, 2024). The reading process enables learning

different aspects of language and developing thinking skills. During this process, the brain exerts great effort in recognizing words, decoding their meanings, and combining them to form a logical whole (Paivio, 1990).

Reading skill is considered a fundamental language skill for students to succeed in their academic, social, and professional lives. This skill encompasses not only the process of deriving meaning from text but also the ability to analyze, evaluate, and examine ideas from a critical perspective (Ornstein & Levine, 1993). Reading skill is a critical language skill that requires students to understand the content of educational materials. It is a process requiring critical thinking and relies on the student's language proficiency to understand written text. Through English reading, foreign language students expand their vocabulary and acquire new knowledge (Daweli & Mahyoub, 2024).

In countries where English is learned as a foreign language, reading is seen as an important skill, especially for students who interact extensively with English texts and references. Good reading skills help students better understand texts, comprehend material, and expand their knowledge. However, not all students naturally possess good reading skills, and some may experience difficulties in understanding text, recognizing words, or maintaining concentration (Fitria et al., 2023). EFL students encounter various challenges in the reading process, such as limited vocabulary knowledge, inability to grasp text meaning, and errors in word recognition and pronunciation. Students particularly struggle with comprehending the literal meaning or general understanding of texts and remembering details that support facts and main ideas (Al-Othman, 2024).

Technological developments offer new opportunities in developing reading skills. Text analysis software helps students analyze the texts they read and receive feedback about the text's main idea, keywords, themes, and structure. This software analyzes the difficulty level of the text, providing materials suitable for students' reading levels and strengthening critical thinking skills related to the text (Cunningham et al., 2018). Interactive reading materials make the reading experience more engaging. Students can click on key words in the texts they read to learn their meanings and actively participate in the learning process by responding to various questions about the text. These tools help students focus on the text and establish a deeper connection with it (Zhang & Kuhlthau, 2015).

E-books and digital books are digital versions of traditional printed books and provide great advantages in terms of portability. Features such as note-taking, highlighting important sections, and term searching are effective in developing reading skills. Additionally, some e-books offer dictionaries, explanations, and interactive features that assist readers during reading (Paas, Renkl & Sweller, 2004). The customizable features of e-books increase visual accessibility and enable digitally literate individuals to maintain and develop their reading habits (Guthrie & Wigfield, 2000). Audiobooks are particularly beneficial for students with learning difficulties such as dyslexia, helping students better comprehend the meaning of texts (Miller & Latham, 2016).

AI-supported platforms offer personalized and dynamic learning experiences tailored to individual students' specific needs and preferences. These platforms can address skills, weaknesses, interests, and learning pace on an individual basis by providing personalized feedback (Daweli & Mahyoub, 2024). These platforms customize lesson content using machine learning and big data to meet each student's unique needs. This approach significantly raises literacy levels, especially among students in public schools (Wang, 2024).

In conclusion, reading skill plays a critical role in foreign language learning, and technological developments offer important opportunities in developing this skill. Particularly AI-supported platforms contribute to the development of reading skills with personalized learning experiences and instant feedback features. Reading activities and applications strengthen students' reading skills from different angles and make the reading process more engaging and effective (Pedró, 2006). However, developing reading skills is not merely a technical process but requires a comprehensive effort that includes enhancing reading comprehension ability. Reading comprehension is a complex cognitive process involving students' abilities to extract meaning from texts, analyze content, and think critically. In this context, the next section will examine in greater detail the importance of reading comprehension in EFL teaching, the factors affecting this skill, and strategies for its development.

2.2.1. Reading Comprehension in EFL

As a fundamental component of reading skill, reading comprehension can be defined as the complex cognitive process of extracting and constructing meaning through

interaction with written language, involving the simultaneous extraction and construction of meaning through interaction and involvement with written language (Snow, 2002). Comprehension is not limited to the act of reading itself; rather, it is a deliberate and continuous process that takes place before, during, and after reading a given text.

Reading comprehension competency involves multiple cognitive processes working together, including decoding, vocabulary knowledge, syntactic parsing, and discourse comprehension. These processes enable readers to construct meaning from text by integrating textual information with their prior knowledge (Guthrie & Wigfield, 2000). Proficient readers demonstrate the ability to identify main ideas, make inferences, recognize text structure, and monitor their own understanding while reading. This comprehensive set of skills allows them to process information at various levels, from literal comprehension to critical evaluation of the author's purpose and perspective (Cheung & Slavin, 2013).

Within this broader framework of reading competency, reading fluency is considered one of the important indicators of reading comprehension. This skill is defined as the ability to read at an appropriate speed without pronunciation and intonation errors, combining accuracy, automaticity, and oral reading prosody. According to the Theory of Automaticity in Reading, fluent readers easily recognize words and expend little cognitive effort (Amin, 2022).

Effective reading comprehension in EFL encompasses various sub-skills that work together to create meaning from text. These sub-skills include: (1) identifying main ideas and supporting details, (2) understanding explicit and implicit information, (3) making inferences about information not directly stated, (4) recognizing text organization and discourse markers, (5) understanding vocabulary in context, (6) distinguishing between facts and opinions, (7) recognizing the author's purpose and tone, and (8) critically evaluating the text (Grabe & Stoller, 2019; Koda, 2005). These sub-skills are not isolated components but rather interconnected processes that readers employ simultaneously while engaging with text.

In the EFL context, reading comprehension is particularly challenging because learners must process unfamiliar linguistic features while simultaneously constructing meaning. Unlike first language reading, where linguistic processing is largely automatic, EFL readers often need to consciously attend to language elements such as

vocabulary and syntax while also trying to understand the content (Bernhardt, 2010). This dual-processing requirement can create significant cognitive demands on EFL learners.

To support the development of reading comprehension skills, various instructional approaches and tools are employed. Reading activities and applications are important tools for developing students' reading skills and increasing their interaction with texts. These activities not only improve reading speed and comprehension skills but also allow students to evaluate the texts they read from a critical perspective (Reiser, 2012). When students engage with these activities regularly, they develop both reading fluency—the ability to read accurately, quickly, and with proper expression—and reading comprehension—the ability to process text, understand its meaning, and integrate it with what they already know. The relationship between these two aspects is crucial, as improved fluency often leads to better comprehension by freeing cognitive resources that can then be dedicated to meaning-making rather than decoding (Amin, 2022). Digital platforms and applications make reading activities more interactive. Various reading applications help students develop their reading skills by allowing them to interact with the text. These applications ask questions about the text, encourage students to think about what they read, and provide feedback (Pickering, 2006). These interactive features specifically target both fluency and comprehension aspects of reading. They support fluency development through repeated exposure to text patterns and vocabulary, while enhancing comprehension through strategic questioning and immediate feedback mechanisms (Al-Othman, 2024).

Students learning English as a foreign language encounter various challenges in the reading comprehension process. Limited vocabulary knowledge, inability to grasp text meaning, and errors in word recognition and pronunciation are among the primary difficulties (Al-Othman, 2024). These challenges can negatively affect students' process of making meaning from the text and decrease their reading motivation. Reading motivation has a significant impact on reading comprehension performance (Guthrie & Wigfield, 2000). Highly motivated students show more active participation in the reading process and can process texts more effectively.

Research has identified several factors that influence EFL reading comprehension. Background knowledge plays a crucial role, as readers with relevant prior knowledge can more easily integrate new information from the text (Hudson, 2009).

Metacognitive awareness—the ability to monitor and regulate one's own comprehension processes—also significantly impacts reading success (Zhang, 2001). Additionally, reading strategies such as previewing, predicting, summarizing, and questioning have been shown to enhance comprehension when applied appropriately (Grabe, 2009).

Multi-sensory approaches play an important role in developing reading comprehension skills. Multi-sensory approaches support the language learning process by providing students with both written and auditory input (Marzban, 2011; Valentini et al., 2018). In this context, technology-enhanced learning tools, particularly TTS technologies, can contribute to the reading comprehension process. The potential of TTS tools in enhancing reading comprehension in second language learning is emphasized by many researchers (Biancarosa & Griffiths, 2012; Bus & Smeets, 2013; Danaei et al., 2020).

Another factor affecting the reading comprehension process is cognitive load. Students experience high cognitive load, particularly when interacting with AI tools (Kundu & Bej, 2024). AI tools can increase students' cognitive load (Wang, 2024). Therefore, the cognitive load factor needs to be considered in reading comprehension activities.

On the other hand, AI positively affects the English learning environment by providing personalized learning experiences and supporting the development of language skills (Fitria, 2021). Therefore, AI effectively develops reading skills through personalized learning experiences, adaptive assessment, and feedback, and promotes lifelong learning (Nugrahawati, 2024).

Assessment of reading comprehension in EFL contexts typically employs various methods to evaluate different aspects of understanding. These include multiple-choice questions, short-answer questions, cloze tests, summary writing, and inference questions. Standardized tests such as IELTS, TOEFL, and Cambridge English exams include reading comprehension sections that assess these various sub-skills. Effective assessment should evaluate not only literal comprehension but also inferential and critical reading abilities (Alderson, 2000).

In conclusion, reading comprehension skill in teaching EFL plays a critical role in the development of students' language proficiency. It represents a complex, multifaceted process that goes beyond simple decoding to include higher-order thinking skills such

as analysis, synthesis, and evaluation. Effective reading comprehension instruction should address the various sub-skills involved while considering the unique challenges faced by EFL learners. While traditional approaches to reading comprehension have focused primarily on text-based interactions, recent developments in language teaching methodology have highlighted the importance of engaging multiple sensory channels to enhance comprehension. This recognition has led to increasing interest in multimodal approaches that integrate visual, auditory, and sometimes tactile elements in the reading process. The multimodal approach, which will be discussed in the next section, offers promising avenues for addressing the challenges of reading comprehension in EFL contexts by leveraging different sensory inputs and learning pathways to create more engaging and effective reading experiences.

2.2.2. Multimodal Approach in EFL

The multimodal approach is a teaching methodology based on integrating visual, auditory, and textual elements in language teaching. This approach makes the language learning process more comprehensive and effective by addressing students' different learning styles. While some students prefer visual learning, others may have auditory or kinesthetic learning styles. The multimodal approach considers these individual differences and provides materials and methods suitable for each student's learning style (Guthrie & Wigfield, 2000). While students are generally passive receivers in traditional teaching methods, in the multimodal approach, students interact more actively with content through various modalities. They contribute to meaningful learning by reinforcing their grammar and vocabulary knowledge with visual and auditory materials (Cheung & Slavin, 2013).

The multimodal approach, applied in various areas of language teaching, strengthens students' language skills, particularly through the use of digital tools and materials in classroom activities. For example, in a language lesson, students can listen to a story and then create an infographic or drawing to visually explain the main points of the story. Such activities strengthen students' comprehension, interpretation, and expression skills while developing their vocabulary (Mayer, 2008; Mayer, 2014). Online language courses adopting the multimodal approach are becoming increasingly common. These courses make the language learning process more dynamic by offering students video lessons, interactive quizzes, audio content, and visual materials.

Students develop their language skills by interacting with content from various sources through online platforms (Cheung & Slavin, 2013).

AI-supported learning platforms strengthen this approach by offering multiple learning experiences. For example, students can view their errors in different colors while reading aloud and listen to their own reading recordings (Jose, 2024). AI-supported platforms provide a multi-sensory learning experience by offering interactive lessons that appeal to auditory and visual learning styles. These platforms analyze and transform educational content using advanced speech recognition and TTS technologies (Wang, 2024).

The multimodal approach offers rich opportunities for teachers as well. Teachers can offer students a wider range of teaching strategies using different modalities. The integration of video, audio recordings, animations, and visual materials provides teachers with significant advantages in engaging students and capturing their attention. This approach allows teachers to plan their lessons more creatively and innovatively compared to traditional methods (Guthrie & Wigfield, 2000; Mayer, 2003). Tracking students' development and providing support in areas they need becomes easier with the multimodal approach. Teachers can record students' oral reading activities and provide feedback by listening to the recordings. This provides teachers with great flexibility in monitoring and evaluating language learners' development (Snow, 2002).

Although the multimodal approach provides many benefits in language teaching, it also brings some challenges. The use of technology-based applications and materials can vary depending on students' and teachers' familiarity with technology (Stockwell, 2022). Teachers need to have technical knowledge for the effective use of digital tools. Additionally, it is important for students to have access to the necessary technology to understand and interact with digital content. Therefore, it is necessary to ensure that technologies used in the classroom are accessible to everyone (National Reading Panel, 2000). Another challenge is adapting the multimodal approach to every student in the classroom. Each student has a different learning style, and some students may struggle to interact with multimodal content. Therefore, teachers need to plan their lessons considering each student's needs and provide guidance on the balanced use of different modalities (Cheung & Slavin, 2013). Despite these challenges, with proper implementation, the multimodal approach can create significant transformation in language teaching (Snow, 2002).

The role and importance of the multimodal approach in language teaching lies in making the learning process more effective and efficient. While meeting the needs of students with different learning styles, this approach enriches the language learning process by utilizing the opportunities offered by technology. The cognitive load theory, which will be discussed in the next section, provides a theoretical framework that helps us implement the multimodal approach in the learning process.

2.2.3. Cognitive Load

Cognitive load theory refers to the mental effort required to process information. This theory was first proposed by Sweller (1988, 1994, 2011) and emphasized that managing working memory load in learning processes is critical for successful learning (Ginns & Leppink, 2019; Kalyuga, 2011).

Mayer (2014) established the cognitive theory of multimedia learning. This theory is based on three fundamental assumptions: (a) the dual-channel assumption suggests that visual and verbal information is processed in separate channels; (b) the capacity assumption states that each channel has a limited amount of material it can process at once; (c) the active processing assumption emphasizes that meaningful learning requires conscious effort to select, organize, and integrate new information with existing knowledge. This theory incorporates Sweller's (1999) cognitive load theory and suggests that multimedia learning processes occur under limited working memory constraints. Plass et al. (2003) indicate that this limited capacity of human working memory can negatively affect learning under certain conditions in the multimedia learning process. For example, it is emphasized that creating a coherent mental representation of the subject presented in a multimedia learning environment is a complex cognitive task and can be particularly challenging for students with low prior knowledge (Schmid, 2008).

Sweller (1988) identifies three main types of cognitive load: intrinsic cognitive load, extraneous cognitive load, and germane cognitive load. Each of these load types affects the learning process differently and emerges as important factors to consider in instructional design. These cognitive load types are particularly significant in EFL learning contexts, where students must simultaneously process unfamiliar linguistic features, cultural references, and new content knowledge. Understanding how each type of cognitive load manifests in EFL is essential for designing effective language

instruction that optimizes learning without overwhelming students' cognitive resources.

i. Intrinsic cognitive load stems from the complexity of the information to be learned. This type of load is affected by the nature of the information being learned and the student's prior knowledge level. For example, a student who has learned basic concepts in mathematics will expend less effort when learning advanced mathematical concepts. Similarly, in foreign language learning, the student's current proficiency level in the target language affects the cognitive effort they will expend when learning new grammatical structures or vocabulary. While intrinsic cognitive load is difficult to limit as it stems from the nature of the information, teachers can manage this load by presenting information in meaningful and manageable chunks (Sweller et al., 2011).

ii. Extraneous cognitive load occurs when the student's attention and mental effort are dispersed by unnecessary elements that complicate the learning process. This type of load typically originates from instructional materials and methods. Complex textbooks, unnecessary texts, colorful graphics, or overly detailed presentations can make it difficult for students to focus and increase extraneous cognitive load. Particularly in technology-supported learning environments, interface design, navigation difficulties, or unnecessary multimedia elements can cause extraneous cognitive load. Therefore, instructional materials should be designed to capture students' attention without overloading their mental capacity (Skulmowski & Xu, 2022). Reducing extraneous load enables more efficient learning for students (Nechita, 2013).

iii. Germane cognitive load represents the mental effort students expend to process information meaningfully. This load is necessary for transferring information to long-term memory, establishing connections, and deep understanding of the material. Germane cognitive load contributes to the efficient functioning of the learning process and provides students with opportunities to develop problem-solving skills, analytical thinking, and participate in creative processes (Debue & van de Leemput, 2014). This type of load plays an important role in language learning, particularly in enhancing the effectiveness of cognitive strategies students use while developing reading, writing, listening, and speaking skills in the target language.

Cognitive variables significantly affect students' performance in the reading process. These variables include reasoning skills, attention, short and long-term memory, visual and auditory processing, and processing speed. Additionally, skills such as interaction, decoding, comprehension, concept formation, visual matching, and reformulation of ideas affect not only students' ability to read effectively but also their ability to use English in different communication contexts. Each of these cognitive processes contributes to the student's reading performance and determines the effectiveness of the learning process in EFL (Al-Othman, 2024).

The use of technological tools in education presents both opportunities and challenges in terms of cognitive load. While learning management systems, virtual classrooms, and digital simulations enable interactive learning, they can increase extraneous cognitive load if not used appropriately. Although instructional technologies, teaching materials, video lessons, and simulations have the potential to reduce cognitive load (Leu et al., 2015), excessive use of technological tools can increase extraneous load by distracting students. Therefore, appropriate integration of technology can make learning processes more efficient (Cheung & Slavin, 2013).

Cognitive load emerges as an important factor in AI-supported language learning. Students experience high cognitive load, particularly when interacting with AI tools. This indicates that educators need to use an iterative design process to effectively utilize AI tools in EFL classes. While the use of AI technologies in language learning has the potential to offer personalized learning experiences, careful evaluation of cognitive load factors is necessary for the effective use of these technologies (Kundu & Bej, 2024).

Cognitive load directly affects students' learning processes and success. Excessive cognitive load makes it difficult for students to focus on the material and negatively affects the learning process. When students expend too much mental effort, they may struggle to process new information, which can reduce learning efficiency. Conversely, effective management of cognitive load helps students achieve deeper learning and increase their success (Snow, 2002).

In conclusion, cognitive load theory emerges as a fundamental concept in understanding learning processes and developing effective teaching strategies. Particularly in technology-supported learning environments, balanced management of different types of cognitive load is critical in increasing the efficiency of the learning

process. In this context, considering the cognitive load factor in the use of AI-supported TTS technologies plays an important role in developing students' EFL reading comprehension skills. Educators' consideration of cognitive load theory principles in the instructional design process and planning technology integration to optimize students' cognitive capacities will contribute to creating effective foreign language learning experiences.

2.3. Related Studies

Recent studies have extensively examined the impact of various technological tools on EFL reading comprehension. Several researchers have focused on the effectiveness of digital reading formats and platforms. For instance, Almadhi and Alanazi (2024) found that e-book integration significantly improved reading comprehension among Saudi EFL learners. Similarly, Kaban (2021) reported that gamified e-reading practices enhanced both reading comprehension and student attitudes among Turkish secondary school students. However, contrasting results were found by Yu et al. (2022), who discovered higher accuracy in paper-based reading compared to mobile phone-based reading among Chinese college students.

In terms of collaborative and interactive approaches for enhancing reading comprehension in EFL contexts, multiple studies have demonstrated positive outcomes. Lo, Wen, and Lin (2021) found that Readers Theater significantly improved reading comprehension among Taiwanese EFL students. In a similar vein, Nasim et al. (2024) reported that web-based Cooperative Integrated Reading Composition (CIRC) technique enhanced various reading comprehension sub-skills. Likewise, AlManafi et al. (2023) demonstrated that blended learning approaches yielded significantly higher reading comprehension outcomes among Libyan primary school students. While these approaches share Natural Reader's goal of improving reading comprehension, they differ significantly in their implementation. Unlike Natural Reader, which provides an individual, technology-mediated audio-visual experience through AI-generated speech, these approaches emphasize human-to-human interaction and collaborative meaning-making. However, they resemble Natural Reader in their multimodal nature, combining different sensory inputs to enhance comprehension. The key distinction is that Natural Reader offers personalized, on-demand audio support that students can control independently, whereas these

collaborative approaches rely on peer interaction and structured group activities to achieve similar comprehension gains.

Several studies have explored innovative technological approaches to EFL reading. Ebadi and Ashrafabadi (2022) found that augmented reality applications significantly improved reading comprehension among Iranian EFL learners. Al Shdaifat and Al-Haq (2021) reported that e-mind mapping enhanced reading comprehension sub-skills among Jordanian students. Additionally, Hazaea and Almekhlafy (2022) discovered that timed reading activities improved both reading rate and comprehension.

Research has also examined cognitive and strategic aspects of reading comprehension. Alenezi (2021) found that Saudi EFL students possessed solid foundations in reading strategies, while Almanea (2021) revealed that left-brained learners outperformed others in reading comprehension tasks. In another study, Sepasdar and Rostampour (2022) demonstrated that syntactic training was more effective than semantic training for improving reading comprehension.

In a similar vein, recent research has also focused on the use of AI technologies in foreign language teaching, revealing significant advantages. For example, Fitria (2021) demonstrated that AI positively impacts the English learning environment by providing personalized learning experiences and supporting language skills development. Similarly, Nugrahawati (2024) found that AI effectively improves reading skills and promotes lifelong learning through personalized learning experiences, adaptive assessment, and feedback.

The effectiveness of AI-assisted tools in EFL reading has been proven in numerous studies. Jose (2024) showed that using Microsoft Teams - Reading Progress tool led to significant improvements in students' pronunciation skills, increased their confidence, and enhanced their vocabulary learning abilities. Al-Othman (2024) found that TTS technology improved students' cognitive abilities such as reading speed, comprehension, vocabulary knowledge, and critical thinking, with 87.5% of students reporting satisfaction with this technology.

Teacher and student perceptions of the use of AI in EFL learning and more specifically in the development of reading comprehension skills are generally positive. In their research, Vera (2023) revealed that teachers have positive perceptions towards using AI and acknowledge these technologies' potential to enhance learning. Daweli and

Mahyoub (2024) showed that students have positive attitudes towards using AI tools, which help improve reading skills and increase motivation.

Systematic reviews also confirm the potential of AI. Kundu and Bej (2024) determined that AI has made significant progress in areas such as adaptive learning systems, assessment, speech recognition, and pronunciation, increasing student engagement and motivation. Jiang (2022) demonstrated that AI has been successfully implemented in various forms in the EFL context, such as automatic assessment systems, machine translation tools, and intelligent teaching systems.

However, researchers also highlight some important challenges of using AI in learning environments. The issue of cognitive load has particularly emerged in AI-related studies in EFL. Kundu and Bej (2024) noted that EFL students experience high cognitive load when using AI tools. Wang (2024) emphasized that AI tools could increase EFL students' cognitive load. Similarly, Fitriani (2024) reported that EFL students face various challenges such as navigation difficulties and weakened critical thinking skills, indicating increased cognitive load in AI-supported learning environments.

Although the reviewed literature covers numerous technological, collaborative, and cognitive approaches to improving EFL reading comprehension, studies explicitly examining AI-supported TTS tools within mainstream, university-level EFL classrooms remain comparatively limited. Much existing research has explored general technological interventions, collaborative methods, or broader AI implementations, yet specific investigations focusing solely on the impact of TTS applications like Natural Reader and Speechify in controlled EFL contexts are less frequent. Given their close methodological alignment and specific relevance to the aims of the present study, the following three recent studies, which directly evaluate TTS tools' effects on reading comprehension and related linguistic skills, merit detailed attention.

Al-Othman (2024) conducted a quasi-experimental study to examine the impact of TTS technology on the cognitive reading abilities and performance of 49 undergraduate EFL students. The intervention lasted for 12 weeks and utilized Natural Reader as the TTS tool. The study employed a one-group pretest-posttest design and systematically scaffolded students' reading processes through a cognitive model. This scaffolding approach likely helped reduce extraneous cognitive load, allowing

students to allocate more cognitive resources to comprehension development. Al-Othman reported that each component of reading—ranging from phonological decoding to higher-order critical thinking—was systematically supported through TTS. This holistic support mechanism enabled students to improve not only their reading comprehension but also their reading speed, vocabulary acquisition, and critical thinking skills. The findings highlight that a well-structured, gradual integration of TTS tools over an extended period can lead to substantial cognitive and linguistic gains in EFL learners. Furthermore, the study reported high student satisfaction rates, with 87.5% of participants expressing positive attitudes toward the use of TTS technology in their reading practice.

Similarly, Amin (2022) explored the effects of combining two TTS-supported techniques—Repeated Reading (RR) and Listening While Reading (LWR)—on the development of EFL learners' reading skills. The study involved 26 undergraduate EFL students and was carried out over a 12-week period using the Speechify TTS application. Employing a one-group pretest-posttest design, Amin's study highlighted that these two techniques were not applied in isolation but were interwoven to provide comprehensive support throughout the reading process. The integration of RR and LWR allowed learners to repeatedly process the same texts both visually and auditorily, which likely strengthened their phonological processing, word recognition, and reading fluency. The study reported significant improvements in both reading fluency and comprehension levels, indicating that the combined use of these TTS-supported strategies could effectively address multiple reading skill areas. Amin's findings emphasize the potential of TTS tools not only as comprehension aids but also as facilitators of repeated and multi-sensory engagement with reading materials, enhancing learners' automaticity and overall reading proficiency.

Fitria et al. (2023) conducted a quasi-experimental study investigating the impact of AI-assisted reading aloud activities on the reading performance of 34 middle school EFL learners. Although the specific TTS tool used was not disclosed, the one-month intervention focused on improving students' reading fluency and pronunciation through AI-supported oral reading tasks. Participants engaged in structured reading sessions designed to strengthen their pronunciation accuracy and oral reading fluency in a junior high school context. The study reported statistically significant improvements in both targeted skill areas, suggesting that AI-assisted reading can be

effective even in short-term interventions and among younger learners. Fitria et al. (2023) emphasized that AI-based oral reading provided learners with immediate exposure to accurate pronunciation models, allowing them to improve their spoken output while simultaneously reinforcing their reading fluency.

These recent studies are particularly relevant to the present research for several reasons. First, all three studies share a common focus on the use of AI-supported TTS technologies to enhance EFL learners' reading skills. Like the current study, they employed quasi-experimental pretest-posttest designs to measure changes in reading performance over time. Second, these studies explored multi-week interventions involving undergraduate or school-aged EFL learners, which aligns with the participant profile and educational setting of the present research. Third, they investigated various TTS-supported strategies, such as Natural Reader, Speechify, or AI-assisted oral reading, making them directly comparable to the use of Natural Reader in this study. While the present research focuses on playback speed optimization and multimodal reading experiences, these studies provide foundational evidence on the general effectiveness of TTS tools for improving reading comprehension, fluency, vocabulary, pronunciation, and critical thinking. Therefore, reviewing these studies helps contextualize the current research and highlights the importance of systematic and well-designed TTS interventions in EFL contexts.

In light of the reviewed studies and identified research gaps, it can be concluded that although recent research has begun exploring AI-supported TTS applications in EFL contexts, significant opportunities and unanswered questions remain in the following areas:

i. Multimodal Learning Approaches: While studies have examined various technological tools, there is limited research specifically investigating how multimodal learning through TTS technology affects mainstream EFL learners' reading comprehension, particularly at the university level.

ii. Cognitive Load Management: Research on how AI TTS tools might help manage cognitive load during reading comprehension tasks for non-remedial EFL learners remains underdeveloped, especially regarding the balance between auditory and visual processing.

iii. Playback Speed Optimization: Few studies have systematically investigated the optimal playback speeds for TTS applications in EFL contexts, despite evidence suggesting that speech rate significantly impacts comprehension outcomes.

iv. MALL Integration: Although MALL has been widely studied, its specific application through TTS tools for reading comprehension deserves further investigation, particularly regarding how mobile TTS applications can be effectively integrated into formal EFL curricula.

v. Long-term Benefits: Most studies focus on short-term outcomes, leaving questions about the sustained benefits of TTS technology on reading comprehension and transfer effects to other language skills.

Based on the reviewed literature and the gaps identified, it appears that AI technologies, particularly TTS applications, offer significant opportunities in foreign language teaching, but require systematic investigation to determine their optimal implementation. The present study aims to address some of these gaps by examining how Natural Reader impacts reading comprehension among B1-level Turkish EFL learners, with particular attention to playback speed optimization and multimodal learning effects. When intelligently combined with traditional methods and provided with necessary infrastructure, AI has the potential to significantly enrich language learning, but empirical evidence is needed to guide these implementations effectively.

3. METHODOLOGY

This chapter presents the methodological framework employed in this study to investigate the impact of AI-supported TTS technology on EFL students' reading comprehension skills. The study adopted an embedded mixed-methods research design (Creswell & Plano Clark, 2017), where qualitative data was embedded within a predominantly quantitative study to provide a supporting role in understanding the research problem. In this design, while quantitative data from pre-test and post-test measurements formed the primary database, qualitative data from focus group interviews was collected and analyzed to explain and elaborate on the quantitative findings.

In line with the aims of this embedded mixed-methods design, the study sought to address the following research questions:

1) Does the use of Natural Reader influence the improvement of B1-level Turkish EFL learners' reading comprehension?

2) Does the playback speed on Natural Reader influence the improvement of B1-level Turkish EFL learners' reading comprehension?

3) What are the perceptions of B1-level Turkish EFL learners regarding the use of Natural Reader in EFL reading, compared to single-mode reading?

3.1. Research Paradigm

This study aims to examine the effects of "Natural Reader," an AI-supported TTS tool, on the reading comprehension skills of university preparatory students learning EFL, as well as to investigate their perspectives on this matter. To achieve these objectives, the study employs an embedded mixed-methods approach, combining quantitative and qualitative research methods to evaluate research problems holistically (Creswell & Plano Clark, 2017; Almeida, 2018).

3.1.1. Quantitative Study

Quantitative research refers to studies that aim to discover facts through external measurements, observations, or experiments to describe phenomena and examine cause-effect relationships. Based on positivism, quantitative research primarily favors objective approaches (Creswell & Creswell, 2017). As a method based on measurement and observation, quantitative research seeks reproducible and objective findings, emphasizing a scientific approach free from value judgments (Johnson & Christensen, 2008). Statistical and mathematical models are used for data analysis in quantitative research. In other words, quantitative research is an effort to explain relationships between variables using mathematical methods, accompanied by statistical and numerical data (Patton, 2005). Quantitative research formulates and tests various hypotheses that require collecting numerical data to explain a phenomenon and transforms numerical data into meaningful interpretations (Johnson & Christensen, 2008). The quantitative research paradigm, which yields objective, unbiased findings free from personal interpretations, facilitates the development of applicable insights for similar contexts (Creswell & Poth, 2018).

In the quantitative portion of the study, a quasi-experimental model with pretest-posttest control group design was employed. Experimental models refer to designs where data is produced under the researcher's control to determine cause-effect relationships (Karasar, 2022). In experimental research, the researcher needs to manipulate variables, maintain control over these changes, observe the effects of manipulations on variables, and randomly assign participants to treatment groups (Büyüköztürk et al., 2021). However, due to the nature of the higher education student placement system, random assignment of participants to experimental and control groups was not possible in this study.

The quasi-experimental model is preferred in situations where the level of control required by true experimental models cannot be achieved or is insufficient (Karasar, 2022). In this type of model, participants are not randomly assigned to groups. Instead, existing groups are matched according to specified variables (Büyüköztürk et al., 2021). In other words, special effort is made to ensure participants have similar characteristics. The determination of which group will serve as the experimental group and which as the control group is made through an unbiased selection (Karasar, 2022). The most important aspect of this model is ensuring that the independent variables,

applications, or methods used in the experimental group are not used in the control group, and this distinction is carefully maintained. In this design, both experimental and control groups receive pre and post-tests; however, only the experimental group undergoes the experimental treatment (Creswell & Creswell, 2017).

3.1.2. Qualitative Study

Qualitative research is defined as a research process where qualitative data are collected through methods such as observation, interviews, and document analysis, examining events and perceptions in their natural environment in a realistic and holistic manner (Yıldırım & Şimşek, 2016). Qualitative methods are frequently preferred by researchers due to their characteristics such as allowing researchers to work in natural settings, obtaining direct data, making comprehensive descriptions, focusing on process, providing detailed descriptions of current situations, seeking answers to "why," "how," and "in what way" questions, reflecting participants' perspectives (thought structures, experiences, perceptions, and feelings as subjective data), evaluating events from a holistic perspective, and allowing flexible research designs (Büyüköztürk et al., 2021).

In the qualitative portion of the study, focus group interviews were conducted with participants. The interview technique is a method of collecting information through verbal communication (Karasar, 2022). In other words, it is a qualitative data collection method where researchers communicate with individuals face-to-face, by phone, or by mail to express their attitudes, views, and feelings and transfer this information in written form. The main purpose of an interview is to reveal the participant's perspective and viewpoint on a specific topic. In this method, it is important to obtain in-depth information by understanding participants' thoughts, feelings, and their world of meaning (Yıldırım & Şimşek, 2016).

The qualitative data obtained from the focus group interviews was analyzed using content analysis approach (Hsieh & Shannon, 2005). Content analysis is a systematic method used for characterizing and comparing qualitative data such as interview transcripts to identify patterns and themes. The main idea of content analysis is to transform many words found in the research text into meaningful content categories. Content analysis generally includes coding data, finding themes, organizing codes and themes, and interpreting findings (Sönmez & Alacapınar, 2018). In this study, content

analysis, which is a type of qualitative analysis, was employed to summarize and interpret the interview data according to predetermined themes (Yıldırım & Şimşek, 2016).

3.2. Participants

3.2.1. Quantitative Study

The sample for the quantitative portion of the study consists of 95 participants who are healthy (with no physical or mental disabilities), native Turkish speakers, learning English as a foreign language, aged 18-25, receiving B1 level English language education, and enrolled in a state university's English preparatory program. Six preparatory classes at the same level were divided into three groups. Two of these groups were assigned as experimental groups, and one as the control group.

Participants were selected using the “convenience sampling method”, which is a type of non-random sampling. In convenience sampling, participants are selected based on their accessibility and availability to the researcher, rather than through random or purposive selection. This method is often preferred when researchers work with pre-existing groups, such as intact classes, due to practical limitations like time, access, or institutional constraints (Büyüköztürk et al., 2021). While convenience sampling does not guarantee representativeness, it allows researchers to collect data quickly and efficiently from readily accessible participants (Yıldırım & Şimşek, 2016). In this study, six intact preparatory classes that were already accessible to the researcher were selected as the sample.

The "simple random sampling method" was used in assigning groups as experimental and control groups. Simple random sampling refers to the completely random selection of the sample group from the population. In this method, each unit in the population has an equal chance of being included in the sample. In other words, the probability of each individual or item being selected for the research sample is the same. This equality ensures that the sample is representative of the population to obtain more accurate and unbiased results (Yıldırım & Şimşek, 2016; Büyüköztürk et al., 2021; Karasar, 2022). Accordingly, control and experimental groups were determined by drawing lots.

In experimental research, potential influencing factors other than the independent variable need to be controlled to indicate that the manipulation of the independent variable affects the dependent variable (Polit & Hungler, 1997). In this context, efforts were made to ensure that control and experimental groups had similar characteristics. Information about the study group of the quantitative portion of the research is presented in Table 1.

Table 1. Participants of the Quantitative Study

Variable		Control (n = 33)		Experiment-1 (n = 30)		Experiment-2 (n = 32)		Total (N = 95)	
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Gender	Female	17	51.5	18	60.0	13	40.6	48	50.5
	Male	16	48.5	12	40.0	19	59.4	47	49.5
Reading Preference	Paper	13	39.4	19	63.3	13	40.6	45	47.4
	Screen	0	0.0	0	0.0	2	6.3	2	2.1
	Both	20	60.6	11	36.7	17	53.1	48	50.5
Variable		**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Age		19.58	.66	19.77	.73	19.56	.72	19.63	.70
Daily Online Time (Hours)		4.50	1.48	4.53	1.27	6.16	2.91	5.07	2.16
Pretest (IELTS)		12.06	5.15	15.70	7.24	14.88	6.39	14.16	6.41

As shown in Table 1, a total of 95 participants were included in the quantitative portion of the study. Participants were divided into three groups: control group (n = 33), experimental-1 group (n = 30), and experimental-2 group (n = 32). To verify the homogeneity of the groups before the experiment, chi-square tests were conducted for categorical variables (gender and reading preference), while one-way ANOVA tests were performed for continuous variables (age, daily online time, and pretest scores) using SPSS v26 software. These statistical analyses helped establish that there were no significant differences between the groups in terms of these demographic and baseline characteristics. When examining the distribution according to participants' demographic characteristics:

- Gender Distribution: 50.5% (n = 48) of participants are female, and 49.5% (n = 47) are male. There is no statistically significant difference between groups in terms of gender distribution ($\chi^2(2) = 2.345$, $p = .310$).
- Reading Preferences: 47.4% (n = 45) of participants prefer reading on paper, while 2.1% (n = 2) prefer reading on screen. 50.5% (n = 48) use both formats.

There is no statistically significant difference between groups in terms of reading preferences (Fisher's Exact Test = 6.678, p = .093).

- Age: The mean age of participants was calculated as 19.63 (SD = 0.70). There is no statistically significant difference between groups in terms of age (F = 0.815, p = .446).
- Daily Online Time: Participants' average daily online time is 5.07 hours (SD = 2.16). There is no statistically significant difference between groups in terms of daily online time (F = 3.605, p = .061).
- Pre-test Results: The mean IELTS pre-test score for all participants was calculated as 14.16 (SD = 6.41). There is no statistically significant difference between groups in terms of IELTS pre-test scores (F = 2.951, p = .057).

These findings indicate that the experimental and control groups have similar characteristics in terms of demographic characteristics, reading preferences, daily online time, and pre-test scores. The similarity between groups suggests that the quantitative findings of the research cannot be attributed to an effect arising from group characteristics.

3.2.2. Qualitative Study

A total of 18 participants, six from each group, participated in the qualitative portion of the study. Participants for the qualitative study were selected using the purposive sampling method. Purposive sampling is a non-probability sampling technique where researchers deliberately select participants based on specific characteristics relevant to the research questions (Creswell & Poth, 2018). This method is particularly useful when researchers need to identify and select information-rich cases related to the phenomenon of interest (Patton, 2005). In educational research, purposive sampling allows researchers to gain deeper insights by selecting participants who can provide diverse perspectives on the research topic (Cohen et al., 2002).

For this study, participants were purposively selected based on several criteria to ensure maximum variation in the sample:

- Performance change: Participants were selected to represent various patterns of change between pre-test and post-test scores, including those who showed

significant improvement, moderate improvement, no change, and decline in performance.

- Gender balance: A relatively equal distribution of male and female participants was ensured (10 females and 8 males) to capture potentially different perspectives based on gender.
- Reading preferences: Participants with different reading medium preferences were included, with representation from those who prefer paper-based reading and those who prefer both paper and screen reading.
- Daily online time: Participants with varying amounts of daily online engagement were selected, ranging from minimal (2 hours) to extensive (12 hours) daily usage.

This purposive selection strategy aimed to capture a wide range of experiences and perspectives regarding the use of Natural Reader and traditional reading methods, thereby enhancing the richness and credibility of the qualitative data. The demographic characteristics of the participants are presented in Table 2.

Table 2. Participants of the Qualitative Study

Nu.	Code	Group	Gender	Age	Reading Preference	Online Time	Performance Change (Pretest-Posttest)*
1	C2	Control	Female	19	Both	4.5	+
2	C7	Control	Female	20	Both	5	+
3	C12	Control	Male	19	Both	2.5	-
4	C16	Control	Male	21	Both	3.5	+
5	C21	Control	Male	19	Paper	5	+
6	C29	Control	Female	20	Paper	2	-
7	EA1	Experimental 1	Male	21	Both	5	+
8	EA3	Experimental 1	Female	20	Paper	5	-
9	EA11	Experimental 1	Female	19	Paper	4	-
10	EA18	Experimental 1	Male	19	Both	4	-
11	EA21	Experimental 1	Female	20	Both	4	-
12	EA27	Experimental 1	Female	19	Paper	2.5	-
13	EB5	Experimental 2	Female	19	Both	4.5	+
14	EB8	Experimental 2	Male	19	Both	12	+
15	EB10	Experimental 2	Male	19	Both	6	No change
16	EB11	Experimental 2	Female	19	Paper	7.5	+
17	EB17	Experimental 2	Male	19	Both	2	-
18	EB29	Experimental 2	Female	20	Both	8	+

* In the Performance Change column, "+" indicates an increase in IELTS scores from pre-test to post-test, while "-" indicates a decrease in scores.

As can be seen in Tablo 2, participants' ages range from 19 to 21, with the majority (n = 14) being between 19-20 years old. In terms of gender distribution, 10 female and 8 male participants were included in the study. Regarding reading preferences, the majority of participants (n = 12) prefer reading both on paper and screen, while others (n = 6) prefer reading on paper. Daily online time ranges from 2 to 12 hours. Participants' IELTS pre-test scores range from 9 to 29, and post-test scores range from 9 to 24.

3.3. Data Collection Instruments

Both quantitative and qualitative data collection instruments were used in this research. In accordance with the embedded mixed-method design of the study, quantitative data was collected through pre-test-post-test applications while qualitative data was gathered through focus group interviews.

The data collection instruments used in the study were administered to participants face-to-face. IELTS General Training Reading Tests taken from IELTS Practice Test Plus 3 (Matthews & Salisbury, 2011), Focus Group Interview Questions, and a Demographic Information Form were used during the data collection process. While the demographic form was used to gather background information about the participants, it was not included in the data analysis. Detailed information about the IELTS tests and focus group interview questions is presented in the following subsections. As part of the intervention process, four reading texts, one per week, were used for the treatment phase. These texts were followed by multiple-choice tests which were administered solely to ensure that participants had read the texts. While the reading texts served as intervention materials, the multiple-choice tests were not included in the research analyses. Detailed information about this implementation is presented under the "3.4. Data Collection Procedure" section.

3.3.1. Quantitative Data Collection Tool: IELTS General Training Reading Tests

IELTS General Reading tests were used to measure participants' English reading skills. The tests were taken from IELTS Practice Test Plus 3 (Matthews & Salisbury, 2011). Two equivalent tests were administered during the experimental process:

Pre-Test: IELTS General Reading Test 1 was administered to determine participants' English reading skill levels before the experiment. The test consists of three sections and contains a total of 40 questions. Participants were given 60 minutes to complete the test. The test includes texts related to daily life, work life, and general interest areas.

Post-Test: IELTS General Reading Test 2 was administered to measure the development in participants' English reading skills after the experiment. Similar to the pre-test, participants were given 60 minutes for this test, which also consists of three sections and 40 questions.

Both tests were in the official IELTS exam format and included different question types such as multiple-choice questions, matching questions, true/false/not given questions, and short-answer questions. An overview of the IELTS General Training Reading Tests applied in the study is presented in Table 3.

Table 3. An Overview of the IELTS General Training Reading Tests

	No. of items	Text Types	Question Types	Target Reading Skills
Section 1 Social Survival	13–14	Informational texts related to everyday situations	• multiple choice • short answer questions • notes / table / form / flow chart / sentence / summary completion • diagram labelling • classification • paragraph headings • matching statements to texts/sections • locating information in paragraphs	• skimming and scanning • understanding main ideas • reading for detail • understanding opinion and attitude
Section 2 Course Related	13–14	Texts from an educational or training context but related to the survival needs of students		
Section 3 General Reading	13–14	One descriptive or narrative text on a topic of general interest		
	Total 40	Total of 2000-2750 words	Up to 4 question types per part	

Source: Matthews & Salisbury (2011)

3.3.2. Qualitative Data Collection Tool: Focus Group Interview Questions

A focus group interview procedure was employed to collect data for the qualitative dimension of the research. The interviews were conducted face-to-face in Turkish, as it was determined that participants would be able to express their thoughts and experiences more comprehensively and accurately in their native language. Each focus group session lasted approximately 45-60 minutes. The interview questions—prepared

separately for the control and experimental groups—covered the following main topics:

- Effectiveness of the implemented reading activities
- Sub-skills of foreign language reading ability and their development
- Strengths and weaknesses of reading activities
- Effects on reading motivation and comprehension level
- Contribution to other language skills
- Comparison of single-modal (traditional text-only) versus multimodal (text with audio) reading experiences
- Future use intentions
- Suggestions for improving the research

The focus group sessions were conducted separately for each of the three groups (control, experimental-1, and experimental-2). In each session, six participants were purposively selected, making a total of 18 participants for the qualitative phase. The interview included eight questions for the control group and ten questions for the experimental groups, as presented in Appendix-7. The experimental-group version of the form also included questions on participants' experiences with, and opinions about, using Natural Reader.

While the primary focus of the qualitative phase was to explore participants' perceptions of the use of Natural Reader, the control group was also included in the qualitative data collection process. The inclusion of their perspectives aimed to capture insights into their experiences with single-mode reading activities implemented during the four-week intervention. These insights provided a valuable contextual reference that helped deepen the understanding of the experimental groups' experiences with Natural Reader.

All focus group sessions were audio-recorded with the consent of the participants.

3.4. Data Collection Procedure

To ensure ethical compliance, ethical approval (Appendix-1) was obtained from the Ethics Committee of Yildiz Technical University (Project ID 006105). In addition,

institutional permission was obtained from Marmara University School of Foreign Languages to conduct the study (Appendix-2). All participants were informed about the research process and signed informed consent forms. Throughout the study, ethical guidelines were strictly followed to protect participant privacy and ensure confidential handling of all collected data.

The data collection process was conducted on three groups (control group, experimental group-1, and experimental group-2). Each group consisted of two classes, and the study was carried out with the support of six instructors, one for each class. To ensure smooth implementation of the process, detailed instructions were provided to the instructors before the research, and they were briefed about the process. These instructions are presented in Appendix-3.

Prior to main study, a pilot study was conducted with four volunteer students from the same academic term and proficiency level who were not included in the main study. The pilot study confirmed the appropriateness of text length, topic variety, and difficulty level. It helped determine the optimal reading duration of 6 minutes for the control group, as participants completed readings between 4-7 minutes. For Experimental Group-2, the x0.81 playback speed was deemed most suitable, as slower speeds were reported to be distracting and unnatural. While British English accent was predetermined due to the institution's coursebook choice, the pilot study was crucial in selecting "Sonia" as the most natural and engaging voice among available British-accented AI speakers. Participants in the pilot study were also able to complete the comprehension tests without referring back to the texts.

The data collection process lasted for six weeks in total. The stages of the process were implemented as follows:

First Week (Pre-Test): In the first week, participants completed a demographic information form (Appendix-4) to provide background data about their language learning and reading profiles. This form collected detailed information on participants' backgrounds, such as their age, gender, native language, and reading habits in both Turkish and English. It included questions about their reading preferences (on paper, on screen, or both), the frequency and type of materials they read (e.g., books, articles, news, social media posts), and their general technology usage patterns. Participants were also asked about their daily online time, primary purposes for using technology (such as education or entertainment), and the devices they commonly used for reading.

Additionally, the form gathered information on participants' prior familiarity with assistive technologies, particularly Natural Reader, including whether they had heard of it before, their previous usage experiences, and their opinions about such tools. This information was collected to describe the participant profile and provide contextual background for interpreting the study's findings; however, it was not included in the data analysis.

In the same week, IELTS General Reading Test 1 was administered to all groups as a pre-test. At this stage, participants in the experimental groups were also enrolled in Natural Reader classes.

Second-Fifth Weeks (Implementation Process): Reading activities were conducted using one text per week (Text 1, Text 2, Text 3, and Text 4) over four weeks. The texts were taken from Objective IELTS Intermediate Self-study Student's Book by Cambridge University Press (Sharp & Black, 2007). These texts were carefully selected considering multiple criteria: they were at B1 (intermediate) level to match participants' proficiency, had similar lengths (ranging from 493 to 533 words), and covered diverse topics (languages, time, in-store TVs, plastic bags) to ensure engagement from all participants. To maintain consistency in presentation, all texts were formatted as single-page documents using 11-point font size, eliminating the need for scrolling and preventing disruption in reading flow.

The groups read the texts as follows:

i. The Control Group read the texts in PDF format on their phone screens. They were given 6 minutes for reading, and their phones were set to airplane mode to prevent notification distractions.

ii. Experimental Group-1 read while listening at normal speed (x1) through Natural Reader, with text playback at 180 words per minute. The duration was 3 minutes 40 seconds. Participants used personal headphones, and no pausing or rewinding was allowed. Their phones were kept in airplane mode during the reading sessions.

iii. Experimental Group-2 read while listening at reduced speed (x0.81) through Natural Reader, with text playback at 145 words per minute. The duration was 4 minutes 30 seconds. As with the first experimental group, participants used

personal headphones, were not allowed to pause or rewind, and kept their phones in airplane mode throughout the reading sessions.

Natural Reader (NaturalSoft, n.d., https://www.naturalreaders.com), used in the experimental groups, is an online TTS application that not only converts text to speech but also highlights the sentences being read in real-time. This specific tool was selected as the intervention instrument for several key reasons aligned with the research objectives. First, Natural Reader offers human-like premium voices for up to 20,000 characters (approximately 20 minutes) daily in its free version, providing high-quality audio without financial barriers. Second, its user-friendly interface requires only email registration, ensuring accessibility for all participants. Third, the application allows for precise adjustment of reading speeds between 50-900 words per minute, which was essential for the experimental manipulation of playback speeds in this study. Fourth, the real-time text highlighting feature supports multimodal learning by synchronizing visual and auditory inputs. Additionally, Natural Reader's web-based functionality eliminated the need for software installation, while its educational features allowed the researcher to create classes and enroll up to 100 students, facilitating controlled distribution of reading materials.

The decision to have all groups read from phone screens, rather than paper, was made to control variables, as paper-based reading might allow different reading strategies (such as underlining) and could create cognitive and psychological differences in the reading experience. To ensure controlled implementation, texts were uploaded to Natural Reader immediately before each reading session to prevent advance access. The experimental groups were not allowed to pause or rewind the audio to maintain uniformity in the reading experience and ensure all participants started and finished simultaneously. A sample screenshot of the Natural Reader application interface is presented in Appendix-5.

After reading each text, participants were given five multiple-choice questions. These questions were specifically designed to assess the same reading sub-skills each week, which were selected from IELTS General Training Test reading sub-skills to maintain consistency with the study's main assessment tool. The sub-skills tested were:

i. Identifying the primary focus

ii. Identifying the viewpoint

iii. Comprehending explicit information

iv. Making inferences

v. Drawing conclusions

All questions were reviewed and revised by the researcher to ensure consistency in difficulty level and skill assessment. To enhance reliability, another experienced teacher independently reviewed the questions, providing feedback for further refinement. The relatively short length of these weekly tests (five questions) was deliberately chosen to make the implementation process more practical while still effectively serving its purpose. During the test:

- Participants were not allowed to refer back to the texts
- 7 minutes were allocated for answering questions
- Tests were distributed as printed copies immediately after the reading activity
- Answer sheets were collected after completion
- Answers were later reviewed with the teacher in class

These tests presented in Appendix-6, were not used in the research analyses but were administered only to ensure that participants had read/listened to the texts.

Sixth Week (Post-Test): In the final week, IELTS General Reading Test 2 was administered to all groups. Additionally, focus group interviews were conducted with selected participants from each group as part of the qualitative dimension of the research.

A summary of the data collection process is presented in Table 4.

Table 4. Data Collection Procedure

	CONTROL		EXPERIMENTAL 1		EXPERIMENTAL 2	
	TOOL	**TEXT**	**TOOL**	**TEXT**	**TOOL**	**TEXT**
PRE	Demographic Form		Demographic Form		Demographic Form	
	IELTS General Reading Test 1		IELTS General Reading Test 1		ELTS General Reading Test 1	
TREATMENT	PDF	Text 1 + MC Questions	Natural Reader x1	Text 1 + MC Questions	Natural Reader x0.81	Text 1 + MC Questions
	PDF	Text 2 + MC Questions	Natural Reader x1	Text 2 + MC Questions	Natural Reader x0.81	Text 2 + MC Questions
	PDF	Text 3 + MC Questions	Natural Reader x1	Text 3 + MC Questions	Natural Reader x0.81	Text 3 + MC Questions
	PDF	Text 4 + MC Questions	Natural Reader x1	Text 4 + MC Questions	Natural Reader x0.81	Text 4 + MC Questions
POST	IELTS General Reading Test 2		IELTS General Reading Test 2		IELTS General Reading Test 2	
	Focus Group Interview		Focus Group Interview		Focus Group Interview	

3.5. Data Analysis

3.5.1. Quantitative Study

SPSS v26 software was used for the analysis of the quantitative section of the research. In this section, ANCOVA analysis was employed to examine the effect of "Natural Reader", an AI-supported text-reading tool, and "playback speed" on the reading comprehension skills of university preparatory students learning EFL.

In experimental research, the dependent variable can be influenced by different factors, and these factors may produce varying results across different groups. Therefore, inter-group analyses based solely on observational results may not accurately reflect the effects of the experiment. When such a problem is encountered, the solution is to include other variables that appear to be related to the dependent variable in the analysis. ANCOVA analysis, also known as Covariance Analysis, combines variance and regression analyses to reveal the actual effect of the experiment on the dependent variable by addressing such situations (Büyüköztürk, 1998).

ANCOVA analysis allows for the statistical control of the effects of other variables, termed "covariates," that are associated with the dependent variable, in addition to the independent variable being studied. This analysis is particularly used in pre-test-post-test control group studies to determine whether post-test values show significant differences between experimental and control groups when pre-test values are

controlled. In this context, the experimental treatment represents the independent variable, post-test values represent the dependent variable, and pre-test values serve as the covariate (Büyüköztürk, 1998).

Consequently, the purpose of using ANCOVA analysis in this study is to examine the effect of the independent variable ("Natural Reader" usage in the first research question and the playback speed in the second research question) on the dependent variable (post-test results) by eliminating the effects of the covariate (pre-test results). For the first quantitative research question, the control group was coded as 0 while both experimental groups were coded as 1 in the analysis. For the second quantitative research question, the normal speed experimental group was coded as 0, and the x0.81 speed experimental group was coded as 1 in the analysis of the effect of playback speed on reading comprehension.

3.5.2. Qualitative Study

Qualitative data analysis was conducted using content analysis, which is a widely recognized method for systematically identifying, analyzing, and reporting patterns within data (Braun & Clarke, 2006). This approach was chosen for its flexibility and ability to provide rich, detailed insights into participants' experiences and perspectives (Patton, 2005). For this study, a descriptive content analysis with interview questions as pre-determined categories was employed (Hsieh & Shannon, 2005). This deductive approach uses existing categories derived from prior research or theory—in this case, the interview questions themselves—to guide the coding process (Mayring, 2000). This method analyzed participant responses within the framework established by each interview question, creating a structured approach to data organization and interpretation.

The analysis process followed a systematic framework consisting of four main stages as outlined by Yıldırım and Şimşek (2016):

i. Coding of data: Raw data was carefully reviewed, and meaningful segments were labeled with initial codes

ii. Identification of codes and themes: Related codes were grouped together to form broader themes

iii. Organization of codes and themes: A hierarchical structure was developed to show relationships between themes

iv. Definition and interpretation of findings: Themes were defined and interpreted with supporting evidence

Each interview question served as a pre-determined category under which relevant responses were organized and analyzed. This approach maintained the contextual integrity of participant responses while allowing for systematic comparison across groups. Rather than pooling all verbal data into a single corpus for analysis, responses were analyzed separately for each question, preserving the specific context in which statements were made and enabling more precise interpretation of meaning.

For presenting the findings, frequency and percentage values were calculated for each code to demonstrate the prevalence of different themes, while maintaining the rich, qualitative nature of the data through carefully selected direct quotations. Throughout the entire process, participant confidentiality was strictly maintained through the use of pseudonyms, adhering to ethical research principles.

For the presentation of findings, a coding system was employed to maintain participant confidentiality while indicating group membership. In direct quotations and result tables, "C" represents participants from the Control group (reading-only), "EA" represents participants from Experimental Group-1 (Natural Reader with normal speed), and "EB" represents participants from Experimental Group-2 (Natural Reader with x0.81 speed). Each code is followed by a number representing the individual participant within that group (e.g., C1, EA3, EB5). This coding system allows for clear identification of participants' group membership while maintaining anonymity throughout the presentation of qualitative findings.

4. RESULTS

This chapter presents the results of the study organized in two main sections. The quantitative results section reports statistical analyses regarding the impact of Natural Reader on EFL students' reading comprehension and the influence of different playback speeds. The qualitative results section presents the findings of the content analysis of focus group interviews exploring participants' perspectives on the effectiveness of reading activities, development methods, and their experiences with the Natural Reader application. Together, these results provide insights into how AI TTS technology affects reading comprehension among B1 level Turkish EFL learners.

4.1. Quantitative Findings

4.1.1. The Influence of Natural Reader on EFL Student's Reading Comprehension

The first quantitative research question addressed was "Does the use of Natural Reader influence the improvement of B1 level Turkish EFL learners' reading comprehension?" To answer this question, ANCOVA analysis was conducted to examine the effect of Natural Reader application on EFL students' reading comprehension.

Before conducting ANCOVA analysis, certain assumptions needed to be met. One of these assumptions is that the dependent variable (post-test) should have a normal distribution. To examine this, the skewness and kurtosis coefficients of the dependent variable were analyzed. The analysis revealed that the IELTS post-test variable had a skewness value of 1.019 and a kurtosis value of 1.652. Skewness and kurtosis values within the ±3 range indicate that the data follows a normal distribution (Kline, 2008). As the results fell within this range, the normality assumption was considered met.

Another assumption for ANCOVA analysis requires a linear relationship between the dependent variable (post-test) and the covariate (pre-test), with a correlation coefficient higher than 0.30. Additionally, there should not be a significant relationship

between the dependent variable (post-test) and the independent variable (Natural Reader usage). The results of the Pearson correlation analysis conducted to examine the linearity assumption are presented in Table 5.

Table 5. Pearson Correlation Analysis Results (Natural Reader)

Variable	IELTS (Post-Test)	IELTS (Pre-Test)	Natural Reader
IELTS (Post-Test)	1		
IELTS (Pre-Test)	.616**	1	
Natural Reader	.113	.184	1

**p < .01

Examining Table 5, there is a positive and significant relationship between the dependent variable (post-test) and the covariate (pre-test), with a correlation coefficient higher than 0.30 ($r = .616$, $p < .01$). Conversely, no significant relationship was found between the dependent variable (post-test) and the independent variable (Natural Reader usage) ($p > .05$). Based on these results, the linearity assumption was met for full sample data.

Another assumption required for ANCOVA analysis is homogeneity of regression, which indicates that the effect of independent variables on the dependent variable is constant across different groups. In other words, this assumption predicts that a change in the values of the independent variable should have a similar effect on the dependent variable across all groups. This means that regression slopes across different groups should be equal. For the homogeneity of regression assumption to be met, the slopes of the regression lines between groups should not show statistically significant differences. This is typically tested by including an interaction term (group * pretest) in the ANCOVA model. If the interaction term in the model is not significant ($p > .05$), this indicates no significant difference between regression slopes and thus the homogeneity of regression assumption is met. The analysis showed no statistically significant difference between the slopes of regression lines across groups ($F = 1.078$, $p > .05$), confirming that the homogeneity of regression assumption was met.

Finally, the assumption of homogeneity of variances needed to be met for ANCOVA analysis. This assumption states that the variances of different groups on the dependent variable should be equal. This means that the rates of variability shown by different

groups on the dependent variable should be similar. Homogeneity of variances is tested using statistical tests like Levene's Test. If the resulting p-value is greater than the significance level (p>0.05), it indicates no statistically significant difference in variances between groups. The analysis showed that the error variance of the dependent variable was equal across groups (F = 0.967, p > .05), confirming that the homogeneity of variances assumption was met.

After confirming all these assumptions were met, ANCOVA analysis was conducted to evaluate the effect of Natural Reader usage on EFL students' reading comprehension levels. The analysis results are presented in Table 6.

Table 6. ANCOVA Analysis Results (Natural Reader)

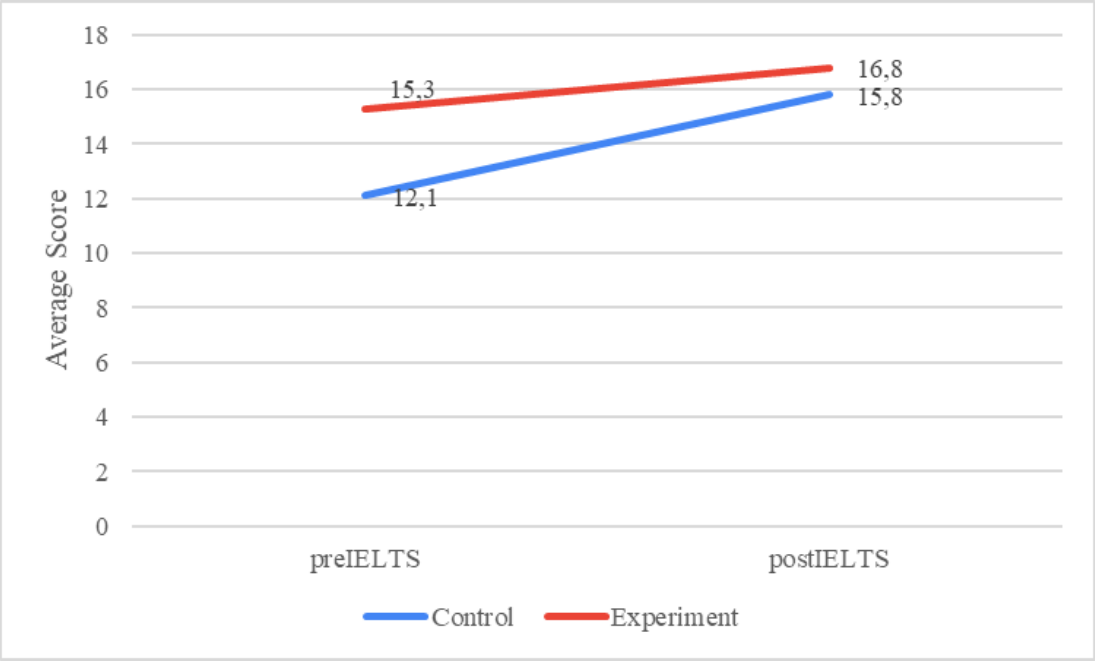
Source of Variance	Sum of Squares	df	Mean Suare	F	p
Corrected Model	1542,261	2	771,130	28,798	,000
Intercept	894,580	1	894,580	33,409	,000
Pre-Test (IELTS)	1521,825	1	1521,825	56,834	,000
Group (Natural Reader)	24,701	1	24,701	,922	**,339**
Error	2463,466	92	26,777		
Total	29820,000	95			
Corrected Total	4005,726	94			

Examining Table 6, when controlling for participants' IELTS pre-test scores, no significant difference was found in IELTS post-test scores between experimental and control groups (p > .05). The analysis results showed that when controlling for IELTS pre-test scores at 14.160, the adjusted mean IELTS post-test score was 16.101 in the experimental group and 17.204 in the control group. In other words, the adjusted IELTS post-test scores were found to be similar in both experimental and control groups. Based on these findings, it was concluded that the use of Natural Reader had no significant effect on EFL students' reading comprehension levels.

To visualize the changes in reading comprehension scores between groups, the pre-test and post-test results are presented in Figure 1. The graph illustrates that both control and experimental groups showed improvement from pre-test to post-test. While the experimental group started with a higher initial score (preIELTS = 15.3) compared to the control group (preIELTS = 12.1), the control group demonstrated a more substantial improvement, with an increase of 3.7 points (from 12.1 to 15.8). In

contrast, the experimental group showed a relatively modest improvement of 1.5 points (from 15.3 to 16.8). This visual representation further supports the ANCOVA results, suggesting that Natural Reader did not provide a significant advantage in improving reading comprehension scores, as the control group actually showed greater improvement despite not using the tool.

Figure 1. Pre-test and Post-test IELTS Scores for Control and Experimental Groups



4.1.2. The Influence of Natural Reader's Playback Speed on EFL Student's Reading Comprehension

The second quantitative research question addressed was "Does the playback speed on Natural Reader influence B1 level Turkish EFL learners' reading comprehension?" Accordingly, an ANCOVA analysis was conducted to examine the effect of playback speed on EFL students' reading comprehension.

Before conducting the ANCOVA analysis, certain assumptions must be verified. One of these assumptions is that the dependent variable (post-test) should have a normal distribution. To examine whether the dependent variable shows normal distribution, the skewness and kurtosis coefficients of this variable were analyzed. The analysis revealed that the IELTS post-test variable had a skewness value of 0.473 and a kurtosis

value of 0.324. Skewness and kurtosis values within the ±3 range indicate that the data follows a normal distribution (Kline, 2008). Since the results obtained in the analysis fell within this range, it was concluded that the normality assumption was met.

According to another assumption for ANCOVA analysis, there should be a linear relationship between the dependent variable (post-test) and the covariate (pre-test), and the correlation coefficient for this relationship should be higher than 0.30. Additionally, there should not be a significant relationship between the dependent variable (post-test) and the independent variable (x0.81 Playback Speed). The results of the Pearson correlation analysis conducted to examine the linearity assumption are presented in Table 7.

Table 7. Pearson Correlation Analysis Results (x0.81 Playback Speed)

Variable	IELTS (Post-Test)	IELTS (Pre-Test)	x0.81 Playback Speed
IELTS (Post-Test)	1		
IELTS (Pre-Test)	.668**	1	
x0.81 Playback Speed	.146	.061	1

**p < .01

Examining Table 7, it can be seen that there is a positive and significant relationship between the dependent variable (post-test) and the covariate (pre-test), with a correlation coefficient higher than 0.30 (r = .668, p < .01). On the other hand, no significant relationship was found between the dependent variable (post-test) and the independent variable (x0.81 Playback Speed) (p > .05). Based on these results, it was concluded that the linearity assumption was met.

Another assumption that needs to be met within the ANCOVA analysis is regression homogeneity. The regression homogeneity assumption indicates that the effect of independent variables on the dependent variable is constant across different groups. In other words, this assumption predicts that the impact of a change in the independent variable's values on the dependent variable should be similar for all groups. This implies that the regression slopes of different groups should have equal slopes. For the regression homogeneity assumption to be accepted, there should not be a statistically significant difference between the slopes of the regression lines across groups. This is typically tested by including an interaction term (group * pretest) in the ANCOVA

model. If the interaction term in the model is not significant ($p > .05$), this indicates there is no significant difference between regression lines and thus the regression homogeneity assumption is met. The analysis conducted in this direction revealed no statistically significant difference between the slopes of regression lines across groups ($F = 0.006$, $p > .05$), and therefore it was concluded that the regression homogeneity assumption was met.

Finally, within the ANCOVA analysis, the homogeneity of variances assumption must be met. This assumption states that the variances of different groups on the dependent variable should be equal. This means that the rates of variability shown by different groups on the dependent variable should be similar to each other. Homogeneity of variances is one of the basic assumptions of many parametric statistical tests, including ANCOVA, and is important for the reliability of group comparisons. Statistical tests such as Levene's Test are typically used to verify if the homogeneity of variances assumption is met. This test evaluates whether the variances of different groups are equal. If the p-value obtained from the test is greater than the determined significance level ($p > 0.05$), it is accepted that there is no statistically significant difference between group variances, and it is concluded that the homogeneity of variances assumption is met. The analysis conducted in this direction showed that the error variance of the dependent variable was equal across groups ($F = 1.369$, $p > .05$). Based on this result, it was concluded that the homogeneity of variances assumption was also met.

After determining that all these assumptions were met, ANCOVA analysis was conducted to evaluate the effect of playback speed (x0.81) on EFL students' reading comprehension levels. The analysis results are presented in Table 8.

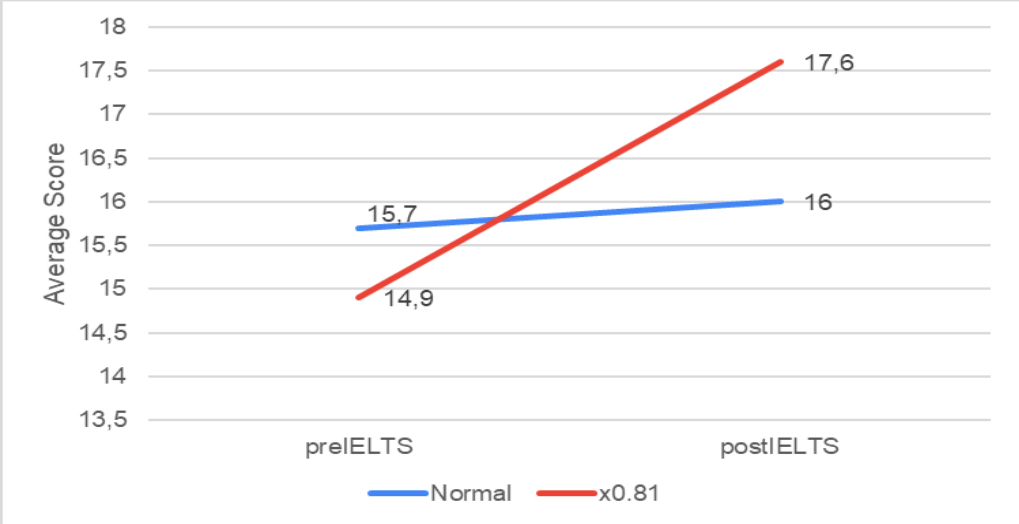
Table 8. ANCOVA Analysis Results (x0.81 Playback Speed)

Source of Variance	Sum of Squares	df	Mean Suare	F	p
Corrected Model	963,568	2	481,784	27,346	,000
Intercept	639,800	1	639,800	36,314	,000
Pre-Test (IELTS)	920,986	1	920,986	52,274	,000
Playback Speed (x0.81)	70,172	1	70,172	3,983	**,051**
Error	1039,480	59	17,618		
Total	19549,000	62			
Corrected Total	2003,048	61			

Examining Table 8, it was determined that when participants' IELTS pre-test scores were controlled, there was no significant difference in IELTS post-test scores between experimental groups ($p > .05$). The analysis results showed that when participants' IELTS pre-test scores were controlled at 15.27, the mean IELTS post-test score was 15.722 in experimental group 1 (normal playback speed) and 17.855 in experimental group 2 (x0.81 playback speed). In other words, it was found that the adjusted IELTS post-test scores according to the IELTS pre-test were similar across experimental groups. Based on these findings, it was concluded that playback speed did not have a significant effect on EFL students' reading comprehension levels.

To demonstrate the changes in reading comprehension scores between groups, the pre-test and post-test results are presented in Figure 2. The graph illustrates that both groups showed improvement from pre-test to post-test. The normal speed group (x1) started with a higher initial score (preIELTS = 15.7) compared to the x0.81 speed group (preIELTS = 14.9). However, the x0.81 speed group demonstrated a more substantial improvement, with an increase of 2.7 points (from 14.9 to 17.6). In contrast, the normal speed group showed a relatively modest improvement of 0.3 points (from 15.7 to 16.0). This visual representation further supports the ANCOVA results, suggesting that the x0.81 playback speed group showed greater improvement in raw scores, however, this difference was not statistically significant when controlling for pre-test scores.

Figure 2. Pre-test and Post-test IELTS Scores for Experimental Groups



4.2. Qualitative Findings

This section presents the analysis findings of the data obtained from focus group interviews with participants.

4.2.1. Findings Related to the Effectiveness of Reading Activities

The "Effectiveness of Reading Activities" theme reflects the effects of the four-week reading studies on participants and their perceptions of these effects. Three codes were identified under this theme: "challenging level", "adaptation/improvement over time", and "increase in reading speed" (Table 9).

Table 9. Findings Related to the Effectiveness of Reading Activities

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Effectiveness of Reading Activities	Challenging level	4	66.7	9	75.0	13	72.2
	Improvement over time	4	66.7	6	50.0	10	55.6
	Increase in reading speed	2	33.3	2	16.7	4	22.2

(i) The "challenging level" code (f=13, 72.2%) indicates that participants found the reading activities' level to be high for their proficiency. Participants expressed the following statements on this matter:

It would've been better if the texts were a bit easier. The vocabulary and grammar made them quite challenging. (C21)

The IELTS readings were slightly above our level. They could've been simpler, but the weekly texts and follow-up questions felt more manageable. (EA21)

(ii) The "adaptation/improvement over time" code (f=10, 55.6%) reveals that although participants struggled initially, they became accustomed to the texts and question structures throughout the process, showing general improvement. Participant views reflecting this situation are as follows:

Over time, I got used to the grammar and vocabulary, and I started to remember sentence structures more easily. (C2)

At first, it was hard doing everything at once—listening, reading, following the highlights. But week by week, I got used to it and improved step-by-step. (EB17)

(iii) The "increase in reading speed" code (f=4, 22.2%) shows that some participants experienced improvement in their reading speed. Participant views on this matter are as follows:

I noticed that I became faster while skimming. I think I gained practice and started reading more quickly over time. (C29)

By the end, I felt like I could read and understand faster. (EB8)

Overall, the majority of participants in both control and experimental groups found the reading activities' level challenging. The perception of challenging level was slightly higher in the experimental group (75.0%) compared to the control group (66.7%). However, it is noteworthy that the rate of adaptation/improvement over time was higher among participants in the control group compared to the experimental group (66.7% versus 50.0%). The increase in reading speed was also reported at a higher rate in the control group (33.3% versus 16.7%). These findings indicate that participants in the control group showed more improvement throughout the process.

4.2.2. Findings Related to Reading Sub-Skills and Methods for Developing Reading Skills

Participants' views on foreign language reading skills and development methods were examined under two themes: "Reading Sub-skills" and "Methods for Developing Reading Skills" (Table 10).

Table 10. Findings Related to Reading Sub-Skills and Methods for Developing Reading Skills

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Reading Sub-skills	Vocabulary knowledge	3	50.0	7	58.3	10	55.6
	Grammar	2	33.3	6	50.0	8	44.4
	Contextual inference	1	16.7	3	25.0	4	22.2
Methods for Developing Reading Skills	Extensive reading	3	50.0	8	66.7	11	61.1
	Target language exposure	2	33.3	5	41.7	7	38.9

The "Reading Sub-skills" theme reflects participants' views on which sub-skills constitute foreign language reading ability. Three codes were identified under this theme: "vocabulary knowledge", "grammar", and "contextual inference".

(i) The "vocabulary knowledge" code (f=10, 55.6%) indicates that participants consider vocabulary knowledge as an important sub-skill in foreign language reading. Participants expressed the following statements:

I think vocabulary is the most important sub-skill. If you don't know the words, it's really hard to understand the text. Also having more vocabulary, knowledge helps us read faster. (EA15)

(ii) The "grammar" code (f=8, 44.4%) reveals that participants believe knowing grammatical structures is important in reading skills. Participant views reflecting this situation are:

Grammar is definitely a part of it. If we don't know the grammar, it's harder to understand what the sentence means. (EA11)

(iii) The "contextual inference" code (f=4, 22.2%) shows that some participants consider the ability to infer the meaning of unknown words from context as an important sub-skill. Participant views on this matter are:

Vocabulary matters, but we also need to guess meanings from the context when we don't know a word. (EA3)

Under the "Methods for Developing Reading Skills" theme, two codes were identified: "extensive reading" and "target language exposure".

(i) The "extensive reading" code (f=11, 61.1%) indicates that participants believe regular reading is necessary to improve reading skills. Views on this matter include:

Reading English books helps a lot. Watching movies with subtitles is helpful too. (C21)

I think we need to keep reading. The more we read, the better we get. I read English storybooks and they really help. (EA5)

(ii) The "target language exposure" code (f=7, 38.9%) shows that participants believe language skills can develop in natural environments. Participant views reflecting this situation are:

I think you learn better by living in the language's culture. Like when you need to ask something at the store, you need to learn it. (C7)

Watching videos, listening to music, or using social media in English helps. When we are exposed to the language all the time, we learn faster. (EA13)

Overall, participants in both control and experimental groups believe that vocabulary knowledge and grammar are fundamental to foreign language reading skills. For developing these skills, they mostly recommended extensive reading and target language exposure methods. Vocabulary knowledge emerged as the most frequently mentioned sub-skill, while extensive reading was the most commonly suggested method for improving reading skills.

4.2.3. Findings Related to Reading Method Perspectives

Responses to the question about "the effectiveness of single-mode reading and Natural Reader usage in developing reading skills" were analyzed under two themes: "Views on Single-Mode Reading" and "Views on Natural Reader Usage" (Table 11).

Table 11. Findings Related to Reading Method Perspectives

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Views on Single-Mode Reading	Better focus	4	66.7	0	0.0	4	22.2
	Advantage of reading at own pace	3	50.0	0	0.0	3	16.7
Views on Natural Reader Usage	Contribution to pronunciation	0	0.0	6	50.0	6	33.3
	Better focus	0	0.0	2	16.7	2	11.1
	Distracting effect	0	0.0	5	41.7	5	27.8

Under the "Views on Single-Mode Reading" theme, two codes were identified: "better focus" and "advantage of reading at own pace".

(i) The "better focus" code (f=4, 22.2%) indicates that participants believe they can concentrate better with single-mode reading. Participants expressed the following statements:

When I read by myself, I focus better. There are no outside distractions, and I can concentrate more easily. (C21)

In our version, since we read in silence and didn't have to follow any voice, it was easier to stay focused. (C29)

(ii) The "advantage of reading at own pace" code (f=3, 16.7%) shows that participants emphasized the importance of being able to control their reading speed. Participant views reflecting this situation are:

I could underline unknown words, go back, and reread as many times as I wanted. That helped me understand better. (C12)

I had the freedom to go back and read again, or slow down when something was confusing. That really helped. (C2)

Under the "Views on Natural Reader Usage" theme, three codes were identified: "contribution to pronunciation learning", "better focus", and "distracting effect".

(i) The "contribution to pronunciation learning" code (f=6, 33.3%) demonstrates the positive effect of Natural Reader particularly on learning pronunciation. Participants expressed the following statements:

The biggest benefit for me was hearing the pronunciation while reading. It helped me recognize how words are actually said. (EA3)

While listening to Sonya, I learned how words are pronounced and how they're used. That was the most useful part for me. (EB11)

(ii) The "better focus" code (f=2, 11.1%) indicates that participants believed they could concentrate better with reading using Natural Reader. Participants expressed the following statements:

It was easier to stay focused when using the app because I could follow the text while listening. It kept me from drifting away. (EA1)

Listening and seeing the colors at the same time helped me focus more. I usually lose track when I just read from paper, but this way I stayed engaged. (EB5)

(iii) The "distracting effect" code (f=5, 27.8%) reflects the difficulties some participants experienced while using Natural Reader. Participant views on this matter are:

Doing reading and listening at the same time reduced my focus. I kept thinking I had to catch every word, and that made it harder to understand the text. (EA3)

Trying to listen, read, and follow the colors all at once was too much. My mind was split in three directions, so it made reading more difficult for me. (EB10)

Overall, participants in the control group emphasized the advantages of single-mode reading, particularly in terms of focus (66.7%) and reading at their own pace (50.0%). In the experimental group, while Natural Reader's contribution to pronunciation learning (50.0%) stood out as a benefit, its distracting effect (41.7%) was noted as a significant disadvantage. Although some participants considered Natural Reader's color highlighting feature as a factor that increases focus (16.7%), experimental group participants generally expressed that they experienced difficulty concentrating when using Natural Reader compared to single-mode reading.

4.2.4. Findings Related to Beneficial Aspects of Reading Activities

From the responses to the question about "the most beneficial aspects of reading activities and Natural Reader usage," the theme "Beneficial Aspects of Reading Activities" was formed (Table 12). This theme reflects the positive effects of four-week reading activities on participants and their perceptions of these effects.

Table 12. Findings Related to Beneficial Aspects of Reading Activities

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Beneficial Aspects of Reading Activities	Exam preparation	2	33.3	0	0.0	2	11.1
	Vocabulary learning	0	0.0	3	25.0	3	16.7
	Pronunciation learning	0	0.0	6	50.0	6	33.3
	Increased concentration	2	33.3	3	25.0	5	27.8
	Increased reading speed	2	33.3	0	0.0	2	11.1

Under the "Beneficial Aspects of Reading Activities" theme, five codes were identified: "exam preparation contribution," "contribution to vocabulary learning," "contribution to pronunciation learning," "increased concentration," and "increased reading speed."

(i) The "exam preparation contribution" code (f=2, 11.1%) shows that some participants in the control group found the reading studies useful for IELTS exam preparation. Participants expressed the following statements:

It was a good experience. Seeing difficult texts and unfamiliar question types made me feel more prepared for future exams. (C7)

Before this, we had never done a test like IELTS. After doing these weekly readings, I started to understand what to expect in the exam. (C12)

(ii) The "contribution to vocabulary learning" code (f=3, 16.7%) indicates that some participants in the experimental group thought Natural Reader helped with vocabulary learning. Participant views reflecting this situation are:

By reading more and more, I learned new words. After a while, you start seeing the same words in similar topics, and it helps you remember them. (EA21)

While reading, I wrote down unfamiliar words and looked them up later. That's how I learned new vocabulary. (EA3)

(iii) The "contribution to pronunciation learning" code (f=6, 33.3%) shows that participants in the experimental group emphasized Natural Reader's positive effect particularly on pronunciation learning. Participants expressed the following statements:

I learned how words are pronounced by hearing them in the app. That was more useful than just seeing them written. (EA1)

It helped me with pronunciation because I was hearing the correct way to say words while reading. That's something I often don't get when studying by myself. (EB8)

(iv) The "increased concentration" code (f=5, 27.8%) indicates that participants believed they could focus better on texts thanks to the reading studies. Participant views on this matter are:

I think my concentration improved. During the first IELTS, I lost focus toward the end, but by the last one, I was able to stay focused until the end despite the difficulty.. (C2)

Listening to Sonya while the text was highlighted kept my attention on the task. I usually get distracted when I read, but this time I stayed concentrated throughout. (EB5)

(v) The "increased reading speed" code (f=2, 11.1%) shows that some participants in the control group thought their reading speed had improved. Views on this matter include:

In the first sessions I struggled to finish on time, but each week I got better. I learned to read faster even when I didn't understand every word. (C2)

Each week, I got faster at reading. I didn't need to pause as often, so my overall reading speed improved. (C29)

Overall, it appears that the control and experimental groups benefited from the reading studies in different ways. While participants in the control group reported benefits mainly in exam preparation (33.3%), increased concentration (33.3%), and increased reading speed (33.3%), participants in the experimental group expressed benefits particularly in pronunciation learning (50.0%), vocabulary learning (25.0%), and increased concentration (25.0%). This indicates that Natural Reader usage provides advantages especially in terms of pronunciation and vocabulary learning.

4.2.5. Findings Related to Weaknesses of Reading Activities

From the responses to the question about "the weakest aspects of reading activities and Natural Reader usage," the theme "Weaknesses of Reading Activities" was formed (Table 13). This theme reflects the difficulties and negative aspects of the four-week reading activities as perceived by participants.

Table 13. Findings Related to Weaknesses of Reading Activities

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Weaknesses of Reading Activities	Challenging level	2	33.3	0	0.0	2	11.1
	Lack of motivation	4	66.7	0	0.0	4	22.2
	Multitasking difficulty	0	0.0	7	58.3	7	38.9
	Speaker speed	0	0.0	4	33.3	4	22.2

Under the "Weaknesses of Reading Studies" theme, four codes were identified: "challenging level," "lack of motivation," "multitasking difficulty," and "speaker speed."

(i) The "challenging level" code (f=2, 11.1%) indicates that some participants in the control group found the reading activities to be above their level. Participants expressed the following statements:

The IELTS tests we did were above our level. They could've been simpler. The weekly texts were more doable, but still hard overall. (C16)

The reading texts were too difficult for me. (C2)

(ii) The "lack of motivation" code (f=4, 22.2%) shows that participants in the control group experienced motivation problems during the process. Participant views reflecting this situation are:

This activity was above our level, and I couldn't stay motivated. I felt lost, especially when I didn't understand most of the words. (C2)

My motivation didn't really change. I wasn't excited to do the readings each week. (C21)

(iii) The "multitasking difficulty" code (f=7, 38.9%) demonstrates that participants in the experimental group emphasized the difficulty of simultaneously listening and reading. Participants expressed the following statements:

We usually learned reading by working with paper texts. But here, there was a speaker reading in the background while we tried to read at the same time. That was the most challenging part for me — and honestly, the part I didn't like. Doing both listening and reading at once was difficult. (EA11)

It was hard doing so many things at once. I was hearing something, reading something else, and trying to process it all together — it just made reading more difficult. (EB10)

(iv) The "speaker speed" code (f=4, 22.2%) shows that some participants in the experimental group saw the Natural Reader speaker's speed as a problem. Participant views on this matter are:

The speaker was reading too fast, and since we had to follow the text while listening, it made things harder. It wasn't just listening — we were doing both at the same time, and the speed made it difficult to keep up. (EA3)

The speaker was going too fast. While I was still trying to process one sentence, they were already on the next one — and that made it hard to keep up.. (EB11)

Overall, it appears that the control and experimental groups encountered different challenges. While participants in the control group experienced problems mainly with lack of motivation (66.7%) and challenging level (33.3%), participants in the experimental group reported issues particularly with multitasking difficulty (58.3%)

and speaker speed (33.3%). This indicates that Natural Reader usage created new challenges for participants. Especially the necessity to simultaneously listen and read created a significant cognitive load for participants.

4.2.6. Findings Related to the Effect of Reading Activities on Motivation

From the responses to the question about "the effect of reading activities and Natural Reader usage on motivation," the theme "Effect of Reading Activities on Motivation" was formed (Table 14). This theme reflects the effects of the four-week reading activities on participants' reading motivation and their perceptions of these effects.

Table 14. Findings Related to the Effect of Reading Activities on Motivation

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Effect of Reading Activities on Motivation	No increase	4	66.7	2	16.7	6	33.3
	Gradually increasing	1	16.7	4	33.3	5	27.8
	Feature-based	0	0.0	5	41.7	5	27.8
	Future-oriented	0	0.0	3	25.0	3	16.7

Under the "Effect of Reading Activities on Motivation" theme, four codes were identified: "no increase in motivation," "gradually increasing motivation," "feature-based motivation," and "future-oriented motivation."

(i) The "no increase in motivation" code (f=6, 33.3%) indicates that some participants experienced no increase in their motivation during the reading activities. Participants expressed the following statements:

> *My motivation didn't increase, but it didn't decrease either. I just had the same level of motivation throughout the four weeks. (C21)*

> *Honestly, I wasn't very motivated. When I do the reading by myself, I feel more engaged. I didn't feel that way using the app. (EA18)*

(ii) The "gradually increasing motivation" code (f=5, 27.8%) shows that participants' motivation increased throughout the process. Participant views reflecting this situation are:

My motivation increased gradually. After finishing the first one, I hadn't understood anything. But each week, I started to understand more, and by the fourth task, I felt like, 'Okay, I get this now — I can do better. (EB10)

At first, I had no motivation because I didn't understand the vocabulary. But over time, I got used to the grammar and sentence structures, and it became easier to continue. (C2)

(iii) The "feature-based motivation" code (f=5, 27.8%) demonstrates that certain features of Natural Reader motivated participants. Participant views on this matter are:

Even though we didn't use all the features, I saw that the app lets you change things like the highlight color or the speaker's accent. Knowing that it has those options made it feel more engaging — maybe that's what motivated me. (EA27)

The best part was adjusting the speed. Since English isn't our native language, slowing it down helped me follow along better and stay motivated. (EB8)

(iv) The "future-oriented motivation" code (f=3, 16.7%) shows that some participants found Natural Reader motivating in terms of its future benefits. Participants expressed the following statements:

We shouldn't just think about this as a school thing. Since we're studying English, this app will help in the future too — and that makes it motivating. (EA11)

Usually, I don't study unless someone pushes me, but following Sonya's voice motivated me. It gave me more confidence, and now I feel ready to keep improving my English and speak more with my international friends in the future. (EB29)

Overall, it appears that the motivation outcomes differed between the control and experimental groups. While the majority of participants in the control group (66.7%) showed no increase in motivation, participants in the experimental group drew motivation from various sources. In the experimental group, particularly the features of Natural Reader (41.7%) and the sense of progress over time (33.3%) emerged as important sources of motivation. Additionally, future-oriented motivation (25.0%) was identified as a notable factor in the experimental group. These findings indicate that Natural Reader usage positively affected participants' motivation from different aspects.

4.2.7. Findings Related to the Contribution of Reading Activities to Other Language Skills

From the responses to the question about "the effect of reading activities and Natural Reader usage on language skills other than reading," the theme "Contribution of Reading Activities to Other Language Skills" was formed (Table 15). This theme reflects the contribution of the four-week reading activities to participants' development of language skills other than reading and their perceptions of these contributions.

Table 15. Findings Related to the Contribution of Reading Activities to Other Language Skills

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Contribution of Reading Activities to Other Language Skills	No contribution	3	50.0	0	0.0	3	16.7
	Listening	0	0.0	8	66.7	8	44.4
	Pronunciation	0	0.0	6	50.0	6	33.3
	Vocabulary	0	0.0	3	25.0	3	16.7
	Emphasis on insufficient duration	0	0.0	4	33.3	4	22.2

Under the "Contribution of Reading Activities to Other Language Skills" theme, five codes were identified: "no contribution," "contribution to listening skill," "contribution to pronunciation skill," "contribution to vocabulary knowledge," and "emphasis on insufficient duration."

(i) The "no contribution" code (f=3, 16.7%) indicates that some participants thought the reading activities made no contribution to their other language skills. Participants expressed the following statements:

I don't think it improved any of my other language skills. I only gained some experience from it. (C29)

We saw different sentence structures, but we couldn't absorb them. I don't think it helped develop any other skills. (C21)

(ii) The "contribution to listening skill" code (f=8, 44.4%) shows that participants thought Natural Reader usage improved their listening skills. Participant views reflecting this situation are:

Before, I was never sure if I understood what I heard. But reading while listening showed me I could actually follow and understand, so it helped improve my listening. (EB5)

At the beginning, I couldn't keep up with the voice and felt distracted. But in the final task, I felt more comfortable — I could actually understand what I was listening to. (EA3)

(iii) The "contribution to pronunciation skill" code (f=6, 33.3%) demonstrates that Natural Reader improved participants' pronunciation skills. Participant views on this matter are:

As I mentioned earlier, I had already noticed an improvement in how I pronounce words. When asked about other skills, I'd say pronunciation is definitely one of the areas that improved thanks to this activity. (EA11)

I focused on pronunciation while listening, and when I think about other skills, that's what stands out. Natural Reader helped me pronounce words more accurately. (EB8)

(iv) The "contribution to vocabulary knowledge" code (f=3, 16.7%) shows that some participants thought Natural Reader usage improved their vocabulary knowledge. Participants expressed the following statements:

This study supported vocabulary learning too. Even when I didn't know a word, I looked it up afterward, and that helped me remember it better. (EA11)

Thanks to Natural Reader, even if I didn't know the meaning of a word, I could guess it from the sentence. This really helped me improve my vocabulary. (EB17)

(v) The "emphasis on insufficient duration" code (f=4, 22.2%) indicates that some participants thought the four-week period was insufficient for language skills development. Participant views reflecting this situation are:

It could've been more frequent and gone on for more weeks. If we had done more reading tasks, I believe we would've gotten better results. (EB10)

I think the study should have lasted longer. Four weeks wasn't enough — if we had continued, we might have seen clearer improvements in reading and listening skills. (EA18)

Overall, it appears that the control and experimental groups reported different perceptions regarding the contribution of reading activities to other language skills. While half of the participants in the control group (50.0%) reported no contribution to

other language skills, it's important to note that these findings reflect participants' subjective perceptions rather than objective measurements. In contrast, all participants in the experimental groups reported some form of improvement in their language skills. Participants in the experimental groups particularly noted enhancements in listening skills (66.7%) and pronunciation skills (50.0%), with additional improvements in vocabulary knowledge (25.0%). This unanimous reporting of benefits among experimental group participants highlights the multi-skill development potential of Natural Reader. However, some participants in the experimental group (33.3%) emphasized that the four-week period was insufficient for these skills to develop fully, suggesting that a longer implementation period might yield even more substantial improvements across various language skills.

4.2.8. Findings Related to Participants' Suggestions

From the responses to the question about "suggestions for the research," the theme "Suggestions" was formed (Table 16). This theme reflects the participants' suggestions and requests for changes to make the research more effective.

Table 16. Findings Related to Participants' Suggestions

Theme	Codes	Control (n = 6)		Experiment (n = 12)		Total (n = 18)	
		f	%	f	%	f	%
Suggestions	Duration should be extended	2	33.3	9	75.0	11	61.1
	Text level should be adjusted	1	16.7	4	33.3	5	27.8
	Reading medium should be changed	4	66.7	0	0.0	4	22.2
	Speed should be adjustable	0	0.0	4	33.3	4	22.2
	Text content should be interesting	0	0.0	1	8.3	1	5.6

Under the "Suggestions" theme, five codes were identified: "duration should be extended," "text level should be adjusted," "reading medium should be changed," "speed should be adjustable," and "text content should be interesting."

(i) The "duration should be extended" code (f=11, 61.1%) indicates that participants thought the study duration should be increased. Participants expressed the following statements:

If it were up to me, I would extend it to 8 weeks instead of 4. That way we'd have more time to get used to the texts and improve gradually. (C21)

I think the study should have lasted longer. When we only do it once a week, we forget things in between. If we did it more regularly, it would have helped more. (EA18)

(ii) The "text level should be adjusted" code (f=5, 27.8%) shows that participants thought the difficulty level of texts should be adjusted. Participant views reflecting this situation are:

The questions were okay, but the texts were a bit above our level. That's why I think the difficulty should've been slightly reduced. (C21)

I think the texts should've been easier at the beginning. We came across too many things we didn't understand, and that lowered our motivation. (EA3)

(iii) The "reading medium should be changed" code (f=4, 22.2%) demonstrates that participants in the control group preferred reading from paper rather than phones. Participant views on this matter are:

We read the texts from our phone screens, but the questions came on paper. Reading it on the phone was sometimes difficult. Maybe if we had read the texts on paper too... it could have been more efficient. (C29)

With paper, I could underline things and make notes. That helps me remember better. I think I'd understand more that way. (C2)

(iv) The "speed should be adjustable" code (f=4, 22.2%) shows that some participants in the experimental group wanted to be able to adjust Natural Reader's reading speed themselves. Participants expressed the following statements:

Since this was a reading-focused activity, I think the speed could have been a bit slower. If it were just for listening, then the current speed would be fine. (EA3)

It would've been better if we could change the speed. I'd personally prefer to listen more slowly. (EB29)

(v) The "text content should be interesting" code (f=1, 5.6%) indicates that one student thought the text contents should be more interesting. The participant stated:

I think the topics could've been more interesting. If the texts were written like short stories, it would've been easier to focus and understand. I'd have preferred something more story-like. (EB11)

Overall, it appears that participants in both control and experimental groups made various suggestions for improving the research. While the majority of participants in the experimental group (75.0%) thought the duration should be extended, this rate was lower in the control group (33.3%). The most prominent suggestion from the control group was changing the reading medium (66.7%), while adjusting text level (33.3%) and allowing student control of speed (33.3%) were prominent suggestions in the experimental group. These findings indicate that the groups had different needs and expectations.

4.2.9. Findings Specific to Experimental Groups

Under this heading, analysis findings related to two separate questions specifically directed to the experimental groups are presented.

4.2.9.1. Findings Related to the Use of Natural Reader Compared to Single-Mode Reading

From the responses to the question about "comparing Natural Reader with single-mode reading" directed to participants in the experimental groups, the theme "Comparison of Natural Reader and Single-Mode Reading" was formed (Table 17). This theme reflects how participants in the experimental groups compared the two different reading methods from various aspects and their preferences.

Table 17. Findings Related to the Use of Natural Reader Compared to Single-Mode Reading

Theme	Codes	Exp-1 (n = 6)		Exp-2 (n = 6)		Total (n = 12)	
		f	%	f	%	f	%
Comparison of Natural Reader and Single-Mode Reading	Context-dependent preference	3	50.0	2	33.3	5	41.7
	Positive effect on attention and focus	2	33.3	3	50.0	5	41.7
	Multitasking difficulty	3	50.0	2	33.3	5	41.7
	Note-taking limitation	2	33.3	1	16.7	3	25.0
	Contribution to pronunciation	1	16.7	3	50.0	4	33.3

The theme "The Use of Natural Reader Compared to Single-Mode Reading" consists of codes: Context-dependent preference, Positive effect on attention and focus, Multitasking difficulty, Note-taking limitation, and Contribution to pronunciation learning.

(i) The "context-dependent preference" code (f=5, 41.7%) shows that participants' reading method preferences varied according to the reading purpose. Participants expressed the following statements:

My opinion can change depending on the context and environment. If I'm in an exam, I want it to be on paper... I want to solve it on paper, underline it. But if I'm at home or want to do reading in my daily life, I would prefer this application. (EA27)

If I were just reading to understand and later summarize it to someone, I'd choose Natural Reader. But if I had to answer detailed questions afterward, I'd prefer single-mode reading. (EB29)

(ii) The "positive effect on attention and focus" code (f=5, 41.7%) reflects views on Natural Reader's effects on attention and focus. Participant views reflecting this situation are:

When I normally read, I get distracted easily. But following the voice helped me concentrate. It felt like I had to keep up, so I paid more attention than usual. (EB8)

Because I was both hearing and seeing the words, it was easier to stay focused on the text. I didn't feel like I was drifting off like I sometimes do when reading silently. (EA1)

(iii) The "multitasking difficulty" code (f=5, 41.7%) shows that some participants emphasized the difficulty of simultaneously reading and listening. Participants expressed the following statements:

I couldn't fully concentrate because I was doing two things at once. On my own, I can stop and reread, but with the audio, I felt rushed and distracted. (EA3)

It felt overwhelming because I was seeing the text, hearing the voice, and trying to understand all at once. It made it harder to focus on the meaning. (EB10)

(iv) The "note-taking limitation" code (f=3, 25.0%) indicates that Natural Reader's inability to allow strategies like note-taking and underlining was seen as a disadvantage. Participant views on this matter are:

I wanted to stop and write down some words, but the text kept going. If I could've paused it, I would've taken notes like I usually do when I study. (EA1)

When I read from paper, I can underline or circle words I don't know. But with Natural Reader, I couldn't really interact with the text like that. (EB11)

(v) The "contribution to pronunciation learning" code (f=4, 33.3%) demonstrates Natural Reader's positive effect on learning pronunciation. Participants stated:

Natural Reader can be useful if we want to improve our speaking skills, pronunciation, and vocabulary. Because hearing the correct pronunciation while reading helped me understand how the words are actually supposed to sound (EB11)

With the use of Natural Reader, listening to the text made me more confident about how to pronounce words. I could match the spelling with the way it's said. (EB29)

Overall, it appears that Natural Reader usage had both advantages and disadvantages in both experimental groups. In Experiment Group-1 working at normal speed (x1.0), context-dependent preference (50.0%) and multitasking difficulty (50.0%) were particularly prominent, with participants emphasizing the challenges of simultaneously processing audio and text inputs. In contrast, in Experiment Group-2 working at slower speed (x0.81), positive effect on attention and focus (50.0%) and contribution to pronunciation learning (50.0%) were more prominently emphasized, suggesting that the reduced speed allowed participants to better manage cognitive demands and experience positive effects on attention. This notable difference between groups indicates that reading speed significantly affected participants' experiences, with the normal-speed group struggling more with multitasking difficulties while the slow-speed group was able to perceive benefits in attention and focus. These findings reveal that reading speed is an important factor shaping participants' experiences and perceptions in Natural Reader usage.

4.2.9.2. Findings Related to the Intention to Use Natural Reader

From the responses to the question about "intention to continue using Natural Reader in the future" directed to participants in the experimental groups, the theme "Intention to Use Natural Reader" was formed (Table 18). This theme reflects the views of participants in the experimental groups regarding whether they will continue using Natural Reader after the preparatory program and the reasons for their decisions.

Table 18. Findings Related to the Intention to Use Natural Reader

Theme	Codes	Exp-1 (n = 6)		Exp-2 (n = 6)		Total (n = 12)	
		f	%	f	%	f	%
Intention to Use Natural Reader	No intention to use	2	33.3	2	33.3	4	33.3
	Use for article reading	1	16.7	2	33.3	3	25.0
	Use for listening skills	2	33.3	0	0.0	2	16.7
	Use for pronunciation learning	1	16.7	2	33.3	3	25.0

The "Intention to Use Natural Reader" theme consists of codes: No intention to use, Use for article reading, Use for listening skills, and Use for pronunciation learning.

(i) The "no intention to use" code (f=4, 33.3%) shows that some participants don't plan to use Natural Reader in the future. Participants expressed the following statements:

I prefer reading on paper because I like taking notes and underlining things. With Natural Reader, I can't interact with the text the same way, so I don't think I'd use it again. (EA3)

It didn't really help me understand better. I was trying to read, listen, and follow the highlights all at once, and it just made me more confused. I'd rather stick to single-mode reading. (EB10)

(ii) The "use for article reading" code (f=3, 25.0%) indicates that some participants will continue using Natural Reader especially when reading academic texts. Participant views reflecting this situation are:

If I have to read a long article, I might use Natural Reader to help me stay focused. It's easier to follow when someone is reading it out loud while I read along. (EB8)

I'd use it if I just needed to understand the content of an article. Not for exams, but for general reading, it could be helpful to hear and read at the same time. (EB29)

(iii) The "use for listening skills" code (f=2, 16.7%) shows that some participants will continue using Natural Reader to improve their listening skills. Participants stated:

I'd use it again mainly to improve my listening. Hearing the words while reading helped me get used to the flow of English, especially in longer texts. (EA1)

If I keep using it, I think I could get better at listening and understanding spoken English. That's the main reason I'd consider using it in the future. (EA21)

(iv) The "use for pronunciation learning" code (f=3, 25.0%) indicates that participants will continue using Natural Reader to learn word pronunciations. Participant views on this matter are:

I might use it to practice pronunciation because hearing how words are pronounced helped me learn how to say them correctly. (EA3)

Even though I don't want to use it for reading, I'd still consider using it just to work on pronunciation. It made me more aware of how the words are supposed to sound. (EB11)

Overall, participants in both experimental groups show varying intentions and purposes for future use of Natural Reader. In Experiment Group-1 working at normal speed (x1.0), use for listening skills (33.3%) was prominent, while in Experiment Group-2 working at slower speed (x0.81), use for article reading and pronunciation learning (33.3%) were more prominently emphasized. In both groups, one-third of participants (33.3%) don't plan to use the application in the future. These findings indicate that Natural Reader offers various potentials for different learning needs, but traditional reading methods remain more preferable for some participants.

5. DISCUSSION

In this section, the findings of the research will be discussed in light of existing studies in the literature. The research aimed to examine the effect of AI-supported TTS technology (Natural Reader) on the reading comprehension skills of B1 level Turkish EFL students. The findings will be discussed around three research questions.

5.1. The Effect of Natural Reader on Reading Comprehension in EFL

The first research question aimed to examine whether the use of Natural Reader had an effect on the reading comprehension skills of B1 level Turkish EFL students. Quantitative findings showed that there was no statistically significant difference between the control and experimental groups in terms of IELTS post-test scores.

This result differs from some previous studies reporting positive effects of TTS technology on reading comprehension. For example, a study conducted by Al-Othman (2024) found that TTS technology improved students' cognitive abilities such as reading speed, comprehension, vocabulary knowledge, and critical thinking, and that most of the students were satisfied with this technology. However, in the current study, no significant effect of Natural Reader on reading comprehension was found.

This difference can be explained by various factors. First, the four-week implementation period used in our research may not have been sufficient to observe a significant effect. Indeed, in the qualitative findings, some participants emphasized the need to extend the duration. Kundu and Bej (2024) emphasized that the effectiveness of AI interventions should be evaluated over time.

Second, the dual-task (multitasking) requirement of TTS technology may have increased participants' cognitive load. In the qualitative findings, some participants in the experimental group emphasized the difficulty of simultaneous listening and reading. This finding parallels Kundu and Bej's (2024) findings that students experience high cognitive load during interaction with AI tools. Fitriani (2024) noted that students face various challenges when using AI platforms, such as navigation

difficulties and weakened critical thinking skills, indicating increased cognitive load in AI-supported learning environments.

Third, participants' unfamiliarity with technology use may also have affected the results. Fitriani (2024) stated that students face various challenges when using AI platforms, such as limited access to devices, unreliable internet connections, and insufficient digital skills. AbdAlgane and Othman (2023) also pointed out the existence of infrastructural challenges such as technology-based knowledge requirements, need for fast internet connection, and financial capacity requirements.

Fourth, the similarity between the implementation method and the assessment method may have influenced the results. Participants in the control group practiced reading texts in PDF format on their own, which directly mirrored the reading format in the IELTS post-test. In both situations, participants processed texts without any audio support, at their own reading pace, and using their own reading strategies. This methodological similarity might have provided an advantage to participants in the control group, as the experience and strategies they acquired during the implementation could be directly transferred to the post-test. In contrast, participants in the experimental groups experienced a multi-sensory reading with Natural Reader but were deprived of this support during the post-test. This may be attributed to the notion that when an intervention closely aligns with the format of an assessment, it can facilitate better performance, which may help explain the progress observed in the control group.

Nevertheless, qualitative findings revealed some positive effects of Natural Reader. Participants in the experimental group stated that Natural Reader provided benefits in areas such as pronunciation learning, vocabulary learning, and increased concentration. These findings are consistent with Fitria's (2023) findings that Natural Reader provides students with the opportunity to learn how words/sentences are pronounced with different accents and voices. Additionally, Jose (2024) also stated that AI-supported reading tools improve students' pronunciation skills, increase their confidence, and enhance their vocabulary learning abilities.

When evaluated in terms of the multi-sensory approach, Natural Reader provides a multi-sensory learning experience by offering both visual and auditory inputs. Wang (2024) stated that AI-supported multi-sensory technology platforms transform into interactive lessons that appeal to different learning styles and enrich the learning

experience. However, cognitive load needs to be managed for the multi-sensory approach to be effective. In the current study, some participants emphasized the difficulty of dual tasks. This indicates that participants have different learning styles and cognitive capacities, and that TTS technologies should be designed considering these differences.

5.2. The Effect of Playback Speed on Reading Comprehension in EFL

The second research question aimed to examine the effect of playback speed in Natural Reader on the reading comprehension skills of B1 level Turkish EFL students. Quantitative findings showed that there was no statistically significant difference between the experimental groups using normal speed (x1.0) and slowed speed (x0.81) in terms of IELTS post-test scores. However, when looking at the raw scores, it was observed that the slowed speed group (x0.81) made more progress and the normal speed group (x1.0) showed less progress.

This finding indicates that playback speed is an important factor in TTS technologies. In the qualitative findings, it was observed that participants in the slowed speed group reported more positive views on attention and focus and pronunciation learning. On the other hand, some participants in the experimental group identified speaker speed as a problem. Additionally, some participants suggested that speed should be adjustable. The effect of playback speed can be evaluated within the framework of cognitive load theory Sweller (2011). Slowed speed can reduce cognitive load by giving students more time to process information (Skulmowski & Xu, 2022).

The effect of playback speed may also be related to participants' language proficiency level. For B1 level students, normal speed (180 words per minute) may be challenging, and this situation may increase cognitive load. Zheng (2024) stated that an AI-supported chatbot was effective in reducing foreign language reading anxiety of Chinese middle school students but did not have a significant effect on reading performance. This indicates that technological tools should be adjusted according to students' language level.

Making playback speed adjustable can provide students with more control and flexibility. Hsiao and Chang (2024) stated that students experienced better optimal experience in student-centered presentations compared to teacher-centered lessons.

This indicates that students should be provided with more control and flexibility. Additionally, Fitria (2021) emphasized that while AI technologies positively affect the English learning environment, technology alone is not sufficient, and teachers' guidance role is still important. Therefore, TTS technologies need to be adjusted according to students' language level and learning styles and used under the guidance of teachers.

5.3. Participants' Perceptions of the Use of Natural Reader in EFL Reading

This section discusses the third research question, which aimed to explore B1-level Turkish EFL learners' perceptions of the reading activities implemented in the study, with a particular focus on the use of Natural Reader, while also considering comparative insights from learners who experienced single-mode reading without audio support. Qualitative findings showed that participants reported both positive and negative views regarding the use of Natural Reader.

Among the positive views, Natural Reader's contributions to pronunciation learning, vocabulary learning, and listening skills stood out. These findings are also supported by similar studies in the literature. Fitria (2023) noted that Natural Reader allows students to learn how words are pronounced with different accents. Similarly, Al-Othman (2024) found that TTS technology improved students' cognitive abilities such as reading speed, comprehension, vocabulary knowledge, and critical thinking, with students reporting high satisfaction rates with this technology. In a study conducted by Fitria et al. (2023), AI-supported oral reading technique resulted in a significant increase in students' pronunciation and fluency achievements. Jose (2024) also demonstrated that a similar AI-supported reading tool led to statistically significant improvements in students' pronunciation skills, with students reporting benefits such as increased confidence, vocabulary learning, and enhanced speaking skills. Additionally, Amin (2022) showed that repeated reading and listening-reading strategies through TTS applications improved students' overall reading fluency and comprehension skills.

In terms of participants' motivation, it was observed that participants in the experimental group benefited from various sources of motivation such as Natural Reader's features, increasing motivation during the process, and future-oriented motivation. These findings are consistent with Daweli and Mahyoub's (2024) findings

that participants have positive perceptions towards the use of AI tools and that these tools help improve reading skills and increase motivation. They also parallel Nugrahawati's (2024) findings that AI effectively improves reading skills through personalized learning experiences, adaptive assessment, and feedback, and promotes lifelong learning.

A particularly noteworthy finding from this study is the significant variation in how participants perceived the multi-sensory approach offered by Natural Reader. This highlights the critical importance of individual differences in learning preferences and cognitive processing styles. While some participants in the experimental group reported that Natural Reader's highlighting feature and audio support enhanced their focus, a larger portion found the dual-task requirement distracting. As Zheng (2024) noted, technological tools affect learners differently based on their individual cognitive styles and learning preferences. This dichotomy in participant responses aligns with cognitive load theory (Sweller, 2011), suggesting that the additional sensory input benefited some learners by providing complementary processing channels, while for others, it created extraneous cognitive load that interfered with comprehension. These findings echo Wang's (2024) observation that AI-supported platforms need to consider individual learning styles to be effective. The contrasting perceptions underscore that technology integration in language learning should not follow a one-size-fits-all approach but rather accommodate diverse learning preferences through flexible implementation options, such as adjustable playback speeds and optional highlighting features that can be enabled or disabled according to individual needs.

Among the negative views, factors such as dual task difficulty, speaker speed, and note-taking limitation stood out. These findings parallel Fitriani's (2024) findings that students face various challenges when using AI platforms. Koç (2024) also stated in his study examining the effect of an AI-supported chatbot on the development of Turkish EFL students' listening and speaking skills that students faced various technical, pedagogical, and social constraints.

Regarding participants' intentions to use Natural Reader in the future, some of the participants in the experimental group stated that they did not intend to use the application in the future, while others expressed interest in using it for various purposes such as article reading, improving listening skills, and pronunciation

learning. These findings are consistent with Vo and Nguyen's (2024) findings that students perceive AI tools as easy to use but have neutral views about their usefulness. They also parallel Fakher Ajabshir's (2023) study emphasizing that for effective use of AI technologies in language learning, teachers, students, and stakeholders need to comprehensively understand recently developed AI-based language learning tools.

One prominent theme that emerged from the qualitative data was the *context-dependent preference* for using Natural Reader versus single-mode reading. Participants' preferences were strongly influenced by the purpose of the reading task. Specifically, both experimental groups reported that they would choose to use Natural Reader in certain contexts—such as reading for pleasure, improving their pronunciation, or when there were no comprehension questions or exams involved. In these situations, the multi-modal experience was seen as more enjoyable and supportive. However, when reading was tied to comprehension tasks—as in exam preparation—participants preferred single-mode reading. They explained that this mode gave them greater control over their reading strategies, such as underlining, circling key terms, adjusting their pace, rereading difficult sentences, and applying personal techniques to enhance comprehension. These responses highlight how participants made deliberate decisions based on the context of the reading task. This nuanced finding supports Chea and Xiao's (2024) conclusion that combining AI tools with traditional reading strategies can enhance effectiveness by allowing learners to adapt the tools to their needs and goals.

Participants' views on contribution to other language skills are also noteworthy. Participants in the experimental group stated that Natural Reader had positive effects especially on listening skills, pronunciation skills, and vocabulary knowledge. These findings indicate that TTS technology can contribute to the development of multiple language skills. Similarly, Fitria et al. (2023) stated that AI-supported oral reading technique resulted in a significant increase in students' pronunciation and fluency achievements. Additionally, Amin (2022) revealed that repeated reading and listening-reading strategies through TTS applications improved students' fluency and comprehension skills.

On the other hand, different perceptions were observed in the control group participants' views regarding the contribution of reading activities to other language skills compared to the experimental groups. Half of the participants in the control

group stated that reading activities did not contribute to other language skills. However, it is important to emphasize that these findings reflect participants' subjective perceptions and are based on personal evaluations rather than objective measurements. Participants reported that they did not see improvement in reading-related skills. Yet, considering the pace of skill-based improvement in the long run, participants' judgments may have been biased. Indeed, Nation (2008) states that regular reading activities, even without audio support, can naturally contribute to vocabulary development. Similarly, Horst (2005) emphasized that the long-term effects of reading activities may not always be accurately perceived by participants, and participants may have difficulty evaluating their own development, especially in short-term interventions.

Participants' suggestions regarding implementation method and duration are also important. Most of the participants stated that the research duration should be extended. This finding is supported by similar studies in the literature. Amin (2022) reported that their study using TTS applications lasted 12 weeks, during which improvements in students' reading skills were observed. Additionally, Hsiao and Chang (2024) employed an 18-week implementation period in their study. This supports our participants' suggestions that the research duration should be extended. Furthermore, most of the participants in the control group stated that the reading medium should be changed. Participants expressed that reading from paper instead of a phone screen could be more efficient, as they were more accustomed to it and could take notes, circle unknown words, or underline important information. Similarly, Fitriani (2024) noted that students faced some challenges with digital devices.

In conclusion, participants' views regarding the use of Natural Reader indicate that TTS technologies should be used carefully in EFL teaching. The effectiveness of technology depends on factors such as students' language level, learning styles, familiarity with technology, and implementation duration. Additionally, cognitive load needs to be managed, and the multi-sensory approach needs to be applied in a balanced way. As emphasized by Son et al. (2023), considering that AI will be continuously integrated into language education and will have a profound impact on language learning and teaching, it is believed that all components (the AI platform used, teachers, and students) need to be adequately prepared for these technologies to be used effectively.

6. CONCLUSION

This study investigated the impact of AI TTS technology, specifically Natural Reader, on the reading comprehension skills of B1 level Turkish EFL learners. The research employed a mixed-methods approach, combining quantitative analysis of pre-test and post-test scores with qualitative insights from focus group interviews. Three research questions guided this investigation: (1) the influence of Natural Reader on reading comprehension improvement, (2) the influence of playback speed on Natural Reader on reading comprehension improvement, and (3) learners' perspectives on the use of Natural Reader in EFL reading, supported by insights from single-mode reading without audio support.

The quantitative findings revealed that Natural Reader did not significantly improve reading comprehension scores compared to single-mode reading. When controlling for pre-test scores, no statistically significant difference was found between the experimental groups using Natural Reader and the control group using single-mode reading methods. Similarly, no significant difference was observed between the two experimental groups using different playback speeds (normal speed x1.0 vs. slower speed x0.81), although raw scores suggested slightly greater improvement in the slower speed group.

Despite these quantitative results, the qualitative findings uncovered several valuable insights. Participants reported that Natural Reader provided benefits in pronunciation learning, vocabulary acquisition, and increased concentration. Additionally, participants in the experimental groups unanimously reported improvements in other language skills, particularly listening and pronunciation. This multi-skill development potential represents a significant advantage of TTS technology in language learning contexts.

However, the study also identified important challenges associated with Natural Reader usage. The difficulty of simultaneously listening and reading, speaker speed concerns, and limitations in note-taking and text interaction emerged as significant barriers. These findings align with cognitive load theory, suggesting that the dual-task

requirement of TTS technology may have increased participants' cognitive burden, potentially offsetting any comprehension benefits.

The study's findings contribute to our understanding of technology integration in EFL contexts in several ways. First, they highlight the importance of considering individual differences in learning styles and cognitive capacities when implementing TTS technologies. While some participants benefited from the multi-sensory approach, others found it distracting. Second, they underscore the need for adjustable features in educational technologies, as some participants suggested that speed control would enhance their experience. Third, they reveal that the benefits of TTS technology may extend beyond reading comprehension to other language skills, suggesting its potential value in integrated skills development.

Several limitations should be acknowledged. First, the four-week implementation period may have been insufficient to observe significant improvements in reading comprehension, as most participants suggested that a longer duration might yield more meaningful results. This is also supported by previous research, such as Al-Othman (2024), which reported improvements in reading comprehension after a 12-week implementation. Second, the study focused exclusively on B1-level Turkish EFL learners from a single university, which limits the generalizability of the findings to other proficiency levels, learner profiles, or institutional contexts. Third, participants' lack of prior experience with TTS tools such as Natural Reader may have influenced their performance and adaptation to the technology, potentially affecting the observed outcomes. Additionally, the fixed technological conditions—such as the inability to adjust playback speed, select different AI voices, or use more suitable devices—may have further impacted participants' engagement and effectiveness. Another important limitation concerns the assessment method: the main assessment tool, the IELTS reading test used as the post-test, had a format similar to the control group's single-mode reading activities, which may have favored their performance. Participants in the control group read at their own pace without audio support both during the intervention and the post-test. This methodological similarity may have provided the control group with an advantage, as the strategies they practiced during the implementation were in alignment with the post-test conditions.

Future research should consider longer implementation periods to allow for adaptation to the technology and to observe potential long-term effects. Studies could also

investigate the impact of providing students with more control over features such as playback speed, voice selection, and text interaction options. Additionally, exploring the effects of TTS technology on different proficiency levels and with various text types would provide valuable insights. Furthermore, future studies should examine the direct impact of Natural Reader on reading speed development, as this aspect was not fully addressed in the current research. Research should also consider how individual differences such as learning styles, cognitive abilities, and prior technology experience might moderate the effectiveness of TTS applications. These variables may explain the varied responses to Natural Reader observed in this study.

The findings of this study offer important pedagogical implications for the use of TTS technology in EFL classrooms. First, teachers should consider using TTS tools like Natural Reader for complementary purposes such as pronunciation learning and vocabulary development rather than directly enhancing reading comprehension skills. Considering the differences in students' capacity to process multi-sensory inputs, it is recommended that TTS technology be introduced gradually and students be given the opportunity to experiment with different speed settings. Additionally, to reduce the difficulty of simultaneous listening and reading, teachers can adopt a phased approach: silent reading of the text first, then listening with TTS, and finally combining both modalities. In terms of classroom applications, TTS technology can be a valuable tool especially for pronunciation modeling, independent study sessions, and homework assignments. When using AI-supported TTS tools, teachers should carefully adjust text difficulty level, length, and complexity to manage students' cognitive load. Finally, balanced integration of TTS technology with traditional reading methods can create a diversified language learning environment that responds to students' individual learning preferences and needs.

In conclusion, while Natural Reader did not significantly improve reading comprehension scores in this study, its potential benefits for pronunciation, vocabulary, and listening skills suggest that TTS technology has a place in the EFL classroom. However, its implementation should be carefully designed to manage cognitive load and accommodate different learning preferences. When evaluated from the perspective of cognitive load theory, these findings indicate that processing multi-sensory inputs can be challenging for some students, and therefore technology integration should be arranged according to students' cognitive capacities. From the

perspective of the multi-sensory learning approach, it is understood that TTS technology has the potential to appeal to different learning styles, but this may not be equally effective for all students. This study contributes to the literature on TELL and MALL, highlighting the need for further research and development of application strategies for the effective use of AI tools in language learning. As AI technologies continue to evolve, finding the optimal balance between technological affordances and pedagogical needs remains crucial for effective language learning.

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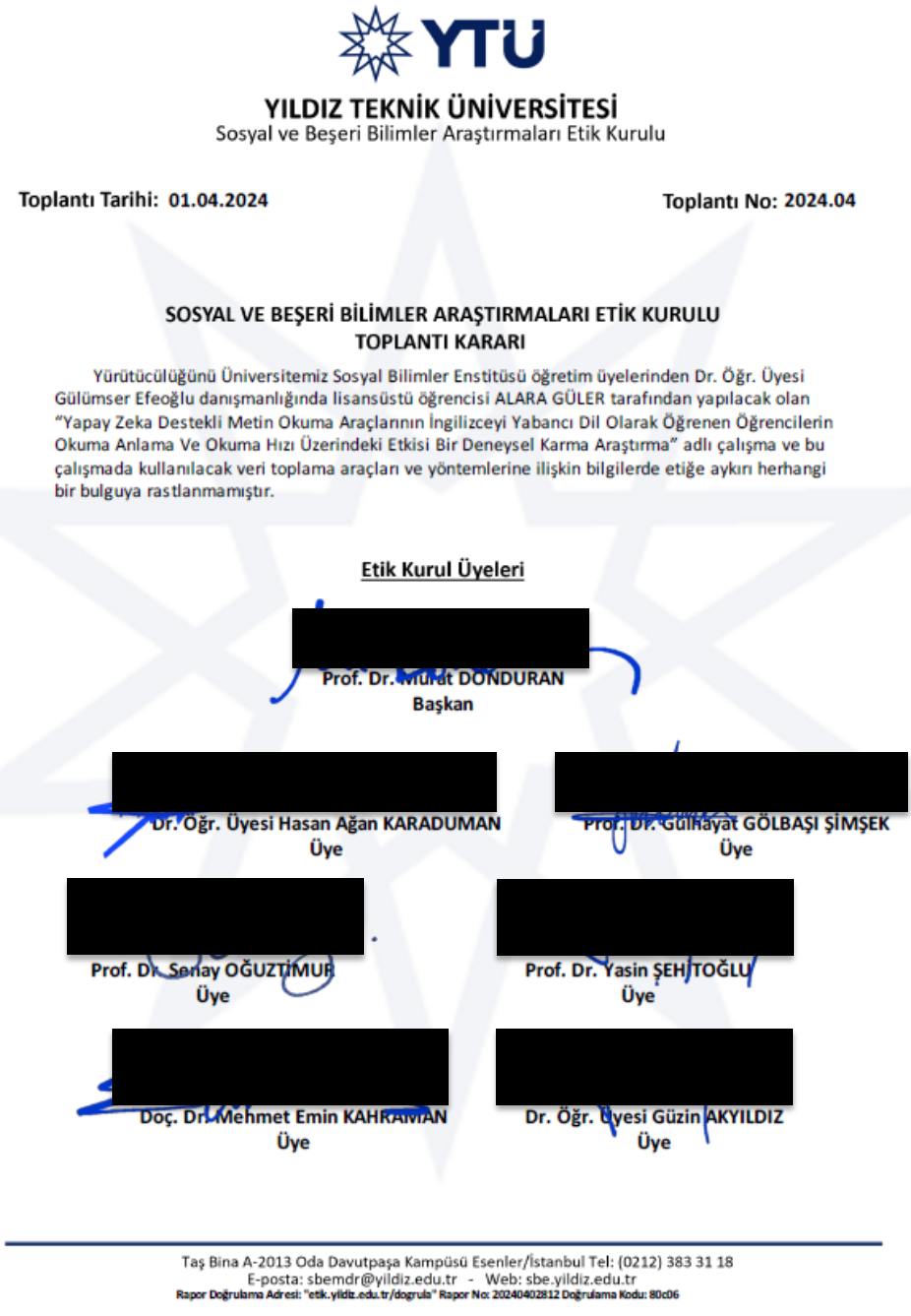
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APPENDICES

Appendix 1. Ethics Committee Approval



YILDIZ TEKNİK ÜNİVERSİTESİ
Sosyal ve Beşeri Bilimler Araştırmaları Etik Kurulu

Toplantı Tarihi: 01.04.2024 **Toplantı No: 2024.04**

SOSYAL VE BEŞERİ BİLİMLER ARAŞTIRMALARI ETİK KURULU TOPLANTI KARARI

Yürütücülüğünü Üniversitemiz Sosyal Bilimler Enstitüsü öğretim üyelerinden Dr. Öğr. Üyesi Gülümser Efeoğlu danışmanlığında lisansüstü öğrencisi ALARA GÜLER tarafından yapılacak olan "Yapay Zeka Destekli Metin Okuma Araçlarının İngilizceyi Yabancı Dil Olarak Öğrenen Öğrencilerin Okuma Anlama Ve Okuma Hızı Üzerindeki Etkisi Bir Deneysel Karma Araştırma" adlı çalışma ve bu çalışmada kullanılacak veri toplama araçları ve yöntemlerine ilişkin bilgilerde etiğe aykırı herhangi bir bulguya rastlanmamıştır.

Etik Kurul Üyeleri

[redacted]
Prof. Dr. Murat DONDURAN
Başkan

[redacted]
Dr. Öğr. Üyesi Hasan Ağan KARADUMAN
Üye

[redacted]
Prof. Dr. Gülhayat GÖLBAŞI ŞİMŞEK
Üye

[redacted]
Prof. Dr. Serlay OĞUZTİMUR
Üye

[redacted]
Prof. Dr. Yasin ŞEHİTOĞLU
Üye

[redacted]
Doç. Dr. Mehmet Emin KAHRAMAN
Üye

[redacted]
Dr. Öğr. Üyesi Güzin AKYILDIZ
Üye

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Rapor Doğrulama Adresi: "etik.yildiz.edu.tr/dogrula" Rapor No: 20240402812 Doğrulama Kodu: 80c06

Appendix 2. Institutional Approval

T.C.
MARMARA ÜNİVERSİTESİ REKTÖRLÜĞÜ
Yabancı Diller Yüksekokulu Müdürlüğü

Sayı : E-49236587-044-779380 22.04.2024
Konu : [redacted] Alara GÜLER'in
Araştırma İzni.

Sayın Alara GÜLER

[redacted] T.C. Kimlik numaralı Alara Güler'in **"Yapay Zeka Destekli Metin-Okuma Araçlarının İngilizceyi Yabancı Dil Olarak Öğrenen Öğrencilerin Okuma Anlama ve Okuma Hızı Üzerindeki Etkisi: Bir Deneysel Karma Araştırma"** başlıklı araştırmasının Marmara Üniversitesi Yabancı Diller Yüksekokulu'nda yapması uygun görülmüştür.

Bilgilerinize rica ederim.

[redacted]
Prof. Dr. Harun DUMAN
Yüksekokul Müdürü

[redacted]

Bu belge, güvenli elektronik imza ile imzalanmıştır.
Doğrulama Kodu :BSLNJ10KPH Pin Kodu :63272 Belge Takip Adresi : https://turkiye.gov.tr/ebd?eK=5709&eD=BSLNJ10KPH&eS=779380
Adres:Marmara Üniversitesi Göztepe Yerleşkesi Yabancı Diller Yüksekokulu 34722 Kadıköy / İSTANBUL
Telefon:0216 777 2900 Faks:0216 777 2901
e-Posta:ydokulu@marmara.edu.tr Elektronik Ağ:http://ydil.marmara.edu.tr
Kep Adresi:marmarauniversitesi@hs01.kep.tr
Bilgi için: MEHMET KOCATAŞ
Unvanı: Yüksekokul Sekreteri

Appendix 3. Instructions for Teachers

Control Group

Şule Doğru - A18 - Wednesday/Friday
Aslıhan Karabulut - A21 - Tuesday/Wednesday

Schema of the study:

	CONTROL		EXPERIMENTAL 1		EXPERIMENTAL 2	
	TOOL	TEXT	TOOL	TEXT	TOOL	TEXT
PRE	Demographic Form		Demographic Form		Demographic Form	
	IELTS General Reading Test 1		IELTS General Reading Test 1		IELTS General Reading Test 1	
TREATMENT	PDF	Text 1 + MC Questions	Natural Reader x1	Text 1 + MC Questions	Natural Reader x0.81	Text 1 + MC Questions
	PDF	Text 2 + MC Questions	Natural Reader x1	Text 2 + MC Questions	Natural Reader x0.81	Text 2 + MC Questions
	PDF	Text 3 + MC Questions	Natural Reader x1	Text 3 + MC Questions	Natural Reader x0.81	Text 3 + MC Questions
	PDF	Text 4 + MC Questions	Natural Reader x1	Text 4 + MC Questions	Natural Reader x0.81	Text 4 + MC Questions
POST	IELTS General Reading Test 2		IELTS General Reading Test 2		IELTS General Reading Test 2	
	Focus Group Interview		Focus Group Interview		Focus Group Interview	

Timetable of the study:

IF YOUR LESSONS ARE ON MONDAY/TUESDAY

PRE	1st week	15-19 APRIL	Demographic Form
			IELTS General Training Reading Test I
TREATMENT	2nd week	22-26 APRIL	Text 1 + Multiple Choice Questions
	3rd week	29-03 MAY	Text 2 + Multiple Choice Questions
	4th week	06-10 MAY	Text 3 + Multiple Choice Questions
	5th week	13-17 MAY	Text 4 + Multiple Choice Questions
POST	6th week	20-24 MAY	IELTS General Training Reading Test II
			Focus Group Interview

IF YOUR LESSONS ARE ON WEDNESDAY/THURSDAY/FRIDAY

PRE	1st week	15-19 APRIL	Demographic Form
			IELTS General Training Reading Test I
TREATMENT	2nd week	22-26 APRIL	Text 1 + Multiple Choice Questions
	3rd week	29-03 MAY	Text 2 + Multiple Choice Questions
	4th week	13-17 MAY	Text 3 + Multiple Choice Questions
	5th week	20-24 MAY	Text 4 + Multiple Choice Questions
POST	6th week	27-31 MAY	IELTS General Training Reading Test II
			Focus Group Interview

1st week:

- Consent Form (printout)
- Demographic form (printout)
- IELTS Reading Test 1 (printout)

2nd week:

- Reading "Text 1" (on PDF)
- Answering multiple choice questions (printout)

3rd week:

- Reading "Text 2" (on PDF)
- Answering multiple choice questions (printout)

4th week:

- Reading "Text 3" (on PDF)
- Answering multiple choice questions (printout)

5th week:

- Reading "Text 4" (on PDF)
- Answering multiple choice questions (printout)

6th week:

- IELTS Reading Test 2 (printout)
- Focus group interview

Instructions for the IELTS tests:

- Prior to starting the test, hand out the exam papers and answer sheets to the students. Give them 5 minutes to go through the test overview and complete their personal details on the answer sheet. After the review time is up, commence the test.
- The test duration is 60 minutes, and no extra time will be allocated.
- Students must not receive assistance during the test, and they are prohibited from using their phones or attempting to cheat from peers.
- All responses must be recorded on the answer sheet, as scores will be based on markings on the answer sheet, not the exam itself.
- In the event of late arrivals, accommodate them to take the test, granting additional time if necessary to ensure a comprehensive dataset.
- Specifically, remind students to carefully read and adhere to the instructions provided for each set of questions.
- Both the exam and answer sheets will be collected from the students and handed over to the researcher Alara Güler.

Instructions for treatment sessions:

- Please remind the students to bring their mobile phones with sufficient battery for the upcoming activity.
- On the day of the session, you will receive the text as a PDF file from me. Your responsibility will be to distribute it to the students either via WhatsApp or email at the beginning of the session.
- Inform the students that they will have 6 minutes to read the given text. Before they begin, instruct them to put their phones in airplane mode to avoid distractions from notifications. Following this, they will be required to answer some reading comprehension questions. Emphasise that they will not have the opportunity to review the text once the time is up and they are not allowed to take notes during the reading period to use for answering the questions.
- Once the allocated time for reading is over, do not provide additional time. Instruct the students to promptly turn off their phones.
- Next, distribute the multiple-choice printouts to the students. They should be given 7 minutes to complete these questions.
- After the completion of the multiple-choice tests, collect them from the students and hand them over to the researcher, Alara Güler.

Thank you for your assistance with this study.

Experimental Group 1

Demet Emre - A24 - Wednesday/Friday
Buse Nur Bozkurt - A25 - Monday/Thursday

Schema of the study:

	CONTROL		EXPERIMENTAL 1		EXPERIMENTAL 2	
	TOOL	TEXT	TOOL	TEXT	TOOL	TEXT
PRE	Demographic Form		Demographic Form		Demographic Form	
	IELTS General Reading Test 1		IELTS General Reading Test 1		IELTS General Reading Test 1	
TREATMENT	PDF	Text 1 + MC Questions	Natural Reader x1	Text 1 + MC Questions	Natural Reader x0.81	Text 1 + MC Questions
	PDF	Text 2 + MC Questions	Natural Reader x1	Text 2 + MC Questions	Natural Reader x0.81	Text 2 + MC Questions
	PDF	Text 3 + MC Questions	Natural Reader x1	Text 3 + MC Questions	Natural Reader x0.81	Text 3 + MC Questions
	PDF	Text 4 + MC Questions	Natural Reader x1	Text 4 + MC Questions	Natural Reader x0.81	Text 4 + MC Questions
POST	IELTS General Reading Test 2		IELTS General Reading Test 2		IELTS General Reading Test 2	
	Focus Group Interview		Focus Group Interview		Focus Group Interview	

Timetable of the study:

IF YOUR LESSONS ARE ON MONDAY/TUESDAY

PRE	1st week	15-19 APRIL	Demographic Form
			IELTS General Training Reading Test I
TREATMENT	2nd week	22-26 APRIL	Text 1 + Multiple Choice Questions
	3rd week	29-03 MAY	Text 2 + Multiple Choice Questions
	4th week	06-10 MAY	Text 3 + Multiple Choice Questions
	5th week	13-17 MAY	Text 4 + Multiple Choice Questions
POST	6th week	20-24 MAY	IELTS General Training Reading Test II
			Focus Group Interview

IF YOUR LESSONS ARE ON WEDNESDAY/THURSDAY/FRIDAY

PRE	1st week	15-19 APRIL	Demographic Form
			IELTS General Training Reading Test I
TREATMENT	2nd week	22-26 APRIL	Text 1 + Multiple Choice Questions
	3rd week	29-03 MAY	Text 2 + Multiple Choice Questions
	4th week	13-17 MAY	Text 3 + Multiple Choice Questions
	5th week	20-24 MAY	Text 4 + Multiple Choice Questions
POST	6th week	27-31 MAY	IELTS General Training Reading Test II
			Focus Group Interview

1st week:

- Consent Form (printout)
- Demographic form (printout)
- IELTS Reading Test 1 (printout)
- Joining Natural Reader class

2nd week:

- Reading "Text 1" (on Natural Reader)
- Answering multiple choice questions (printout)

3rd week:

- Reading "Text 2" (on Natural Reader)
- Answering multiple choice questions (printout)

4th week:

- Reading "Text 3" (on Natural Reader)
- Answering multiple choice questions (printout)

5th week:

- Reading "Text 4" (on Natural Reader)
- Answering multiple choice questions (printout)

6th week:

- IELTS Reading Test 2 (printout)
- Focus group interview

Instructions for the IELTS tests:

- Prior to starting the test, hand out the exam papers and answer sheets to the students. Give them 5 minutes to go through the test overview and complete their personal details on the answer sheet. After the review time is up, commence the test.
- The test duration is 60 minutes, and no extra time will be allocated.
- Students must not receive assistance during the test, and they are prohibited from using their phones or attempting to cheat from peers.
- All responses must be recorded on the answer sheet, as scores will be based on markings on the answer sheet, not the exam itself.
- In the event of late arrivals, accommodate them to take the test, granting additional time if necessary to ensure a comprehensive dataset.
- Specifically, remind students to carefully read and adhere to the instructions provided for each set of questions.
- Both the exam and answer sheets will be collected from the students and handed over to the researcher Alara Güler.

Instructions for Natural Reader:

- Please remind students to bring their earphones or headphones on the day of the activity, as they will listen to the texts individually on their mobile phones.
- Students do not need to download the app; they can use the website version, whichever is more convenient for them.

- On the day of the activity, they will find that session's text on the Natural Reader class under "Edu Library."
- When they click on the text:
    - They must choose the speaker "**Sonia**" from the "**UK**" speakers.
    - Ensure they **untick the first three boxes** from the filters so that the AI will read between the brackets as well.
    - They must not change the speed of the speech; it must remain at the original **x1** speed.
    - They must not make any other changes, just choosing the speaker as "Sonia" and unticking the first three boxes about reading between the brackets.
- After these adjustments, students must also put their phones in airplane mode to avoid distractions from notifications.
- Inform them that they will be required to answer some reading comprehension questions. Emphasize that they will not have the opportunity to review the text once the listening is finished, they are not allowed to take notes during this period to use for answering the questions, and they cannot pause or rewind the audio.
- When the listening is finished, they must turn off their phones.
- Next, hand out the multiple-choice printouts to students and give them 7 minutes to answer.
- Students are not allowed to look back at the text to answer the questions or cheat from their friends.
- Collect the multiple-choice tests from the students and hand them over to the researcher, Alara Güler.

Natural Reader class code link:
https://www.naturalreaders.com//forms/join.html?product=edu&code=UAHUDBU



Thank you for your assistance with this study.

Experimental Group 2

Alara Güler - A37 - Monday/Thursday
İzel Gür - A42 - Monday/Thursday

Schema of the study:

	CONTROL		EXPERIMENTAL 1		EXPERIMENTAL 2	
	TOOL	TEXT	TOOL	TEXT	TOOL	TEXT
PRE	Demographic Form		Demographic Form		Demographic Form	
	IELTS General Reading Test 1		IELTS General Reading Test 1		IELTS General Reading Test 1	
TREATMENT	PDF	Text 1 + MC Questions	Natural Reader x1	Text 1 + MC Questions	Natural Reader x0.81	Text 1 + MC Questions
	PDF	Text 2 + MC Questions	Natural Reader x1	Text 2 + MC Questions	Natural Reader x0.81	Text 2 + MC Questions
	PDF	Text 3 + MC Questions	Natural Reader x1	Text 3 + MC Questions	Natural Reader x0.81	Text 3 + MC Questions
	PDF	Text 4 + MC Questions	Natural Reader x1	Text 4 + MC Questions	Natural Reader x0.81	Text 4 + MC Questions
POST	IELTS General Reading Test 2		IELTS General Reading Test 2		IELTS General Reading Test 2	
	Focus Group Interview		Focus Group Interview		Focus Group Interview	

Timetable of the study:

IF YOUR LESSONS ARE ON MONDAY/TUESDAY

PRE	1st week	15-19 APRIL	Demographic Form
			IELTS General Training Reading Test I
TREATMENT	2nd week	22-26 APRIL	Text 1 + Multiple Choice Questions
	3rd week	29-03 MAY	Text 2 + Multiple Choice Questions
	4th week	06-10 MAY	Text 3 + Multiple Choice Questions
	5th week	13-17 MAY	Text 4 + Multiple Choice Questions
POST	6th week	20-24 MAY	IELTS General Training Reading Test II
			Focus Group Interview

IF YOUR LESSONS ARE ON WEDNESDAY/THURSDAY/FRIDAY

PRE	1st week	15-19 APRIL	Demographic Form
			IELTS General Training Reading Test I
TREATMENT	2nd week	22-26 APRIL	Text 1 + Multiple Choice Questions
	3rd week	29-03 MAY	Text 2 + Multiple Choice Questions
	4th week	13-17 MAY	Text 3 + Multiple Choice Questions
	5th week	20-24 MAY	Text 4 + Multiple Choice Questions
POST	6th week	27-31 MAY	IELTS General Training Reading Test II
			Focus Group Interview

1st week:

- Consent Form (printout)
- Demographic form (printout)
- IELTS Reading Test 1 (printout)
- Joining Natural Reader class

2nd week:

- Reading "Text 1" (on Natural Reader)
- Answering multiple choice questions (printout)

3rd week:

- Reading "Text 2" (on Natural Reader)
- Answering multiple choice questions (printout)

4th week:

- Reading "Text 3" (on Natural Reader)
- Answering multiple choice questions (printout)

5th week:

- Reading "Text 4" (on Natural Reader)
- Answering multiple choice questions (printout)

6th week:

- IELTS Reading Test 2 (printout)
- Focus group interview

Instructions for the IELTS tests:

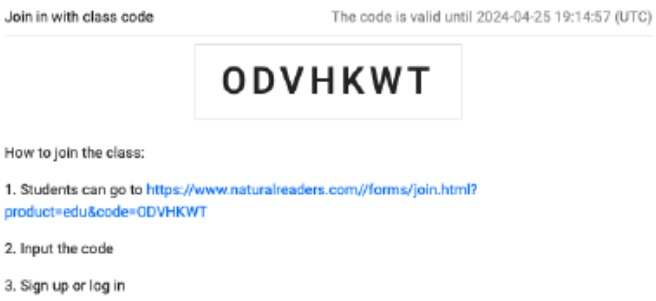
- Prior to starting the test, hand out the exam papers and answer sheets to the students. Give them 5 minutes to go through the test overview and complete their personal details on the answer sheet. After the review time is up, commence the test.
- The test duration is 60 minutes, and no extra time will be allocated.
- Students must not receive assistance during the test, and they are prohibited from using their phones or attempting to cheat from peers.
- All responses must be recorded on the answer sheet, as scores will be based on markings on the answer sheet, not the exam itself.
- In the event of late arrivals, accommodate them to take the test, granting additional time if necessary to ensure a comprehensive dataset.
- Specifically, remind students to carefully read and adhere to the instructions provided for each set of questions.
- Both the exam and answer sheets will be collected from the students and handed over to the researcher Alara Güler.

Instructions for Natural Reader:

- Please remind students to bring their earphones or headphones on the day of the activity, as they will listen to the texts individually on their mobile phones.
- Students do not need to download the app; they can use the website version, whichever is more convenient for them.

- On the day of the activity, they will find that session's text on the Natural Reader class under "Edu Library."
- When they click on the text:
    - They must choose the speaker "**Sonia**" from the "**UK**" speakers.
    - Ensure they **untick the first three boxes** from the filters so that the AI will read between the brackets as well.
    - They must change the speed of the speech to **x0.81.**
    - They must not make any other changes, just choosing the speaker as "Sonia", unticking the first three boxes about reading between the brackets, and changing the speed to x0.81.
- After these adjustments, students must also put their phones in airplane mode to avoid distractions from notifications.
- Inform them that they will be required to answer some reading comprehension questions. Emphasize that they will not have the opportunity to review the text once the listening is finished, they are not allowed to take notes during this period to use for answering the questions, and they cannot pause or rewind the audio.
- When the listening is finished, they must turn off their phones.
- Next, hand out the multiple-choice printouts to students and give them 7 minutes to answer.
- Students are not allowed to look back at the text to answer the questions or cheat from their friends.
- Collect the multiple-choice tests from the students and hand them over to the researcher, Alara Güler.

NaturalReaders class code link:
https://www.naturalreaders.com//forms/join.html?product=edu&code=ODVHKWT



Thank you for your assistance with this study.

Appendix 4. Demographic Form

Demografik Bilgi Formu

Kişisel Bilgiler:

- Adı soyadı:
- Cinsiyet: [ ] Erkek [ ] Kadın [ ] Diğer
- Doğum tarihi:
- Doğum yeri:
- Uyruğu:
- Anadili:
- Telefon numarası:
- Güncel e-posta adresi:

Eğitim Durumu:

- Mezun olduğunuz lise türü:
- Üniversitede kazandığınız bölüm:
- Bu ilk yükseköğretiminiz mi? [ ] Evet [ ] Hayır
- Eğer hayır ise, hangi yıl hangi üniversitenin hangi bölümünden mezun oldunuz?

Yurt Dışı Deneyimi:

- Daha önce yurt dışında yaşadınız mı? [ ] Evet [ ] Hayır
- Eğer evet ise, hangi ülkelerde ve kaç ay?

- Daha önce yurt dışında bulundunuz mu? [ ] Evet [ ] Hayır
- Eğer evet ise, hangi ülkelerde, kaç kere, ne uzunlukta?

Okuma Alışkanlıkları ve Tercihleri:

- Kitap okuma alışkanlığı: [ ] Günlük [ ] Haftalık [ ] Ayda birkaç kez [ ] Hiç
- Kendi anadilinizde okumayı sevdiğiniz konular:

- Kendi anadilinizde okumayı sevdiğiniz yazı tipleri (Örneğin: Roman, Makale, Biyografi, Şiir):

- İngilizce okuma yaparken tercih ettiğiniz konular:

- İngilizce okuma yaparken tercih ettiğiniz yazı tipleri (Örneğin: Short stories, Argumentative essays, News reports):

- Okuma hızı tercihi: [ ] Yavaş [ ] Orta [ ] Hızlı
- Okuma yöntemi tercihi: [ ] Ekran üzerinden [ ] Kitap üzerinden [ ] Hem ekran hem kitap
- Okumalarınızı genellikle hangi cihaz üzerinden gerçekleştiriyorsunuz? (Örneğin: Akıllı telefon, Tablet, Bilgisayar)

1

Teknoloji Kullanımı:

- Hangi marka ve modelde mobil cihaz(lar) kullanıyorsunuz?
- En sık kullanılan mobil uygulamalar:

- Bu uygulamaları ne sıklıkla kullanıyorsunuz?

- Günlük internet kullanım süresi (saat olarak):
- Günlük hayatınızda akıllı telefon mu, tablet mi, yoksa diz üstü bilgisayar mı daha sık kullanıyorsunuz?

- Hangi tür mobil uygulamaları kullanırken en fazla zaman geçiriyorsunuz? (Örneğin: Sosyal medya, Haber, E-kitap okuma uygulamaları, vb.)

- İngilizce eğitiminizi destekleyici uygulamalar kullanıyor musunuz? [ ] Evet [ ] Hayır
- Eğer evet ise, hangi uygulamaları ne sıklıklıkla kullanıyorsunuz? (Örneğin: Duolingo, Babbel, Quizlet, vb.)

- Eğer evet ise, bu uygulamalarla ne tür içerikler çalışıyorsunuz? (Örneğin: Sözcük bilgisi, Dilbilgisi, Dinleme, Konuşma pratiği, vb.)

- NaturalReaders uygulamasını duydunuz mu? [ ] Evet [ ] Hayır
- Eğer evet ise, kullandınız mı? [ ] Evet [ ] Hayır
- Eğer kullandıysanız, hangi cihaz(lar) üzerinden kullandınız? (Örneğin: Akıllı telefon, Tablet, Bilgisayar)

- Eğer kullandıysanız, hangi amaçla kullandınız?

- Eğer kullandıysanız, uygulama hakkındaki görüşleriniz nedir?

Yabancı Dil Bilgisi:

- Kaç yıldır İngilizce öğreniyorsunuz?

- İngilizce dil becerilerinizi 1 çok kötü ve 5 çok iyi olacak şekilde değerlendiriniz.

	1	2	3	4	5
Okuma					
Yazma					
Dinleme					
Konuşma					

- Bildiğiniz başka yabancı diller varsa, kaç yıldır öğreniyorsunuz?

_____

- Bildiğiniz başka yabancı diller varsa, dil becerilerinizi 1- çok kötü 5- çok iyi olacak şekilde değerlendiriniz.

Bildiğiniz yabancı dil (varsa): _____

	1	2	3	4	5
Okuma					
Yazma					
Dinleme					
Konuşma					

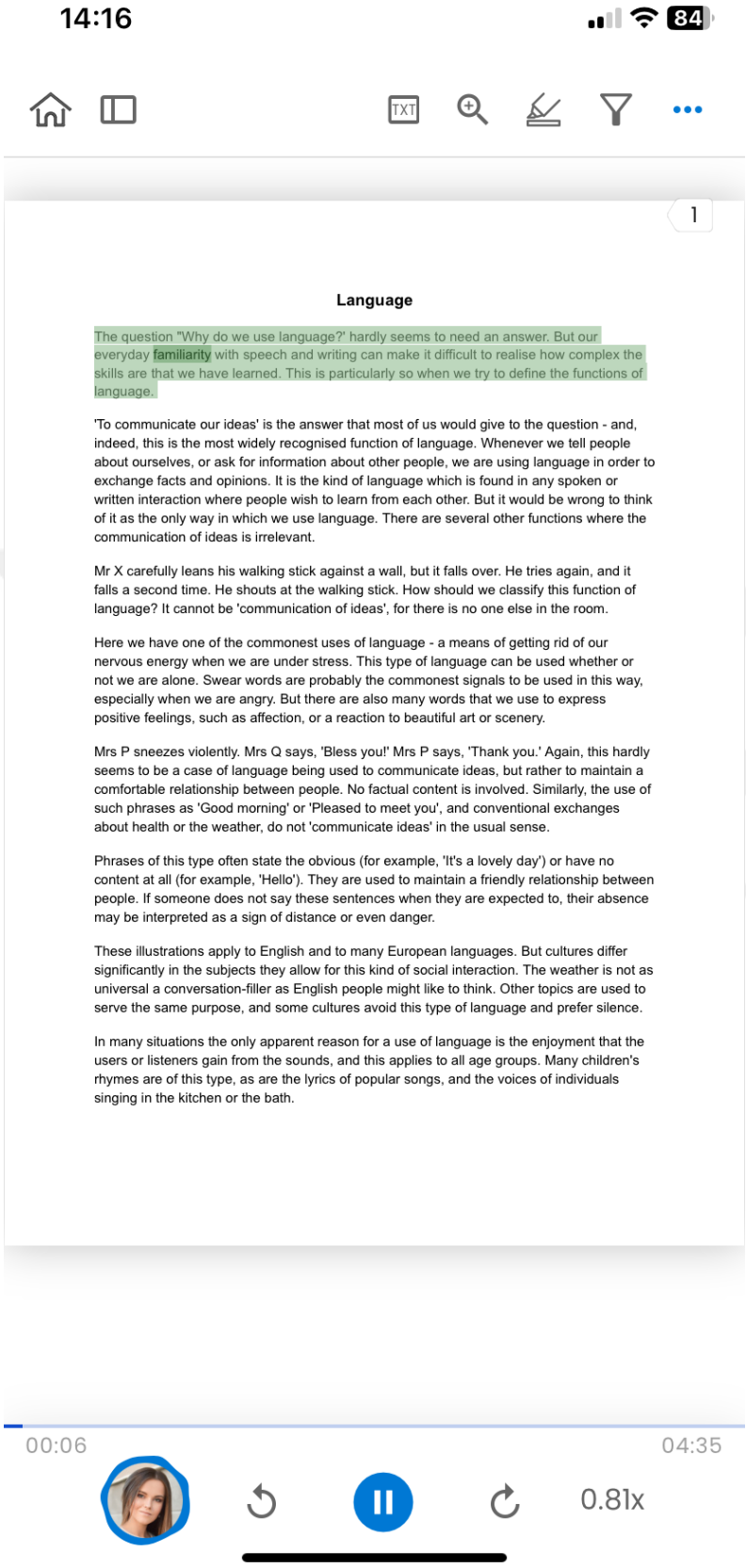
Bildiğiniz diğer yabancı dil (varsa): _____

	1	2	3	4	5
Okuma					
Yazma					
Dinleme					
Konuşma					

3

Appendix 5. PDF and Application Interface Screenshots




14:16
84
TXT
1
Language
The question "Why do we use language?' hardly seems to need an answer. But our everyday familiarity with speech and writing can make it difficult to realise how complex the skills are that we have learned. This is particularly so when we try to define the functions of language.
'To communicate our ideas' is the answer that most of us would give to the question - and, indeed, this is the most widely recognised function of language. Whenever we tell people about ourselves, or ask for information about other people, we are using language in order to exchange facts and opinions. It is the kind of language which is found in any spoken or written interaction where people wish to learn from each other. But it would be wrong to think of it as the only way in which we use language. There are several other functions where the communication of ideas is irrelevant.
Mr X carefully leans his walking stick against a wall, but it falls over. He tries again, and it falls a second time. He shouts at the walking stick. How should we classify this function of language? It cannot be 'communication of ideas', for there is no one else in the room.
Here we have one of the commonest uses of language - a means of getting rid of our nervous energy when we are under stress. This type of language can be used whether or not we are alone. Swear words are probably the commonest signals to be used in this way, especially when we are angry. But there are also many words that we use to express positive feelings, such as affection, or a reaction to beautiful art or scenery.
Mrs P sneezes violently. Mrs Q says, 'Bless you!' Mrs P says, 'Thank you.' Again, this hardly seems to be a case of language being used to communicate ideas, but rather to maintain a comfortable relationship between people. No factual content is involved. Similarly, the use of such phrases as 'Good morning' or 'Pleased to meet you', and conventional exchanges about health or the weather, do not 'communicate ideas' in the usual sense.
Phrases of this type often state the obvious (for example, 'It's a lovely day') or have no content at all (for example, 'Hello'). They are used to maintain a friendly relationship between people. If someone does not say these sentences when they are expected to, their absence may be interpreted as a sign of distance or even danger.
These illustrations apply to English and to many European languages. But cultures differ significantly in the subjects they allow for this kind of social interaction. The weather is not as universal a conversation-filler as English people might like to think. Other topics are used to serve the same purpose, and some cultures avoid this type of language and prefer silence.
In many situations the only apparent reason for a use of language is the enjoyment that the users or listeners gain from the sounds, and this applies to all age groups. Many children's rhymes are of this type, as are the lyrics of popular songs, and the voices of individuals singing in the kitchen or the bath.
00:06
04:35
0.81x

Appendix 6. Multiple Choice Tests

Test 1

Name-Surname: **...../...../2024**

Reading Comprehension Test
"Language"

1. What is the primary focus of the text?

A) The complexity of language skills
B) The cultural differences in language usage
C) The various functions of language
D) The importance of language in maintaining social relationships

2. What is the author's perspective on the use of language in social interaction?

A) The absence of conventional phrases may signal distance or danger.
B) Language is primarily used for exchanging factual information.
C) Social exchanges in language are universal across cultures.
D) Enjoyment gained from language is limited to children's rhymes.

3. How does the author classify the function of language when Mr. X shouts at his walking stick?

A) Communication of ideas
B) Social interaction
C) Expression of nervous energy
D) Expression of positive feelings

4. Which statement cannot be inferred from the text?

A) Language can be used as a means of releasing nervous energy, especially when under stress.
B) Language serves primarily to maintain social relationships rather than communicate ideas.
C) Cultural differences influence the topics used for social interaction through language.
D) Language can be used purely for the enjoyment of sounds.

5. What conclusion can be drawn about the role of language in expressing emotions?

A) Language is primarily used for exchanging factual information rather than expressing emotions.
B) Cultural differences do not affect the way emotions are expressed through language.
C) Expressing emotions through language is a rare occurrence and is not culturally influenced.
D) Language serves as a means to express both positive and negative emotions.

Write your chosen options in the table provided below.

1.	2.	3.	4.	5.

Answer Key: C - A - C - B - D

Test 2

Name-Surname: **...../...../2024**

Reading Comprehension Test
"Time"

1. What is the primary focus of the text?

A) The history of time measurement devices
B) The significance of time management in daily routines
C) The transition from natural to artificial time indicators
D) The standardisation of time in Britain

2. What is the author's perspective on the transition to standardised time in Britain?

A) Standard time was unnecessary and caused inconvenience.
B) Standard time became essential due to advancements in communication and transportation.
C) The standardisation of time was a simple and fast process.
D) The use of local time persisted despite efforts to standardise it.

3. How did the Liverpool and Manchester Railway company attempt to address the issue of time standardisation in 1845?

A) They petitioned Parliament to introduce standardised time across Britain.
B) They implemented their own local timekeeping system.
C) They developed advanced timekeeping devices for their trains.
D) They initiated a campaign to promote the importance of accurate timekeeping.

4. Which statement cannot be inferred from the text?

A) Before the advent of modern timekeeping devices, natural phenomena such as the movement of the sun and seasons were relied upon for measuring time.
B) The rise of railways and telegraph communication led to an increased demand for accurate timekeeping.
C) Sand timers and candles were highly accurate timekeeping devices.
D) The use of local time persisted in Britain until the late 19th century, causing significant inconveniences for various organisations.

5. What conclusion can be drawn about the impact of railway operations on time standardisation?

A) Railway companies were resistant to adopting standardised time.
B) Railway operations were a key factor behind the adoption of standardised time.
C) Railway timetabling was unaffected by differences in time measurement.
D) Railway operations had little influence on the standardisation of timekeeping.

Write your chosen options in the table provided below.

1.	2.	3.	4.	5.

Answer Key: D - B - A - C - B

Test 3

Name-Surname: **...../...../2024**

Reading Comprehension Test
"In-Store TV"

1. What is the primary focus of the text?

A) The impact of in-store TV on customer experience
B) The evaluation of advertising strategies in retail stores
C) The history of television advertising
D) The comparison between in-store TV and regular television

2. What is the author's perspective on in-store TV?

A) In-store TV is an unnecessary expense for retailers.
B) In-store TV is ineffective in attracting customers.
C) In-store TV can be beneficial if tailored correctly to the shopping environment.
D) In-store TV should focus solely on broadcasting advertisements.

3. How has in-store TV evolved over the years according to the text?

A) It has become more intrusive, leading to a decline in customer satisfaction.
B) Advertisers have become more skilled at tailoring ads to the shopping environment.
C) In-store TV has shifted away from playing continuous ads to showing editorial content.
D) Manufacturers have stopped using in-store TV due to its ineffectiveness.

4. Which statement cannot be inferred from the text?

A) In-store TV has become a common feature in supermarkets and department stores.
B) Ads with product information are more effective than those showing everyday life.
C) In-store TV ads need to be attention-grabbing to compete with the shopping environment.
D) Customers universally view in-store TV as a positive addition to their shopping experience.

5. What conclusion can be drawn about the impact of in-store TV on sales?

A) In-store TV has no noticeable effect on sales figures.
B) In-store TV has proven to be highly successful in increasing sales.
C) In-store TV only benefits retailers and not customers.
D) In-store TV is ineffective in reaching a mass audience compared to regular television.

Write your chosen options in the table provided below.

1.	2.	3.	4.	5.

Answer Key: A - C - B - D - B

Test 4

Name-Surname: **...../...../2024**

Reading Comprehension Test
"Plastic Bag"

1. What is the primary focus of the text?

A) The history of plastic bag usage since the 1970s
B) The efforts made by individuals to reduce plastic bag pollution.
C) Impact of plastic bags on wildlife and the environment
D) Statistics on the global consumption of plastic bags

2. What is the author's viewpoint regarding the impact of plastic bags?

A) The author believes that plastic bags have minimal impact on wildlife and the environment.
B) The author suggests that plastic bags should be banned completely to mitigate their harmful effects.
C) The author recommends using plastic bags responsibly without considering their environmental impact.
D) The author argues that plastic bags are a significant environmental problem that requires urgent action.

3. What consequence could individuals face for being caught in possession of a plastic bag in Himachal Pradesh, India?

A) A warning issued by local authorities
B) Seven years in jail and a £1000 fine
C) A small fine imposed by the government
D) Mandatory participation in environmental awareness programs

4. Which statement <u>cannot</u> be inferred from the text?

A) Plastic bags are a minor contributor to litter in the UK.
B) Plastic bags can have a devastating effect on wildlife, including marine animals and birds.
C) Taxes and regulations have been ineffective in reducing plastic bag usage in several countries.
D) The pollution impact of plastic bags is worsened by their mobility in the environment.

5. What conclusion can be drawn about the effectiveness of taxes on plastic bags?

A) Taxes on plastic bags have led to a significant reduction in their usage in several countries.
B) Taxes on plastic bags have been met with resistance from both industry and consumers.
C) Plastic bag taxes have primarily benefited retailers rather than consumers.
D) Plastic bag taxes have not consistently reduced plastic pollution as effectively as desired.

Write your chosen options in the table provided below.

1.	2.	3.	4.	5.

Answer Key: C - D - B - C - A

Appendix 7. Interview Questions

Questions for the Control Group:

1. How effective do you think the reading activities we completed over the 4 weeks were?

2. What sub-skills do you think are involved in foreign language reading? How can these skills be developed?

3. What is your opinion on using single-mode reading (reading the text only) to improve reading skills?

4. What were the most beneficial aspects of the reading activities we did over the 4 weeks? How did they help improve your reading skills?

5. What were the weakest aspects of the reading activities we did over the 4 weeks? What did you find most challenging?

6. Did the reading activities over the 4 weeks increase your motivation to read? Did you feel that you understood the text better?

7. Did the reading activities over the 4 weeks help improve any other language skills besides reading?

8. Do you have any suggestions for this research? What changes or improvements would you recommend?

Questions for the Experimental Groups:

1. How effective do you think the reading activities we completed over the 4 weeks were?

2. What sub-skills do you think are involved in foreign language reading? How can these skills be developed?

3. What is your opinion on using "Natural Reader" to improve reading skills?

4. What were the most beneficial aspects of using "Natural Reader"? Which features did you find most helpful?

5. What were the weakest aspects of using "Natural Reader"? What did you find most challenging?

6. Did using "Natural Reader" increase your motivation to read? Did you feel that you understood the text better?

7. How would you compare the effectiveness of using "Natural Reader" to single-mode reading (reading the text without audio)?

8. Have any of your other language skills, besides reading, improved with the use of "Natural Reader"?

9. Do you plan to use "Natural Reader" to improve your reading or other language skills in the future?

10. Do you have any suggestions for this research? What changes or improvements would you recommend?