REVIEW STUDY

Technology in English vocabulary instruction for K-12: A systematic literature review

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Abstract

Recognizing the crucial role of vocabulary knowledge in foreign language learning, this study conducts a systematic literature review, analyzing 21 theses from the Turkish Council of Higher Education's (YÖK) National Thesis Center from 1990 to 2020, following PRISMA guidelines and What Works Clearinghouse standards, on the integration of technology in English vocabulary instruction across the K-12 education. The study examines the levels, types, benefits, and limitations of technologies used in vocabulary instruction in the determined theses. The findings indicate that theses have explored the use of technological tools such as software applications, mobile apps, and Web 2.0 tools in K-12 English education in Türkiye. These studies primarily concentrate on enhancing receptive vocabulary skills while neglecting productive skills, and are predominantly employed in high schools. Given the significant gaps in primary and middle schools, further research is recommended to explore and expand the use of these technologies to enhance both receptive and productive foundational skills in these educational stages.

Keywords
English language teaching,
Foreign language teaching,
K-12,
Systematic literature review,
Vocabulary teaching.

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Introduction

In Türkiye, despite national efforts to enhance foreign language proficiency, the country ranks 64th among 111 nations, indicating ongoing challenges in language education (EF Education First, 2022). The literature consistently points to deficiencies in Türkiye's foreign language education system (Aydın & Zengin, 2008; Can & Can, 2014; Koru & Akesson, 2011; Şahin & Aykaç, 2022), citing issues such as inadequate textbooks, curriculum gaps, and insufficient vocabulary knowledge as primary concerns (Çatal et al., 2018; Özer & Akay, 2022). Furthermore, despite evidence stressing the importance

of vocabulary for effective communication, there is a strong pedagogical emphasis on grammar over vocabulary, often reflecting traditional teacher preferences rather than curricular requirements. Perceptions of Turkish students also show that non-native English-speaking teachers frequently resort to Turkish and are grammar and textbook-dependent, which limits creativity (Karakaş et al., 2016). The ability to select contextually appropriate words often preserves communication more effectively than grammatical accuracy alone, yet vocabulary instruction remains underemphasized (Barcroft, 2016; De Groot & Van Hell, 2005). Similar to global trends, vocabulary teaching in Türkiye struggles with creating unique, level-appropriate content and effectively implementing teaching strategies, which hinders vocabulary instruction (Çelik & Yavuz, 2018; Yolcu & Akçayoğlu, 2022). Enhancing vocabulary teaching strategies and incorporating technology could significantly improve the effectiveness of foreign language education in Türkiye.

Vocabulary knowledge is essential for enhancing language skills and effective communication, with studies indicating that technology-supported teaching is more effective than traditional methods (Bal, 2018; Salman & Akay, 2022). The term ‘word’ has various definitions. Matthews (1997) defines it as the smallest meaningful unit, while Vygotsky (1986) views it as a mirror of human consciousness. Vocabulary, which includes words, idioms, and proverbs, is the core of both expressing ideas and understanding others (Joffe & Lowe, 2023). This foundation is crucial for clear communication, literacy, and academic success (Qian & Lin, 2020). Extensive vocabulary knowledge, which includes the form, meaning, and usage of words such as spelling, pronunciation, and syntax (Nation, 2001; Read, 2004), is linked to improved comprehension and expression (Zwier & Boers, 2022) and is associated with enhanced writing (Stæhr, 2008) and communication capabilities (Khan et al., 2018). The breadth and depth of vocabulary knowledge, crucial for bridging cultural gaps and enhancing personal and academic achievements, reflect the range of known words and the depth of their meanings and uses (Anderson & Freebody, 1981; Marzban & Hadipour, 2012) and supporting language success (Macis et al., 2018; Webb & Nation, 2017). In conclusion, vocabulary development should be prioritized due to its significant role in improving communication skills and facilitating language learning in the target language.

Krashen's Input Hypothesis (1982) suggests that learners acquire language most effectively when exposed to comprehensible input that is slightly above their current proficiency level. In terms of vocabulary learning, this implies that encountering language that is appropriately challenging can significantly aid in vocabulary expansion. Building on this idea, Vygotsky's Sociocultural Theory (1978) emphasizes the importance of social interaction and cultural context in the learning process. By introducing the concept of the Zone of Proximal Development (ZPD), Vygotsky stresses how learners can achieve more when supported through collaboration and guidance. These complementary theories indicate that meaningful engagement with language, combined with feedback and peer collaboration, leads to more effective language learning. In this context, Technology-Enhanced Language Learning (TELL) aligns well with these principles, as it provides digital tools such as language apps, online forums, and interactive software that facilitate interaction and deliver comprehensible input (Ma, 2017). As a result, these approaches demonstrate the potential of technology to enhance not only vocabulary acquisition but also overall language development.

Since the 1960s, technology has dramatically transformed language teaching, beginning with mainframe computers that applied behaviorist methods like the Audiolingual Method, providing tailored multimedia inputs and immediate feedback (Beatty, 2010; Butler-Pascoe, 2011). Moving into the 1970s, there was a noticeable shift towards Computer-Supported Language Learning (CSLL), adopting communicative approaches with interactive tools such as language games (Warschauer, 1996). By the 1990s, CSLL expanded to include constructivist methods and multimedia resources, enhancing real-world communicative skills (Warschauer & Healey, 1998). The 21st century brought the integration of smart devices and Web 2.0 technologies, further advancing CSLL through interactive platforms, making learning more engaging (Beatty, 2010). Today, Mobile-Assisted Language Learning (MALL) uses portable devices to allow learning anytime and anywhere, significantly improving language skills (Burston, 2015; Kukulska-Hulme & Shield, 2008). In this context, Basal et al. (2016) note that well-designed mobile apps can effectively enhance vocabulary teaching. On the other hand, Karakas and Kartal (2020) found that English teacher candidates prefer apps that facilitate listening and watching due to their access to authentic materials, although they generally demonstrated low familiarity and usage of these apps. Despite facing

challenges such as financial and technical barriers and the need for ongoing teacher training (Burston, 2014; Ko, 2019), technological advancements continue to enrich personalized learning and extend global access to language education. This overview demonstrates how technology has transformed language learning, guiding the focus of the research on evaluating the use of technology in teaching English vocabulary through postgraduate research in Türkiye.

This study systematically examines theses on the application of technology in teaching English vocabulary in Türkiye, aiming to identify the technologies and tools used, along with their advantages and limitations. Addressing these challenges is key to enhancing the effectiveness of language teaching in Türkiye, with the potential to shift the focus from a predominant emphasis on grammar to a more balanced approach that improves comprehensive language skills. The central aspect of this research is the role of technology and digital tools in overcoming these challenges and filling the gaps in English vocabulary teaching in Türkiye. The study specifically explores how these technologies are implemented in K-12 English vocabulary instruction. The following research questions guided the current study:

- What are the trends in theses written on technologies and tools used in teaching English vocabulary at the K-12 levels in Türkiye?
- What technologies and tools are used for English vocabulary teaching at K-12 levels in Türkiye?
- What are the advantages of the technologies and tools used for English vocabulary teaching at K-12 levels in Türkiye?
- What are the limitations of the technologies and tools used for English vocabulary teaching at K-12 levels in Türkiye?

Methodology

Research Design

In this study, a systematic literature review was utilized to answer the research questions, adhering to predefined scientific methods to minimize bias, regardless of the designs of the studies involved (Petticrew & Roberts, 2006). Systematic reviews offer

several advantages over individual studies, which may have flaws in design, implementation, or reporting that could lead to erroneous conclusions. By examining multiple studies, systematic reviews provide a more comprehensive and robust framework, facilitating easier access to information for decision-makers and practitioners compared to sourcing and analyzing individual studies (Gough et al., 2012).

In this systematic review, only theses were included due to their comprehensive and in-depth content. These documents offer detailed methodologies, extensive literature reviews, and thorough discussions, which makes them valuable for exploring vocabulary instruction in English language teaching. Additionally, theses are easily accessible through the Turkish Council of Higher Education (YÖK) National Thesis Center electronic database, ensuring a systematic and replicable data collection process, especially when peer-reviewed articles may not be as easily accessible.

To ensure the accuracy and transparency of the review process, established steps in conducting a systematic literature review were followed. These steps included formulating the research questions, creating a conceptual framework, determining inclusion and exclusion criteria, developing a search strategy, conducting a comprehensive search for relevant studies, screening and selecting studies, assessing the quality of the studies, extracting data, synthesizing the data, and reporting the findings (Newman & Gough, 2020). In the initial phase of the research, research questions were defined, and a conceptual framework was established. Deciding on the target audience, practices, and expected impacts of the research facilitated the design and methodology of the study (Gough et al., 2012). Subsequently, criteria were established to determine which studies would be included or excluded. These criteria included the year of thesis publication, the educational level, focus on English vocabulary teaching, and availability in the YÖK National Thesis Center database.

Following the establishment of criteria, a search strategy was developed, which Gough et al. (2012) identify as crucial for successful systematic literature reviews due to its strong information management. During this phase, keywords, operators, timing, and results were recorded in a search log. Duplicate references from searches using different keywords were noted. After removing duplicates, predetermined inclusion and exclusion criteria were applied to identify relevant studies, which were then coded into

a different database. The coding included details such as the researcher's name, publication year, type of publication, educational level, class level, research design, number of participants, duration of the application, technology used, and quantitative and qualitative findings.

Following the coding phase, the quality of the studies to be included in the review was assessed. Newman and Gough (2020) caution that publication after peer review does not guarantee the quality of a study, necessitating a critical evaluation across several dimensions. The first dimension involves assessing the suitability of the design of the selected studies to ensure it aligns with the research questions. The second dimension checks the correct application of the research methods. The third dimension determines whether the chosen studies contribute to answering the research questions set by the systematic literature review (Gough, 2007). Moreover, the systematic review's research questions and scope must be considered in the quality assessment (Valentine, 2019).

Given that the research questions and scope of this study pertain to the field of educational sciences, the included studies were evaluated based on the criteria established by the What Works Clearinghouse (WWC) (Gough et al., 2012), an initiative of the U.S. Department of Education's Institute of Education Sciences aimed at identifying effective educational interventions and sharing them with stakeholders (What Works Clearinghouse, 2022). The evaluation framework was developed by reviewing the WWC's Procedures and Standards Handbook (What Works Clearinghouse, 2022) and the Evidence Review Protocol for Interventions for English Learners (What Works Clearinghouse, 2020). During the assessment, it was determined that one study (see the appendix) was design-based and did not meet the research design criteria outlined in the guide; therefore, it was not included in the analysis.

The qualitative assessment criteria for research studies are divided into five categories: General, Design, Population, Intervention, and Outcome Eligibility. These categories align with the standards of the American Institutes for Research's What Works Clearinghouse. General Eligibility ensures the research is accessible, complete, and published within the last 20 years. Design Eligibility requires the study to be either fully experimental or quasi-experimental. Population Eligibility assesses if the study

targets English language learners, occurs in a K-12 setting, and is conducted within formal or non-formal educational contexts. Intervention Eligibility checks for the inclusion of educational practices, products, policies, or programs. Lastly, Outcome Eligibility focuses on studies that measure language skills outcomes, particularly vocabulary (What Works Clearinghouse, 2020).

By evaluating research studies based on these WWC criteria, we ensure that they meet the necessary standards for validity and relevance. Each category addresses a critical component of the research, from its accessibility and completeness to its design, participant population, intervention, and outcomes. This thorough evaluation process helps select studies that are methodologically sound and pertinent to the field of education.

Following the evaluations, data from the included studies, such as methods, participant characteristics, and findings, were detailed in tables for clarity. Graphs were also created to facilitate easier examination and interpretation of the data. Thematic analysis was used to summarize and categorize the findings (Gough et al., 2012). Thematic analysis in this study involved a structured process to analyze qualitative data from the selected theses systematically. Initially, all theses were thoroughly reviewed to develop a deep familiarity with the content regarding the research questions. Before bringing codes together into broader themes, the two researchers independently conducted the initial coding of each thesis. They identified and assigned codes to meaningful segments of text based on their relevance to key focus areas, such as types of technologies, educational outcomes, and limitations. After completing their independent coding, the researchers came together to compare their codes, discuss any differences, and resolve them collaboratively to ensure coding reliability. This approach helped consolidate the codes into broader themes like “Learning Outcomes,” “Beneficial Features of Technologies,” and “Limitations”. In the final stage, themes were interpreted and reported in the results section.

To ensure the reliability of these stages and the applicability of the results by decision-makers, as well as the repeatability or updatability of the research by different researchers, it was necessary to report the systematic literature review process (Page et al., 2021). Therefore, this research employed the PRISMA protocol, a widely accepted guideline in academia, which enhances the transparency, completeness, and replicability

of the review process (Page et al., 2021). A detailed process was followed to identify, select, and analyze studies related to the research questions using the PRISMA protocol. A comprehensive search was conducted in the designated database, studies were selected based on pre-determined inclusion and exclusion criteria, and detailed analysis was conducted to obtain the data. Researcher triangulation (Denzin, 2015) was applied to enhance the reliability of the data and findings, with two researchers of different experiences reviewing the coding and categorization processes. Finally, the findings were synthesized.

These methods, based on the PRISMA protocol, enhance the reliability of the findings. The comprehensive database search, adherence to inclusion and exclusion criteria, and detailed data analysis all contribute to the credibility of the results. During the quality assessment phase, the WWC criteria—an initiative aimed at identifying effective research—provided the criteria for evaluating the studies included in this dataset. The evaluation framework was based on the WWC's Procedures and Standards Handbook and the Evidence Review Protocol for Interventions for English Learners. This systematic methodological approach demonstrates the researcher's diligence in maintaining specific standards.

Data Set

This study examines 21 theses (19 master's and 2 doctoral) from the YÖK National Thesis Center in Türkiye, focusing on the use of technology in teaching English vocabulary at the K-12 level. These theses, written in Turkish and English, were selected based on specific criteria and span from 1990 to 2022. The search was conducted on April 17, 2023.

Of the 21 theses, 71.4% were conducted in public schools, while 28.6% were in private schools. Specifically, 68.4% of the master's theses and all the doctoral theses were conducted in public schools. Three master's theses did not specify the school type but were later identified as public. The studies included 2 at the primary school level, 8 at the middle school level, and 11 at the high school level. Most primary and high school studies were in public schools, with a few in private schools. Middle school studies covered grades 5 through 8, with one study in a private school at grade 7. One high school study focused on 15-17-year-olds in a private school.

Data Collection

In order to access theses relevant to the research topic and questions, the researchers identified various keywords. Due to the limited search options provided by the general search engine in the database and the lack of support for using logical operators, the selected keywords were used in the search engine under the advanced search tab. In this tab, after entering the words to be searched into the appropriate boxes, the field was chosen as the thesis title and the search type as "include in." The keywords used in the screening are provided in Table 1.

Table 1.

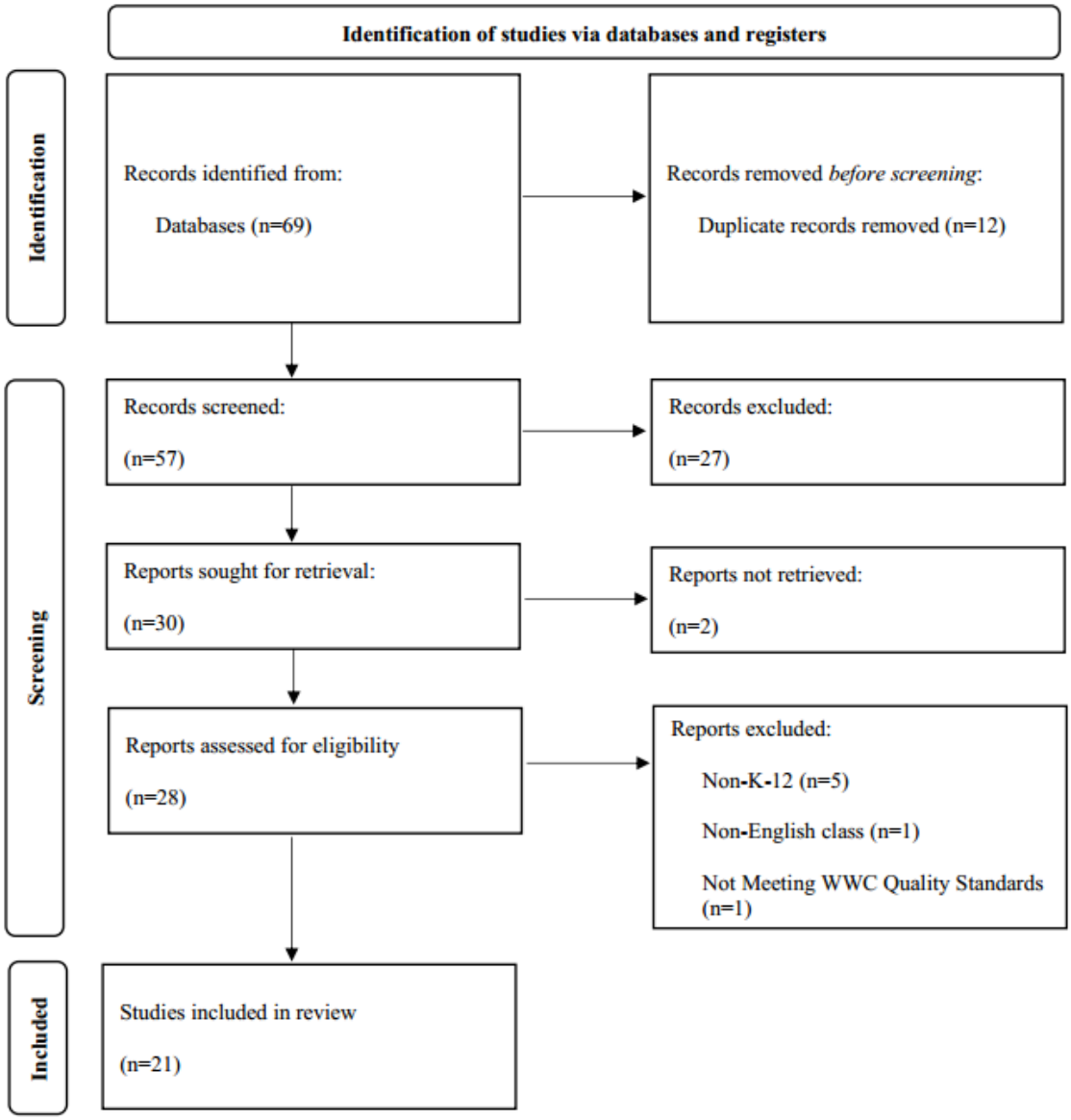
Keywords used in the screening

vocabulary teaching AND technology	vocabulary learning AND digital
vocabulary teaching AND software	vocabulary learning AND mobile
vocabulary teaching AND mobile	vocabulary learning AND computer
vocabulary teaching AND computer	vocabulary learning AND tool
vocabulary teaching AND tool	vocabulary learning AND application
vocabulary teaching AND device	vocabulary learning AND technology
vocabulary teaching AND application	vocabulary learning AND device
vocabulary teaching AND digital	

As a result of the screening, information on a total of 69 studies was accessed. Since similar keywords were used for screening, a review was conducted to detect duplicate studies. Following the detection of duplicates, 57 studies remained for title and abstract review. After reviewing the titles and abstracts, studies conducted outside the K-12 level and in languages other than English were excluded, leaving 30 theses for full-text review. Two theses that were not electronically accessible were removed from the review scope for the purpose of full-text review. Considering the exclusion criteria, the full-text review excluded five studies conducted outside the K-12 level and one study conducted in a language other than English, thus including 22 theses in the quality assessment. The quality assessment of these studies was conducted according to WWC criteria, and as a result of this assessment, one thesis was found unsuitable and removed from the research. Data analysis was conducted with the remaining 21 theses (see the appendix). The data collection process is shown in Figure 1.

Figure 1

Steps of PRISMA 2020 protocol



Data Analysis

To carry out the systematic literature review, criteria for including and excluding studies were established based on factors such as the publication year of the thesis, the educational level of the subjects, the focus on English vocabulary teaching, and their availability in the YÖK National Thesis Center Database. Following this, a comprehensive search strategy was devised using specific keywords, and the search was executed on April 17, 2023, using the advanced search interface of the database. Once

relevant studies were identified, they were meticulously coded into an Excel database, which cataloged descriptive information, details, and findings from each study. The quality of these studies was rigorously evaluated against the standards set by the WWC, ensuring only the most credible studies were included.

The synthesis and analysis process involved tabulating data like methods, participant characteristics, and findings, which were thoroughly analyzed and presented in the results section. This process was vital for generating reliable evidence to aid decision-making. A narrative synthesis was then employed, where details of the included studies were systematically categorized and analyzed, allowing for an integrated understanding of the research topic. Thematic analysis was used to identify significant themes and concepts across different studies, enhancing the coherence and depth of the findings. According to Gough et al. (2012), detailed coding of practices and contexts is essential for the reliability of the evidence provided. Moreover, narrative synthesis aids in integrating findings from different studies coherently, as described by Popay et al. (2006), and involves thematic analysis to identify recurring or significant themes within different study categories (Petticrew & Roberts, 2006; Popay et al., 2006). To ensure the validity and reliability of the entire process, the PRISMA protocol was adhered to, and researcher triangulation was utilized, promoting transparency, completeness, and the reproducibility of the research compilation.

Throughout the research, a comprehensive data search process was followed. This process involved conducting extensive searches in the database, selecting studies based on predefined inclusion and exclusion criteria, and thoroughly analyzing the data. All these procedures enhance the reliability and applicability of the research findings. An Excel table was prepared to facilitate the analysis process and ensure quality assessment, incorporating details including author, year, thesis title, type of thesis, type of school, educational level, grade level, sample size, duration of application, research design, technologies and tools, quantitative findings, and qualitative findings.

Findings

Trends in theses written on technologies and tools used in teaching English vocabulary at the K-12 levels in Türkiye

The distribution of theses related to the trends in the technologies and tools for teaching English vocabulary at K-12 levels in Türkiye has been analyzed over the years (Table 2). The analysis shows an increasing trend in theses about technology use in English vocabulary instruction at K-12 levels, peaking in 2019 (*n* = 5) followed by a decrease in 2021 (*n* = 4) and 2022 (*n* = 3). No theses were found before 2008, but five theses were published over eight years, from 2008 (*n* = 1), 2011 (*n* = 1), and 2015 (*n* = 3). In the six years from 2017 to 2022, 16 theses were published: 2017 (*n* = 2), 2018 (*n* = 2), 2019 (*n* = 5), 2021 (*n* = 4), 2022 (*n* = 3). Regarding educational levels, 52.4% of the research (*n* = 11) on technologies and tools used in English vocabulary instruction at K-12 levels was conducted in high schools, followed by middle schools with 38.1% ((*n* = 8), and primary schools with 9.5% (*n* = 2). In terms of vocabulary knowledge dimensions, 90.5% of the theses (*n* = 19) measured only receptive vocabulary knowledge, while 9.5% (*n* = 2) measured both receptive and productive vocabulary knowledge. From these results, it can be stated that receptive vocabulary knowledge was measured in 100% (*n* = 21) of the theses.

Table 2.

Distribution of theses on English vocabulary teaching technologies in k-12 by year and educational level

Year	Total theses	Primary school	Middle school	High school	Receptive vocabulary	Both receptive & productive vocabulary
2008	1	0	0	1	1	0
2011	1	0	1	0	1	0
2015	3	0	1	2	3	0
2017	2	0	1	1	2	0
2018	2	0	1	1	2	0
2019	5	0	2	3	4	1
2021	4	1	1	2	3	1
2022	3	1	1	1	2	1
Total	21	2	8	11	18	3

Technologies and tools that are used for English vocabulary teaching at K-12 levels in Türkiye

The study analyzed technologies and tools used in teaching English vocabulary at K-12 levels in Türkiye. Despite having 21 theses included in the research, the number of technologies mentioned reached 24, indicating that some featured multiple technologies or tools. The analysis revealed that 50% (n = 12) of the technologies studied were mobile applications. Following mobile apps, devices, learning objects, Web 2.0 tools, and software, each accounted for 12.5% (n = 3) of the technologies explored. Among mobile applications, Quizlet emerged as the most utilized, appearing in 58.3% of the theses, followed by Duolingo, Kahoot, Quizziz, Vocastyle, and WhatsApp, each at 8.3%.

In the device category, the analysis showed that smartphones, Kinect, and tablets were each featured in one thesis, making up 33.3%, respectively. For Web 2.0 tools, three theses were analyzed, which examined the use of Animaker, Padlet, Powtoon, Voki, and Wordwall. Similarly, three theses were analyzed in the software category, noting the use of Adobe Captivate, DENIS, Hot Potatoes, and Visual Basic as tools for teaching English vocabulary at K-12 levels.

Table 3.

Technologies and tools used in K-12 English vocabulary teaching in Türkiye

Technology Category	Specific Tools/Technologies	Total Theses
Devices	Mobile Phone, Kinect, Tablet	3
	Mobile Phone	1
	Kinect	1
	Tablet	1
Mobile Applications	Duolingo, Kahoot, Quizlet, Quizizz, Vocastyle, WhatsApp	12
	Duolingo	1
	Kahoot	1
	Quizlet	7
	Quizizz	1
	Vocastyle	1
	WhatsApp	1
Web 2.0 Tools	Animaker, Padlet, Powtoon, Voki, Wordwall	3

Technology Category	Specific Tools/Technologies	Total Theses
	Animaker	1
	Padlet	1
	Powtoon	1
	Voki	1
	Wordwall	1
Learning Objects	Not Specified	3
	Adobe Captivate, DENIS, Hot Potatoes, Visual Basic	3
	Adobe Captivate	1
Software	DENIS	1
	Hot Potatoes	1
	Visual Basic	1

The analysis of the distribution of mobile application usage over the years in teaching English vocabulary at K-12 levels has shown an increasing trend in the number of theses investigating this area. There were no theses on the effectiveness of mobile apps in this context until 2015, but by 2021, the number peaked at four theses. Similarly, an analysis of the usage of Web 2.0 tools over the years has indicated a recent increase in the number of theses. Before 2018, there were no theses specifically focused on this topic, but 2022 saw the highest number of theses written.

For device usage in teaching English vocabulary at K-12 levels, the distribution over the years shows that no theses met the criteria before 2011. However, studies started appearing with two theses published in 2015 and one in 2018, totaling three. The analysis of the usage of learning objects in the context of English vocabulary teaching at K-12 levels also shows a spread over the years. One thesis was published in 2008, 2011, and 2019, making a total of three. Finally, the analysis of software usage in teaching English vocabulary at K-12 levels also shows a distribution over several years. Theses were published in 2008, 2015, and 2019, each year contributing one thesis, totaling three.

Table 4

Yearly distribution of technologies and tools in K-12 English vocabulary teaching

Year	Mobile Apps	Web 2.0 Tools	Devices	Learning Objects	Software
2008	0	0	0	1	1
2011	0	0	1	1	0
2015	0	0	2	0	1
2018	0	0	1	0	0
2019	2	1	0	1	1
2021	4	0	0	0	0
2022	4	2	0	0	0

Advantages of the technologies and tools used for English vocabulary teaching at K-12 levels in Türkiye

The theses were analyzed in terms of the advantages of technologies and tools used in English vocabulary teaching at K-12 levels. As a result of the analysis, three main themes and sub-themes related to these themes were revealed. The main themes are *learning outcomes*, *measured vocabulary knowledge dimension*, and *beneficial features of technologies*. As shown in Table 5, the layout categorizes the learning outcomes into academic achievement and affective outcomes which are further detailed into motivation, positive experience, and perception of benefits. It also includes a measured vocabulary knowledge theme divided into receptive and productive vocabulary knowledge. Additionally, it outlines beneficial features of technologies that enhance learning, including portability, a variety of apps, multimedia capabilities like visuals and audio features, handwriting input, competitive and motivational elements like ranking systems, motivational music, timers, and a colorful interface.

Table 5

Themes, subthemes, and details of the advantages

Theme	Subtheme	Category/Detail
Learning Outcomes	Academic Achievement	
	Affective Outcomes	Motivation
		Positive Experience
		Perception of Benefits

Theme	Subtheme	Category/Detail
Measured Vocabulary Knowledge	Receptive Vocabulary Knowledge	
	Productive Vocabulary Knowledge	
Beneficial Features of Technologies		Portability
		Variety of Apps
		Multimedia (Use of and ability to add visuals, having a speaker)
		Handwriting Input
		Competitive and Motivational Elements (ranking system, motivational music, timer)
		Colorful interface

Learning Outcomes

Two subthemes have been identified under the main theme of learning outcomes as a result of analyzing theses published on the technologies and tools used in English vocabulary teaching at K-12 levels in Türkiye.

Academic Achievement

Regarding the subtheme of academic achievement, 20 theses have been examined. In 19 of these theses (Albayrak, 2015; Anlamış, 2018; Atalan, 2022; Bekar, 2019; Bilcan, 2019; Çaparlar, 2021; Çinar, 2019; Gelir, 2015; Gürkan, 2018b; Kılıç, 2019; Kocaman, 2015; Kurtoğlu, 2021; Özcan, 2017; Özer, 2017; Şahin, 2022; Salman, 2022; Söğüt, 2021; Yardım, 2011; Zengin, 2019), it has been found that the use of technology and tools in English vocabulary teaching at K-12 levels positively contributed to the development of students' vocabulary. In one study (Bayraktar, 2008), while the use of additional textual explanations in the native language in multimedia had a positive effect on the development of the group's vocabulary, the use of additional visuals in the native language, or additional textual or visual explanations in a foreign language, did not significantly contribute to the development of students' vocabulary.

In the analysis of 12 studies on mobile applications, it was found that 11 theses investigated the subtheme of academic achievement. In all these theses (Atalan, 2022; Bilcan, 2019; Çaparlar, 2021; Çinar, 2019; Gürkan, 2018b; Kılıç, 2019; Kurtoğlu, 2021;

Özcan, 2017; Özer, 2017; Salman, 2022; Söğüt, 2021), it was stated that mobile applications used in vocabulary instruction positively contributed to the development of students' vocabulary.

Çinar (2019) researched the impact of Quizlet on students' vocabulary learning. In a four-week study with 71 students at the 9th-grade level, an experimental and a control group were formed. The control group received vocabulary instruction as specified in the curriculum, whereas the experimental group used the Quizlet application for vocabulary studies before class, differing from the control group. At the end of four weeks, the results of the tests showed that the Quizlet group's achievement scores were significantly higher than those of the control group. Additionally, a retention test administered three weeks after the final test found that retention scores were significantly higher in favor of the experimental group.

Söğüt (2021) investigated the impact of MALL (Mobile Assisted Language Learning) on English vocabulary learning. In the eight-week study with 30 students from 7th and 8th grades, both the experimental and control groups were taught the curriculum in the same manner. Additionally, students in the experimental groups were asked to study specified topics on Duolingo outside of class regularly. According to the achievement test results, there was no significant difference between the pre-test and post-test scores of the control groups. In contrast, a significant positive difference was observed between the pre-test and post-test scores of the experimental groups.

All three studies (Bekar, 2019; Şahin, 2022; Salman, 2022) on Web 2.0 tools found that Web 2.0 tools enhanced students' vocabulary development in English vocabulary teaching at K-12 levels.

Bekar (2019) investigated the impact of digital storytelling on vocabulary learning and the retention of words. In the 11-week study with 28 third-grade students, words were taught through five digital stories created using the Animaker tool. The analysis at the end of the process indicated that digital storytelling positively affected students' vocabulary learning.

There are three theses (Albayrak, 2015; Anlamış, 2018; Gelir, 2015) focusing on the use of devices. All studies showed that using devices in English vocabulary teaching at K-12 levels positively impacted students' vocabulary learning.

Gelir (2015) researched the effectiveness of tablet computers in English vocabulary teaching. The four-week study involved 60 students from the 9th grade. Students in the experimental group watched videos on tablets, read texts, and completed various activities related to the target words. The control group, meanwhile, conducted their vocabulary studies through the textbook as specified in the curriculum. The analysis of the achievement scores between the experimental and control groups showed that the experimental group's scores were significantly higher.

An examination regarding the learning objects revealed three studies. Two of these (Yardım, 2011; Zengin, 2019) determined that the use of learning objects in English vocabulary teaching at K-12 levels positively contributed to students' vocabulary learning.

Three theses investigated the use of software. Two studies (Kocaman, 2015; Zengin, 2019) found that using software in English vocabulary teaching at K-12 levels provided positive contributions. However, another study (Bayraktar, 2008) indicated that three out of four different learning objects prepared using software did not contribute positively to vocabulary teaching. Kocaman (2015) investigated the impact of computer-assisted vocabulary teaching on vocabulary learning. In an 8-week study with 68 sixth-grade students, contents were used that had been prepared with DENIS software, explicitly developed for vocabulary teaching, and Hot Potatoes software. Analyzing the pre-test, mid-test, and post-test scores indicated that the software used significantly increased the students' vocabulary scores.

Affective outcomes

Regarding the subtheme of affective outcomes, 15 theses (Anlamış, 2018; Aslan, 2021; Atalan, 2022; Bilcan, 2019; Çaparlar, 2021; Çinar, 2019; Gelir, 2015; Kılıç, 2019; Kocaman, 2015; Kurtoğlu, 2021; Özcan, 2017; Özer, 2017; Şahin, 2022; Salman, 2022; Söğüt, 2021) have been examined. Three categories related to this subtheme have been identified: motivation, positive experience, and perception of benefits.

In the *motivation category*, there are 8 thesis studies (Anlamış, 2018; Bilcan, 2019; Çaparlar, 2021; Çinar, 2019; Gelir, 2015; Kocaman, 2015; Kurtoğlu, 2021; Şahin,

2022). All studies have indicated that using technology in English vocabulary teaching at K-12 levels motivates students and enhances their motivation for vocabulary learning.

Gelir (2015) studied the effectiveness of tablet computers in English vocabulary teaching, where ninth-grade students mentioned in interviews that the use of tablet computers increased their motivation for learning vocabulary. One student expressed, "Playing vocabulary games on a tablet computer is fun and motivating for me" (p.91). Another student mentioned, "Using a tablet computer has improved my vocabulary learning performance, and now I am more willing to undertake more vocabulary tasks on the tablet" (p.92).

In the *positive experience* category, there are 10 thesis studies (Atalan, 2022; Bilcan, 2019; Çaparlar, 2021; Çinar, 2019; Gelir, 2015; Kılıç, 2019; Kocaman, 2015; Kurtoğlu, 2021; Özer, 2017; Söğüt, 2021) mentioning the students' experiences being positive with the technology and tools used in English vocabulary teaching. These studies have shown that students have had positive experiences using the technologies.

Kurtoğlu (2021) conducted a five-week study with 29 seventh-grade students using the Quizlet and Kahoot applications for vocabulary teaching. After the application, students reported in interviews that the applications were easy to use. One student said about Kahoot, "Kahoot! is an easy application to use in the classroom because answering the questions is very easy" (p.77). Another student mentioned Quizlet: "I don't struggle using Quizlet. It has a simple interface" (p. 83).

In the *perception of benefits category*, there are 9 thesis studies (Anlamış, 2018; Atalan, 2022; Gelir, 2015; Kılıç, 2019; Kocaman, 2015; Kurtoğlu, 2021; Özcan, 2017; Şahin, 2022; Salman, 2022). In all studies, students have stated that they found the use of technology in English vocabulary teaching beneficial. In a study by Kocaman (2015), students found the DENIS software beneficial for vocabulary teaching. Students commented, "It was very beneficial for me. I loved the study. I wish it never ended" (p.98) and "I have improved my English vocabulary. My performance in English class has increased" (p.99).

In Özcan's (2017) thesis "The Use of Mobile Environment Software in Language Education: An Example of Collocational Vocabulary Teaching," students expressed that mobile applications were beneficial in language teaching. For example,

one student said, “We didn’t go into detail in the class, but I saw visually included words used in sentences in this application. It became more memorable” (p.76). Another student expressed, “It was more beneficial in terms of constructing sentences and learning how to use words” (p.77). Another student commented on using WhatsApp for vocabulary teaching, “I can look up forgotten words from my phone whenever and wherever I want” (p.78).

Measured Vocabulary Knowledge

The analysis of theses on technologies and tools used in English vocabulary teaching at K-12 levels in Türkiye has determined two subthemes related to the main theme of measured vocabulary knowledge.

Receptive Vocabulary Knowledge

All the theses included in the analysis (n = 21) measured receptive (passive) vocabulary knowledge in the tests applied while investigating the effectiveness of technology and tool use in English vocabulary teaching at K-12 levels. It was determined that in 9 of these theses (Anlamış, 2018; Aslan, 2021; Bayraktar, 2008; Çaparlar, 2021; Gelir, 2015; Kılıç, 2019; Kurtoğlu, 2021; Salman, 2022; Zengin, 2019), multiple-choice measurement tools were used to measure vocabulary knowledge. Söğüt (2021), in a study following an intervention, used a vocabulary achievement test that assessed the effectiveness of an application in English vocabulary teaching with question types, including matching visuals with words, writing the word shown in a visual, and selecting the correct word to fill in the blanks in sentences from multiple choices.

In his thesis, Yardım (2011) explored the effectiveness of computer-supported versus teacher-supported story narration in vocabulary teaching. He used tools in the pre-test and post-test, including visual and word matching, writing the word given with missing letters and visuals, and completing puzzles based on visuals. Bekar (2019) simplified the Vocabulary Knowledge Scale in his thesis, investigating the impact of digital storytelling on vocabulary learning and retention to measure whether students recognized the words.

Productive Vocabulary Knowledge

Upon examining the theses included in the analysis, it was found that both receptive and productive vocabulary knowledge was measured in 2 theses (Atalan, 2022; Özer, 2017). In these two studies investigating the use of the Quizlet application in English vocabulary teaching, forms were used that measured both receptive and productive vocabulary knowledge related to the spelling of words, as well as the grammatically correct usage of words in sentences. Students were asked to write the words they heard correctly to measure productive vocabulary knowledge related to spelling and to create new sentences using the given words correctly in a grammatical context.

Beneficial Features of Technologies

The analysis of 9 theses (Anlamış, 2018; Atalan, 2022; Çaparlar, 2021; Gelir, 2015; Kılıç, 2019; Kurtoğlu, 2021; Özcan, 2017; Özer, 2017; Salman, 2022) has shown that they describe the beneficial features of technologies and tools used in English vocabulary teaching at K-12 levels in Türkiye.

Özcan (2017) showed that mobile application software provides the ability to study anytime and anywhere due to its *portability*, and the use of visuals in applications was listed among its beneficial features. Students have commented on this topic: “The difference with these applications was the visuals included in vocabulary teaching.” (p.77), “The visuals had a positive effect.” (p.80), and “We can learn words better. It provides the opportunity to learn with visuals...” (p.81). Moreover, students mentioned the benefits of the portability of these technologies, saying, “With my phone, I have the opportunity to learn in any setting I want.” (p.82) and “We find opportunities to learn on our own, outside of the classroom, in any setting.” (p.82).

In Gelir’s (2015) study that examined the effectiveness of tablet computers in English vocabulary teaching, the beneficial features of tablet devices included the *variety of applications*, *handwriting input capability*, *portability*, and having a speaker. Regarding the handwriting recognition feature, a student stated, “Improved handwriting recognition features and the stylus help me write new words easily.” (p.84). Another student described the beneficial feature of the tablet device as “Being able to learn how a new word is pronounced is a great feature for me.” (p.85). Kurtoğlu (2021) compared the effects of Quizlet and Kahoot applications in English vocabulary teaching, noting

Kahoot's beneficial features as the ranking system, colorful interface, motivating music, and the competitive feeling created by the timer. The ability to add visuals was mentioned among the beneficial features of the Quizlet application.

A student commented on Kahoot's ranking system, "Seeing myself on the podium positively affected me." (p.76). Another student mentioned, "Kahoot! is preferred over word lists because it has motivating music and colorful options" (p.78), stressing the music and interface features. Another student spoke of the timer, "Kahoot! is useful because there is a time limit, competition, and fun." (p.80). Regarding the feature of adding visuals in Quizlet, a student remarked, "Effective visuals make it more memorable and better than memorizing words from word lists." (p.88).

Limitations of the technologies and tools used for English vocabulary teaching at K-12 levels in Türkiye

The limitations of the technologies and tools used in English vocabulary teaching at K-12 levels in Türkiyeare analyzed through theses. The analysis has revealed two main themes and associated sub-themes. The main themes identified are *learning outcomes*, and *the lacking features of technologies*. The subthemes are detailed under the main themes.

Table 6.

Subthemes and details of limitations of the technologies and tools

Theme	Subtheme	Category/Detail
Learning Outcomes	Limited Effectiveness	
	Neutral and Adverse Affective Outcomes	Student Boredom
		Dissatisfaction
		Demotivation
Lacking Features of and Limitations of Technologies		Lack of voice recording and speaking mode
		Not working without internet
		Device/screen freeze
		Poor sound output
		Touchscreen causing eye fatigue and not feeling like a physical keyboard

Theme	Subtheme	Category/Detail
		Lack of a developed spaced repetition technique
		Use of abbreviations not allowed

Learning Outcomes

Limited Effectiveness

This subtheme includes two thesis studies (Bayraktar, 2008; Özer, 2017). The studies show that using technology may offer benefits comparable to traditional methods without showing a substantial advantage, thus demonstrating their limited effectiveness.

Bayraktar (2008) explored the effect of using native language textual and visual explanations, as well as foreign language textual and visual explanations in multimedia-assisted reading texts on vocabulary learning. Seventy-nine eleventh-grade students were divided into four explanation groups, and the study lasted one lesson for each group. Comparing the pre-test and post-test results, a significant increase was noted only in the native language textual explanation group, favoring the post-test results. No significant difference was found between the pre-test and post-test scores within the other three groups. The result suggests that using native language textual explanations is more effective in enhancing vocabulary learning compared to other explanation types, indicating a potential limitation in the effectiveness of technology use in English vocabulary instruction.

Özer (2017) investigated the impact of mobile-assisted vocabulary learning on recall, using Quizlet for the experimental group and a vocabulary notebook for the control group. Conducted with 89 ninth-grade students, the study found significant differences between the pre-test, post-test, and retention test results for both interventions. However, there was no significant difference between the post-test and retention test scores of the two groups. The finding indicates that both mobile-assisted vocabulary learning using Quizlet and traditional vocabulary notebooks were effective for vocabulary recall, but neither method showed a significant difference in long-term retention between the groups. This suggests that while mobile tools can be as effective as traditional methods, they do not necessarily offer superior retention benefits.

Neutral and Adverse Affective Outcomes

Five studies (Atalan, 2022; Kocaman, 2015; Kurtoğlu, 2021; Salman, 2022; Zengin, 2019) discussing limitations under the neutral and adverse affective outcomes subtheme have been reviewed. Zengin (2019) applied an attitude scale in his study on the effects of educational computer games (experimental group) versus the traditional method specified in the curriculum (control group) on vocabulary teaching. The analysis of the results from the attitude scale showed no difference between the attitudes of the two groups, nor was a difference detected between the pre-test and post-test results of the experimental group. The result demonstrates that there was no significant difference in students' attitudes between those who used educational computer games and those who followed traditional methods. This suggests that educational games did not have a notable impact on students' attitudes toward vocabulary learning.

In one study, a student commented, "...but it was sometimes boring because we were repeating the words over and over again." (Kocaman, 2015; p.100), expressing boredom. Another study (Kurtoğlu, 2021) mentioned how the ranking system in the Kahoot app negatively impacted a student's motivation, stating, "I was disappointed when I couldn't see my name on the podium." (p.76). These observations suggest that repetitive vocabulary exercises can lead to boredom, and the ranking system in the Kahoot app could demotivate students, as a student expressed disappointment when they did not make it to the podium.

Four thesis studies (Atalan, 2022; Kocaman, 2015; Kurtoğlu, 2021; Salman, 2022) have discussed dissatisfaction. Kurtoğlu (2021) reported issues faced by three students using Kahoot for vocabulary teaching. Similarly, a student in a study by Kocaman (2015) mentioned finding the computer-assisted vocabulary teaching process exhausting (p.99). In a study by Salman (2022), students expressed difficulties with the mandatory membership for using Web 2.0 tools (p.70). The subtheme "Neutral and Adverse Affective Outcomes" shows the mixed emotional impacts of using various technologies in vocabulary teaching. This reveals that while technologies are often adopted to enhance vocabulary learning, their affective outcomes can be neutral or even negative. The reviewed studies demonstrate that the use of technologies, such as computer games and interactive apps, does not necessarily translate into positive

emotional engagement. Instead, they can lead to feelings of boredom, dissatisfaction, and demotivation among students. This stresses the importance of critically assessing the emotional and psychological effects of technologies.

Lacking Features and Limitations of Technologies

This section discusses the lacking features and limitations of technologies. Eight thesis studies (Atalan, 2022; Çaparlar, 2021; Çinar, 2019; Gelir, 2015; Kocaman, 2015; Kurtoğlu, 2021; Özcan, 2017; Salman, 2022) have indicated that there are features of the technologies and tools used in English vocabulary teaching at K-12 levels in Türkiye that need to be improved.

In a study investigating the impact of Quizlet on vocabulary teaching (Atalan, 2022), it was stated that adding a voice recording feature and developing the spaced repetition technique were necessary. Another study (Çaparlar, 2021) pointed out that the writing section of the app does not accept abbreviations, the matching of example sentences with visuals is not clear, and there is a lack of a feature for recording and improving pronunciation. One participant stated, “I would like to add a feature to Quizlet that allows me to record my pronunciation of words and example sentences and give us feedback on whether it is correct or not because there is no practice related to speaking.” (p.117), expressing a desire for the development of the application. These observations point out feature limitations and application-specific issues in Quizlet, suggesting a need for enhancements in its user experience and interface.

Çinar (2019) conducted a study where students suggested that Quizlet should work without an internet connection and include a speaking mode. In a thesis investigating the effectiveness of tablet computers in vocabulary teaching (Gelir, 2015), reported drawbacks by students included device and screen freezing due to poor hardware, poor sound output, the touch screen not providing a physical keyboard feel, and causing eye fatigue. These issues indicate hardware and performance problems as well as user experience limitations, pointing out the need for better device compatibility and more user-friendly features.

Other studies mentioned limitations such as the time counter in the Kahoot app making it difficult to focus on the questions (Kurtoğlu, 2021), encountering the same words repeatedly in the DENIS software being boring (Kocaman, 2015), problems with

internet access during the use of the WhatsApp application (Özcan, 2017), and the obligation to register to use Web 2.0 tools (Salman, 2022). These findings show user interface limitations and application-specific issues, indicating that design choices and technical requirements can negatively impact user experience.

Discussion

This in-depth analysis examined the trends, applications, and outcomes of using technology in teaching English vocabulary at K-12 levels in Türkiye. A systematic literature review of 21 theses from the period 2008 to 2022 demonstrates a significant trend: an increased reliance on technology post-2015, which represents 90.5% of the studies reviewed, indicating a pivot towards more digitally enhanced learning environments. This trend is further supported by findings from Dağdeler (2023), Dehghanzadeh et al. (2021), and Turan and Akdag-Cimen (2020), all of whom stress the effectiveness of technology in elevating student educational outcomes.

The majority of research focuses on high school settings (52.4%), with comparatively less attention to middle (38.1%) and elementary levels (9.5%). This pattern suggests a critical need to broaden technology integration into earlier educational stages to support foundational vocabulary skills. Parents ' concerns regarding the impact of technology on young children might be influencing this hesitancy (Atalan & Akgül, 2021; Auxier et al., 2020; Uçar, 2023).

The studies exclusively explored receptive vocabulary, with only 9.5% addressing productive vocabulary, possibly due to the complexities in assessing these skills. This observation is consistent with Uchihara and Saito (2019) and Read (2000) and aligns with Yang et al. (2021), which noted a similar focus in language studies. In the current research, despite a strong preference for mobile applications like Quizlet, which facilitate accessible learning (Kukulska-Hulme & Shield, 2008; Kukulska-Hulme, 2020), there is a notable underutilization of other technologies such as Web 2.0 tools and specific software.

While mobile apps and Web 2.0 tools like Animaker and Padlet have shown potential in enhancing interactive learning (Beatty, 2010; Ko, 2019), their adoption is

not as widespread as expected. This indicates a research gap and a practical disparity in the usage of various educational technologies, which could otherwise contribute to more engaging learning experiences (Başal & Gürol, 2014; Dos Santos, 2021). Therefore, further investigation into the barriers to widespread adoption and strategies to overcome these obstacles is essential to fully leverage the benefits of these technologies in educational settings.

Research indicates that technology use in vocabulary teaching not only improves achievement scores but also supports positive affective outcomes. Students report increased motivation and enjoyment in their learning experiences, supporting broader educational benefits (Golonka et al., 2014; Seibert Hanson & Brown, 2020; Zou et al., 2021). However, the repetitive nature of some content delivered via technological means can diminish the learning experience, pinpointing an area for improvement in how content is presented (Burston, 2015; Lin & Lin, 2019). Addressing this challenge could enhance the effectiveness of technology in education, making learning more dynamic and engaging.

In sum, while the increasing trend of technology use in English vocabulary teaching at the K-12 levels in Türkiye is evident, especially at the high school level, a critical need remains for more thorough research into effective use and broader application of technological tools. Addressing this gap could significantly enhance the vocabulary learning process across all educational levels. Therefore, it is imperative to develop targeted strategies that promote technology integration in a way that maximizes its impact on student learning outcomes.

Conclusions and Recommendations

Based on the systematic review of the theses, we suggest that technology has improved vocabulary acquisition and student engagement in English language learning at the K-12 levels in Türkiye. However, its application predominantly focused on receptive rather than productive vocabulary skills. This gap pinpoints a critical area for future educational technology deployment, emphasizing the need to balance both aspects of vocabulary learning to ensure comprehensive language development. Moreover, the review showed a notable increase in the use of technology to enhance vocabulary

acquisition at the K-12 levels in Türkiye, with a particularly strong focus on high schools. However, this emphasis demonstrates a significant gap in integrating and exploring technological tools in primary and middle school settings, where foundational language skills are crucial. To enhance vocabulary teaching, future research should focus on integrating technology at lower educational levels, emphasizing both receptive and productive skills. It is crucial to explore innovative technologies that engage students actively, going beyond mere passive learning. By doing so, we can bridge existing gaps and create effective language learning environments that prepare students for real-world communication.

Limitations

The emphasis on accessible theses from YÖK National Thesis Center overlooked relevant peer-reviewed studies that could provide additional insights. To address this limitation, future research should include peer-reviewed articles to offer a more balanced view of technology's role in vocabulary teaching. This broader analysis would help mitigate potential biases associated with relying solely on theses.

Ethics Committee Permission Information

This research was a systematic literature review and did not involve human participants. Accordingly, the study did not require approval from an ethics committee, as it exclusively involved the analysis of previously published data and did not include any direct human experimentation or intervention.

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APPENDIX

List of theses analyzed in the systematic literature review data set

1) Albayrak, M. Ş. (2015). Kinect kullanılan 3 boyutlu sanal gerçeklik uygulamalarının ilkokul öğrencilerinin yabancı dilde kelime öğrenimine etkisi (Publication No. 407086) [Master's Thesis, Fatih University]. YÖK National Thesis Centre.
2) Anlamış, Z. (2018). Cep telefonu destekli video kelime sunumlarının lise öğrencilerinin kelime öğrenmeleri ve materyal motivasyonları üzerine etkisinin incelenmesi (Publication No. 531194) [Master's Thesis, Mersin University]. YÖK National Thesis Centre.
3) Aslan, A. (2021). The effects of students' attitudes towards digital technology on English vocabulary learning via mobile devices (Publication No. 698735) [Master's Thesis, Yeditepe University]. YÖK National Thesis Centre.
4) Atalan, E. (2022). The use of Quizlet in teaching vocabulary to 9th grade EFL students (Publication No. 757619) [Master's Thesis, Anadolu University]. YÖK National Thesis Centre.
5) Bayraktar, S. (2008). The effectiveness of computer glosses on vocabulary learning. L1 or L2 glosses: With or without pictures? (Publication No. 229240) [Master's Thesis, Anadolu University]. YÖK National Thesis Centre.
6) Bekar, N. C. (2019). Exploring the effects of digital storytelling on young learners' motivation, vocabulary learning and retention in foreign language teaching (Publication No. 545761) [Master's Thesis, Çukurova University]. YÖK National Thesis Centre.
7) Bilcan, G. (2019). Learning vocabulary with a computer-based vocabulary flashcard tool in a Turkish EFL high school context (Publication No. 555123) [Master's Thesis, Anadolu University]. YÖK National Thesis Centre.
8) Çaparlar, İ. (2021). İngilizce kelime öğrenmede çevrimiçi uygulamaların etkileri ve öğrenen görüşleri: Quizlet uygulaması (Publication No. 687695) [Master's Thesis, Balıkesir University]. YÖK National Thesis Centre.
9) Çinar, İ. (2019). Quizlet çevrimiçi kelime uygulamasının ortaöğretim öğrencilerinin kelime öğrenmelerine ve İngilizce dersine yönelik tutumlarına etkisi (Publication No. 557345) [Master's Thesis, Eskişehir Osmangazi University]. YÖK National Thesis Centre.
10) *******Ergin, D. (2022). A suggested mobile vocabulary instruction application: WorDBook. (Publication No. 730063) [Master's Thesis, Selçuk University]. YÖK National Thesis Centre [This study was not included in the dataset because it did not meet the quality assessment criteria. Nitelik değerlendirme kriterlerine uymadığı için veri setine dâhil edilmedi].
11) Gelir, F. T. (2015). The effectiveness of using tablet computers in teaching vocabulary to Turkish EFL teenage students (Publication No. 412150) [Master's Thesis, Erciyes University]. YÖK National Thesis Centre.
12) Gürkan, S. (2018b). The effects of hypermedia annotation types and learning styles on mobile assisted vocabulary learning, recall and retention (Publication No. 497567) [Doctoral dissertation, Yeditepe University]. YÖK National Thesis Centre.
13) Kılıç, T. (2019). The impact of vocabulary learning strategies and computer assisted language learning on vocabulary development of Turkish high school students (Publication No. 555079) [Master's Thesis, Bahçeşehir University]. YÖK National Thesis Centre.
14) Kocaman, O. (2015). Effects of computer assisted vocabulary instruction on vocabulary learning and vocabulary learning strategies (Publication No. 384124) [Doctoral dissertation, Yeditepe University]. YÖK National Thesis Centre.
15) Kurtoğlu, U. (2021). Vocabulary teaching through Web 2.0 tools: A comparison of Kahoot! and Quizlet (Publication No. 705495) [Master's Thesis, Trakya University]. YÖK National Thesis Centre.
16) Özcan, M. S. (2017). Mobil ortam yazılımlarının dil eğitiminde kullanımı: Eşdizimsel kelime öğretimi örneği (Publication No. 488167) [Master's Thesis, Yıldız Teknik University]. YÖK National Thesis Centre.
17) Özer, Y. E. (2017). Mobile-assisted vocabulary learning and its effect on vocabulary recall (Publication No. 460593) [Master's Thesis, Yeditepe University]. YÖK National Thesis Centre.
18) Salman, M. (2022). Web 2.0 araçlarının ortaokul öğrencilerinin yabancı dilde kelime öğrenme stratejilerine ve başarılarına etkisinin incelenmesi: bir karma yöntem araştırması (Publication No. 748322) [Master's Thesis, Mersin University]. YÖK National Thesis Centre.
19) Söğüt, Ş. (2021). The effects of mobile-assisted language learning (MALL) on Turkish EFL students' vocabulary learning (Publication No. 707302) [Master's Thesis, İstanbul Sabahattin Zaim University]. YÖK National Thesis Centre.
20) Şahin, L. (2022). Web 2.0 araçlarının ortaokul beşinci sınıf öğrencilerinin kelime öğrenimine ve ingilizce dersine yönelik tutumlarına etkisi (Publication No. 739227) [Master's Thesis, Kırşehir Ahi Evran University]. YÖK National Thesis Centre.
21) Yardım, S. (2011). The effect of computer assisted and teacher-led storytelling on vocabulary learning of 5th grade students (Publication No. 290543) [Master's Thesis, Gazi University]. YÖK National Thesis Centre.
22) Zengin, M. (2019). İngilizce kelime öğretiminde eğitsel bilgisayar oyunları kullanımının öğrencilerin başarı ve tutumlarına etkisi (Publication No. 548752) [Master's Thesis, Bursa Uludağ University]. YÖK National Thesis Centre.

******* did not meet the research design criteria outlined in the guide, and, therefore, was not included in the analysis.