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COMPUTER-ASSISTED LANGUAGE LEARNING (CALL)

SUMMARY

This article explores the development, theoretical underpinnings, and practical applications of Computer-Assisted Language Learning (CALL), with a specific focus on English and Russian as second languages. It traces the historical evolution of CALL from early behaviorist drill-based systems to modern multimedia and AI-driven platforms. The study examines pedagogical frameworks such as sociocultural theory, interactionist SLA, and self-regulated learning, demonstrating how they inform CALL design. It reviews empirical findings on the effectiveness of CALL tools in improving vocabulary, grammar, listening, and writing skills, highlighting comparative outcomes in English and Russian learning contexts. The paper also addresses challenges in implementation, such as access, teacher preparedness, and technological limitations. Finally, it discusses emerging trends, including mobile learning, virtual reality, and intelligent tutoring systems, emphasizing the need for pedagogically sound integration to maximize CALL's impact on language acquisition.

Key words: CALL, English as a Second Language, Russian as a Foreign Language, language technology, SLA theory, learner autonomy

Computer-Assisted Language Learning (CALL) refers to the use of digital technologies to facilitate language teaching and learning. CALL has evolved from simple drill-and-practice exercises into rich, multimedia environments that support communication and autonomyacademypublication.com. In recent decades, English has been a primary focus of CALL research due to its global importance, while interest in using CALL for Russian as a Second Language (RSL) has grown alongside globalization and international student mobility [5]. This paper reviews the theoretical foundations and historical development of CALL, examines pedagogical frameworks, surveys current tools and technologies, and evaluates learner outcomes and challenges. Emphasis is placed on lessons learned from applications in English and Russian L2 contexts, highlighting how different language features and educational settings influence CALL design.

CALL dates to the 1960s with mainframe computer systems. Early projects like the PLATO system at the University of Illinois pioneered computer-based language drills. In its first "Structural/Behavioristic" phase, CALL relied on behaviorist pedagogy: linear lessons, grammar-translation or audio-lingual methods,

and repetitive drill exercisesacademypublication.com. For example, programs presented sentence patterns and provided immediate feedback, reflecting the view that language learning required habit formation.

The Communicative phase coincided with the advent of personal computers and the shift in language teaching toward communicative language teaching [8]. CALL moved away from rote drills toward simulations, language games, and task-based activities academypublication.com. Computers were used to create mini-dialogues and interactive exercises that emphasized meaning over form. This era saw greater integration of audio and later video, enabling pronunciation practice and listening comprehension tasks.

Beginning around 2000, CALL entered the Integrative or Multimedia phaseacademypublication.com. The Internet, rich media, and social software enabled authentic language use online. CALL materials began to incorporate real-world text, audio and video, supporting content-based instruction and learner autonomy. For instance, web-based tasks connected learners to news articles, language corpora, and international pen-pals. CALL environments became more learner-centered and networked, reflecting constructivist and communicative theories [1].

In summary, CALL's history reflects parallel trends in educational technology and pedagogy (Table 1). From mainframes and drill-and-practice to PCs and communicative exercises, to today's Internet and mobile devices, CALL has continuously adapted to new tools and language-teaching paradigmsacademypublication.com. The timeline in Table 1 illustrates these phases and their characteristics.

Table 1. Stages of CALL development, with associated technologies, pedagogies, and instructional focuses (source [8].

Stage (Approx. Years)	Technology	Pedagogical Approach	CALL Activity Focus	Primary Goal
1960s–1970s (Structural/ Behavioristic)	Mainframe computers	Grammar–Translation; Audio-Lingual	Drill-and-practice exercises	Accuracy and habit formation
1980s–1990s (Communicative)	Personal computers	Communicative Language Teaching	Interactive dialogues, language games	Fluency through communication
2000s–Present (Integrative/Multimedia)	Multimedia PCs, Internet	Content-based; Task-based; Cooperative learning	Authentic tasks (web projects, simulations)	Agency and real-world competence

CALL integrates theories from language pedagogy, second language acquisition (SLA), and educational technology. In its behaviorist roots, CALL material design emphasized stimulus–response feedback loops. With communicative

CALL, SLA theory shifted to interactionist and cognitive models, focusing on comprehensible input and negotiation of meaning. In recent research, scholars have applied social constructivist and sociocultural theories to CALL. For example, Vygotskian principles underlie collaborative online tasks and peer feedback.

Akayoğlu's systematic review identified Social Constructivism, Sociocultural Theory, and Interactionist SLA as prominent frameworks in recent CALL studies [1]. Interactionist SLA (e.g. Long's Interaction Hypothesis) informs CALL tasks that require learner negotiation of meaning. Social constructivism (Piaget, Vygotsky) guides approaches where learners build knowledge through social interaction; many CALL activities, such as discussion forums or multiplayer language games, embody this. Sociocultural theory, emphasizing cultural context and the Zone of Proximal Development, supports using CALL for collaborative authoring and projects across borders. In addition to SLA theories, self-regulated learning has been used to analyze how learners use CALL tools autonomously. Technologies like adaptive quizzes or game-based drills foster learner control over pace and content. CALL also draws on cognitive principles (e.g. mental imagery, schema activation) through multimedia input. Moreover, the Communities of Practice model (Lave & Wenger) has inspired CALL designs that create language learner networks.

Overall, the pedagogical logic in CALL has evolved from teacher-centered drill to learner-centered, social, and content-integrated models. Modern CALL materials are typically framed as "technology-enhanced language learning" (TELL), combining best practices from SLA with the affordances of digital media. Teachers are encouraged to blend CALL with face-to-face instruction (blended learning) so that technology supports communicative goals.

English as a Second or Foreign Language (ESL/EFL) has been the predominant context for CALL development and research. The abundance of English-language content and global demand for English learning have driven the creation of many CALL applications and platforms. English CALL covers all skill areas:

- **Listening and Speaking:** Multimedia and video conferencing tools provide exposure to diverse accents and contexts (e.g. movie clips, online dialogues). Voice-recognition software offers immediate pronunciation feedback. For example, some systems let learners record speech and compare it to native models. Studies show that such input-rich, feedback-enabled CALL can improve listening comprehension and spoken fluency.
- **Reading:** Digital readers and online corpora (e.g. news archives, literature corpora) allow self-paced reading with built-in dictionaries and annotation tools. Concordancers (KWIC tools) help learners discover authentic usage patterns. CALL reading tasks often integrate hyperlinked glossaries and interactive quizzes to scaffold reading strategies. Research finds that these tools foster vocabulary acquisition and reading speed.

- **Writing and Grammar:** Word processors with spell/grammar checkers and automated feedback modules aid writing practice. Computerized writing labs often include prompts with automated grammar exercises and instant correction (e.g. error-flagging). Automated writing evaluation (AWE) systems give feedback on grammar accuracy and coherence. Meta-analyses report that grammar-focused CALL significantly improves written accuracy.
- **Vocabulary:** English CALL frequently uses spaced-repetition and flashcard software. For example, Chukharev-Hudilainen and Klepikova [2] found that a computer-generated flashcard system used for only a few minutes daily tripled learners' long-term retention of new English vocabulary. Data-driven learning (DDL) from corpora also teaches collocations and usage patterns.

In practice, English learners encounter CALL through computer labs, language learning apps, and online platforms. Many learning-management systems support blended ESL courses. Research synthesizes positive outcomes: Nazee et al. [6] reported that Pakistani intermediate students using CALL showed significant gains in vocabulary, grammar, reading comprehension and speaking ability. Across studies, the consensus is that CALL can enhance English learning when thoughtfully integrated [3].

Research on Computer-Assisted Russian as a Second Language (RSL) is smaller but growing. Russian presents unique considerations: Cyrillic alphabet, rich inflectional morphology, and less widely available digital content than English. CALL tools for Russian often focus on script acquisition (e.g. apps for learning Cyrillic letters), morphological drills, and vocabulary building with pictures or context. At universities, blended and online courses for Russian RSL incorporate CALL for listening and reading. Lebedeva et al. [5] studied Russian RFL (Russian as a Foreign Language) students and found that web-based CALL drills significantly improved their ability to extract detailed information from Russian audio, though general listening comprehension did not change significantly. This suggests that targeted CALL activities (e.g. fill-in-the-gap listening quizzes) can develop specific listening skills in Russian. Other Russian-focused CALL applications provide gamified grammar practice or interactive dialogues set in Russian cultural contexts.

The Pushkin Institute in Russia, for example, has developed digital platforms with structured Russian exercises (all levels) for self-study. However, outside major centers, resources are fewer. Russian CALL researchers note challenges with automated feedback: standard spell-checkers and parsers struggle with Russian inflections, so CALL systems often use tailored algorithms for stress or case endings.

In comparison to English CALL, Russian CALL benefits from similar advances (e.g. online tutors, multimedia content) but sometimes lags behind due to resource constraints. Nonetheless, learners of Russian leverage many general CALL tools: Russian corpora (National Corpus of Russian), word and sentence recording

for pronunciation practice, and bilingual forums. A review by Akayoglu [1] did not distinguish language-specific theory, but the same pedagogical principles apply: Russian learners use CALL for communicative practice and drill, guided by SLA theory.

Modern CALL encompasses a wide array of technologies beyond traditional computer software. Key categories include:

- **Web and Online Platforms:** Learning Management Systems (LMS) and dedicated language websites host exercises, quizzes, and forums. Virtual classrooms and videoconferencing tools (Zoom, Moodle) enable synchronous and asynchronous language practice. Social-networking sites and language-exchange platforms connect learners with native speakers for real communication.
- **Mobile and Ubiquitous Learning (MALL):** Smartphones and tablets allow on-the-go learning. Language learning apps incorporate gamification (points, badges) and microlearning. The portability of mobile devices means learners can study anywhere [7]. Mobile apps often use spaced repetition and multimedia (images, audio) for vocabulary. Location-based and augmented reality apps are emerging, letting learners interact with words in their real environment [3].
- **Multimedia and Virtual Reality:** Rich media – videos, podcasts, interactive stories – provide authentic input. Recently, Augmented Reality (AR) and Virtual Reality (VR) have shown promise in language education. For instance, AR can overlay vocabulary labels on real-world objects, reinforcing meaning in context. VR creates fully immersive environments (e.g. a virtual café) where learners practice speaking in simulated real-life scenarios. Early research suggests that these immersive tools boost motivation and contextual learning.
- **Artificial Intelligence (AI) and NLP:** AI-driven CALL (often called ICALL) uses technologies like Natural Language Processing (NLP) to provide intelligent feedback. Applications include: automated speech recognition (ASR) for pronunciation feedback; automated writing evaluation (AWE) grading essays; and chatbots for conversational practice. Recent CALL systems incorporate AI modules such as dynamic assessment, intelligent tutoring systems (ITS), and conversation agents. For example, an intelligent tutor might analyze a learner's writing and adapt subsequent exercises to focus on weak grammar points. AI can also power virtual assistants that interact with learners via speech, simulating a human tutor.
- **Corpora and Data-Driven Learning:** Large digital text corpora allow data-driven approaches. CALL researchers use corpus tools to teach collocations, register differences, and usage examples. Learners can enter a word to see

authentic sentences. This approach applies to English corpora and to Russian corpora (e.g. Sketch Engine for Russian).

Collectively, these technologies have transformed CALL from isolated drills to interactive, adaptive, and ubiquitous systems. Importantly, all CALL tools rely on sound pedagogical design: technology is most effective when it serves clear communicative and learning objectives. How well does CALL work in practice? Numerous empirical studies report positive effects of CALL on L2 proficiency. For English, meta-analyses find moderate effect sizes for CALL-enhanced grammar, writing, and vocabulary instruction. In vocabulary learning, Chukharev-Hudilainen & Klepikova [2] showed that students using a spaced-repetition CALL tool retained about three times more words than controls. Likewise, Nazee et al. [6] found that Pakistani ESL students using CALL showed significant gains in vocabulary, grammar, reading comprehension, and speaking relative to pretest scores. For Russian learning, Lebedeva et al. [5] demonstrated that a web-based CALL curriculum significantly improved selective listening skills for RFL students (though general listening did not improve). This suggests CALL can target specific proficiencies effectively. Anecdotal reports also highlight gains in learner motivation, cultural awareness, and autonomy when technology is used. Importantly, feedback is a key factor. A recent meta-analysis found that automated feedback in CALL produces a moderate positive effect on language outcomes (Hedges' $g \approx 0.56$). In other words, intelligent correction of errors leads to better learning than unassisted practice. Blended approaches that combine teacher guidance with CALL often yield the best results. Despite its benefits, CALL faces notable challenges. First, technical and design limitations can hinder learning. Zainurrahman [9] synthesized CALL literature and identified software shortcomings (e.g. limited adaptability, usability issues) as major disadvantages. Poorly designed interfaces or repetitive drill formats can disengage learners. Also, CALL often requires careful teacher preparation. Crafting or curating CALL materials takes significant time; many teachers report needing extensive training to effectively integrate technology.

Second, access and equity issues persist. Reliable computers and high-speed Internet are not universally available. Learners with limited digital literacy or without devices may be excluded. In some contexts, traditional classroom instruction is preferred; the same SSRN review noted that in certain situations face-to-face methods were seen as more practical. Cultural and institutional resistance to technology can slow adoption. Third, pedagogical pitfalls exist. Over-reliance on CALL can reduce face-to-face interaction: Excessive computer-mediated communication may limit authentic discourse. Some skills, notably speaking, can be hard to practice authentically with CALL alone. Automated feedback is still limited: grammar checkers often miss nuances, and ASR can struggle with accented speech. For Russian, in particular, speech recognition and auto-correction tools are less

mature due to complex phonology and morphology. Finally, affective and motivational factors can be double-edged. While many learners find digital games and online practice engaging, others feel isolated or anxious using technology. Self-paced CALL demands discipline; not all learners self-regulate effectively, despite pedagogical efforts [6]

In conclusion, successful CALL implementation must address these challenges through teacher training, careful software design, blended pedagogy, and attention to learners' contexts. Technology should normalize into teaching practices where it clearly enhances learning, not as an end in itself.

Immersive Learning: AR and VR are poised to enter mainstream language education. For example, VR "town simulation" environments allow students to role-play in authentic settings (a market, airport, etc.), receiving input and performing tasks in the target language. AR apps can overlay multilingual signs on real-world scenes, linking vocabulary to physical objects. These technologies promise to make learning more experiential, though research is still needed on long-term gains.

Mobile Ubiquity: Mobile learning has reached "anytime, anywhere" status. With smartphones, quick language tasks (listening to a phrase, reading a tweet, learning a word) fit into daily life. Wearables and voice assistants may soon prompt language practice in context (e.g. asking for a weather report in the L2). MALL research is growing, examining how to sustain learning outside the classroom [7].

Corpora and Big Data: Data-driven learning is expanding. More languages, including Russian, have large online corpora. CALL tools are leveraging big data for adaptive content generation. For instance, algorithms can analyze a learner's writing for frequent errors and automatically produce customized practice exercises.

Blended and Flipped Models: The integration of CALL into mainstream curricula continues. Many programs now use a flipped classroom approach: learners engage with CALL materials (videos, quizzes) outside class, and class time is devoted to communication. This blend harnesses technology for practice and teachers for higher-order guidance. For English learners, CALL is ubiquitous and well-supported by research. For Russian learners, CALL is emerging but shows promise (especially in receptive skills like listening and reading). In both cases, success depends on thoughtful integration: teachers must select or design CALL activities that align with objectives, and learners must be trained to use the tools actively.

Challenges remain – technical limitations, access issues, and the need for professional development – but the trajectory is positive. Future CALL will likely see AI-powered tutors and immersive reality becoming more common, but always in service of sound pedagogy. By combining innovative technology with established language teaching principles, CALL can continue to enhance second-language acquisition and prepare learners of English and Russian for communicative competence in a globalized world.

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S.Z.MECİDLİ

KOMPÜTER DƏSTƏYİ İLƏ DİL ÖYRƏNMƏ (CALL)

XÜLASƏ

Məqalə Kompüter Dəstəyi ilə Dil Öyrənməsi (CALL) sahəsinin inkişafını, nəzəri əsaslarını və praktik tətbiq sahələrini araşdırır. Xüsusi diqqət İngilis və Rus dillərinin ikinci dil kimi öyrənilməsinə yönəldilmişdir. Məqalədə CALL-ın tarixi inkişafı — ilkin davranış yönümlü drill sistemlərindən başlayaraq müasir multimedia və süni intellekt əsaslı platformalara qədər — təhlil olunur. Sosial-mədəni nəzəriyyə, interaksionist İkinci Dil Öyrənmə (SLA) yanaşması və özünüidarə olunan öyrənmə kimi pedaqoji modellər CALL dizaynının əsasları kimi təqdim olunur. Empirik nəticələr əsasında CALL alətlərinin lüğət, qrammatika, dinləmə və yazılı ifadə bacarıqlarını necə inkişaf etdirdiyi göstərilir. İngilis və Rus dillərində CALL

tətbiqlərinin effektivliyi müqayisəli şəkildə qiymətləndirilir. Həmçinin texnologiyaya çıxış, müəllim hazırlığı və texniki məhdudiyyətlər kimi çağırışlar müzakirə olunur. Sonda isə mobil öyrənmə, virtual reallıq və intellektual təlimçi sistemləri kimi müasir meyllər dəyərləndirilir və onların pedaqoji baxımdan əsaslandırılmış şəkildə inteqrasiyasının vacibliyi vurğulanır..

Açar sözlər: CALL, ikinci dil kimi ingilis dili, xarici dil kimi rus dili, dil texnologiyaları, SLA nəzəriyyəsi, öyrənənlərin muxtariyyəti

С.МАДЖИДЛИ

КОМПЬЮТЕРНАЯ ПОДДЕРЖКА ИЗУЧЕНИЯ ЯЗЫКОВ (CALL)

РЕЗЮМЕ

В данной статье рассматривается развитие, теоретическая основа и практическое применение компьютерной поддержки изучения языков (CALL) с особым акцентом на английский и русский языки как вторые. Работа прослеживает историческую эволюцию CALL — от ранних систем, основанных на бихевиористских подходах, до современных мультимедийных и ИИ-платформ. Анализируются педагогические теории, такие как социокультурная теория, интеракционистская теория усвоения второго языка (SLA) и саморегулируемое обучение, которые лежат в основе проектирования CALL. Приводятся эмпирические данные о результативности CALL в развитии словарного запаса, грамматики, аудирования и письменной речи. Особое внимание уделяется сравнению эффективности CALL при обучении английскому и русскому языкам. Также обсуждаются вызовы внедрения, такие как доступ к технологиям, подготовка преподавателей и технические ограничения. В заключение анализируются перспективные тенденции — мобильное обучение, виртуальная реальность и интеллектуальные системы наставничества — с акцентом на необходимость педагогически обоснованной интеграции.

Ключевые слова: CALL, английский как второй язык, русский как иностранный, языковые технологии, теория усвоения языка, автономия обучающегося

Rəyçi: dosent F.Ə.Hüseynova