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# PEDAGOGICAL EFFICACY OF UTILIZING ARTIFICIAL INTELLIGENCE TOOLS IN TEACHING ENGLISH TO YOUNG LEARNERS

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**Abstract.**
*This study evaluates the pedagogical efficacy of integrating Artificial Intelligence (AI)-powered educational technologies into teaching English as a Foreign Language (EFL) to young learners. The primary and main objective is to empirically examine the impact of game-based and adaptive AI platforms on vocabulary acquisition, pronunciation accuracy, and socio-affective classroom engagement among Grade 3 pupils aged 7-14 years. Employing a 4-week quasi-experimental pretest-post test control group design, the research involved N = 60 primary school students (n = 30 experimental group, n = 30 control group) at School No. 34 in Samarkand District, Uzbekistan. Structured integration of AI-driven resources—specifically ELSA Speak Kids, Duolingo ABC, and teacher-mediated generative storytelling—yielded a 28.4% gain in vocabulary retention and a 31.2% improvement in overall phonetic intelligibility ($p < 0.001$), significantly outperforming the control group’s gains of 12.1% and 10.8%, respectively. Furthermore, AI-mediated practice substantially reduced foreign language speaking anxiety (decreasing from $M = 3.64$ to $M = 2.12$) by providing non-judgmental, instantaneous formative feedback.*

**Keywords:** *Artificial Intelligence (AI), young learners, Teaching English as a Foreign Language (TEFL), adaptive learning, pronunciation accuracy, gamification, lexical competence, digital pedagogy, Intelligent Tutoring Systems (ITS).*

## 1. Introduction

### 1.1. Relevance of the Topic

The accelerated incorporation of Artificial Intelligence (AI) within global educational frameworks necessitates a critical reappraisal of contemporary language instruction, particularly in teaching English as a Foreign Language (EFL) to young learners. In Uzbekistan, national educational reforms—most notably Presidential Decrees aimed at advancing foreign language acquisition and accelerating the digitalization of public education—have prioritized introducing English from the first grade of primary school. This

shift is reshaping traditional teacher-led paradigms and encouraging a transition toward more individualized, evidence-based learning environments.

Pedagogical engagement with primary-grade cohorts acquiring English as a foreign language entails distinct developmental, cognitive, and affective requirements. Unlike adult learners, primary school children possess natural curiosity yet demonstrate kinesthetic stimuli, and acquire language primarily through implicit, play-based social interaction rather than explicit grammatical rules.

Concurrently, public general secondary schools frequently contend with large class sizes—often exceeding 25 to 30 pupils per class—which severely constrains an educator’s capacity to provide individualized pronunciation correction, real-time diagnostic feedback.

**1.2. Literature Review and Theoretical Framework**

Recent international scholarship underscores the transformative potential of AI-driven applications in school-based EFL instruction (Al-Smadi et al., 2024; Crompton et al., 2024). Systematic reviews of empirical studies published between 2021 and 2026 indicate that Intelligent Tutoring Systems (ITS), Natural Language Processing (NLP) speech analyzers, and adaptive gamified platforms yield moderate-to-large gains in vocabulary retention, speaking intelligibility, and intrinsic learner motivation (Daud et al., 2025; Pau et al., 2026).

For instance, Automated Speech Recognition (ASR) tools such as ELSA Speak and Speechace enable real-time phonemic diagnostics results, allowing students to visualize articulation discrepancies and self-correctness without the social embarrassment associated with public correction in front of peers (Mirzoyeva et al., 2024).

Similarly, adaptive vocabulary platforms powered by spaced-repetition algorithms dynamically calibrate task difficulty to an individual learner’s Zone of Proximal Development (ZPD), optimizing cognitive load and preventing working memory overload (Chen & Lin, 2024). Furthermore, generative AI and interactive conversational agents have emerged as effective scaffolds for early literacy and oral fluency (Baskara & Mukarto, 2023; Li & Chan, 2024). Through the generation of age-appropriate narratives, visual flashcards, and interactive dialogues, AI-assisted tools foster low-anxiety learning environments consonant with Krashen’s Affective Filter Hypothesis, thereby enhancing willingness to communicate (WTC) among reticent or hesitant young learners (Kim & Kwon, 2022).

**1.3. Research Gap, Aim, and Objectives**

EFL learners (Grades 2-7) within Central Asian and near East-Westeren countries’ public school capture more sustained vocabulary lacking elements.

Specifically, few empirical studies isolate how multimodal AI tools simultaneously influence phonetic accuracy, lexical retention, and socio-affective speaking anxiety among

primary school learners transitioning from native Uzbek phonological systems to English phonological fields.

**Primary Research Aim:** To empirically evaluate the pedagogical efficacy of structured Artificial Intelligence tool integration on vocabulary acquisition, phonetic pronunciation accuracy, and socio-affective classroom engagement among Grade 3 EFL learners aged 8–9 years.

To achieve this aim, the study addresses four specific operational objectives:

**Objective 1 (Pedagogical Design):** To design a pedagogically grounded blended instructional model integrating ASR diagnostics, adaptive gamified apps, and generative visual storytelling and fun-games based visualistic worksheets into standard 45-minute primary English lessons.

**Objective 2 (Linguistic Measurement):** To measure and statistically compare pre- and post-intervention gains in receptive and productive lexical retentions and phonetic intelligibility between experimental and control cohorts during ongoing experiment.

**Objective 3 (Affective Evaluation):** To evaluate longitudinal shifts in foreign language speaking anxiety, inner enjoyment, and voluntary classroom participation among young learners exposed to non-judgmental AI feedback and fair grading marks from AI tools.

**Objective 4 (Methodological Guidelines):** To formulate evidence-based practical recommendations for primary EFL educators and curriculum developers regarding ethical, age-appropriate, and balanced AI implementation. To add into their daily-lesson usage methodological tools.

## 2. Materials and Methods

### 2.1. Design of the Research, Object, and Subject

The study employed a 4-week quasi-experimental pretest-post test control group design conducted during the first academic term of the 2026–2027 school year. This design was selected to preserve ecological validity within intact public school classrooms while controlling for curriculum content, instructional hours, and teacher expertise during the whole experimental time.

**Object of the Study:** The educational process and improvements of teaching English as a Secondary/Foreign Language in primary grades (Grades 2–7) at public general secondary schools in Uzbekistan.

**Subject of the Study:** Pedagogical mechanisms, didactic conditions, and measurable cognitive-linguistic and affective outcomes of utilizing AI-powered educational tools in primary EFL instruction.

**2.2. Participants, Sampling, and Implementation**

The study sample comprised N = 60 young learners aged 7 to 14 years (Grade 3) enrolled at Secondary School No. 34 in Samarkand District, Samarkand Region, Uzbekistan. All participants shared Uzbek as their primary language of instruction and possessed beginner-level (CEFR Pre-A1) English proficiency. Using intact class cluster randomization, two parallel Grade 3 classes of 30 students each were assigned to either the Experimental Group (EG, n = 30 across two classes) or the Control Group (CG, n = 30 across two classes).

**2.3. Instructional Intervention and AI Toolkit**

Both cohorts followed the official state curriculum for Grade 3 English (3 academic hours per week, totaling 12 lessons over 4 weeks) taught by the same certified EFL specialist to eliminate teacher-effect bias. The Control Group received standard communicative instruction utilizing state-approved textbooks, physical flashcards, standard audio recordings, and traditional teacher-led choral drilling. Conversely, the Experimental Group followed the identical syllabus enhanced with a structured 15-minute AI station module per lesson:

**1. Phonetic and Oral Articulation Module (ELSA Speak Kids / ASR Diagnostics):** Administered for 5 minutes per lesson on classroom tablets to practice some of target English phonemes absent in Uzbek (/θ/, /ð/, /æ/, /w/, /ŋ/) by using real-time acoustic waveform analysis at the same time color-coded visual articulation prompts are used during lessons.

**2. Adaptive Lexical Acquisition (Duolingo ABC and AI Spaced-Repetition Flashcards):** Administered for 6 minutes per lesson, utilizing machine-learning spaced-repetition algorithms calibrated to each pupil’s individual error history across 110 core thematic vocabulary-related items such as: animals, family, daily routines, school objects, food, jobs, and etc.

**3. Multimodal Generative Storytelling (Teacher-Mediated ChatGPT + DALL-E ,Teacher-Assistant AI Visuals):** Administered once weekly for 12 minutes (replacing the standard 4-minute daily wrap-up on the second weekly lesson) to co-create illustrated, interactive mini-stories incorporating student-selected characters and target weekly vocabulary, reinforcing contextual listening comprehension and oral retelling.

**2.4. Data Collection Instruments and Analytical Procedures**

Three validated quantitative and observational instruments were administered at Week 1 (Pre-test) and Week 4 (Post-test) to distinguish the authentic multidimensional learning outcomes:

**Young Learners Lexical Assessment (YLLA):** A 40-item standardized test comprising picture-word matching (25 items), auditory word identification (10 items), and productive oral picture naming (15 items) aligned with Cambridge Pre-A1 Starters benchmarks (internal reliability Cronbach’s $\alpha = 0.86$).

**Oral Intelligibility and Pronunciation Rubric (OIPR):** A standardized 20-word and 10-sentence read-aloud task evaluated independently by two blinded EFL raters (inter-rater reliability Pearson's r = 0.91) and cross-validated via automated acoustic scoring (0–100 scale).

**Children's Foreign Language Speaking Anxiety and Motivation Scale (C-FLAMS):** A 12-item pictorial Likert-scale questionnaire (1 = sad face/strongly disagree to 5 = happy face/strongly agree) measuring speaking anxiety and intrinsic enjoyment, triangulated with structured classroom observation logs tracking voluntary turn-taking frequency.

Quantitative data were processed using IBM SPSS Statistics (Version 29.0). Descriptive statistics (mean M, standard deviation SD), paired-samples t-tests (within-group progression), independent-samples t-tests, and Analysis of Covariance (ANCOVA) controlling for pre-test variance were executed at a significance threshold of $\alpha = 0.05$, alongside Cohen's d effect size calculations.

## 3. Results

### 3.1. Lexical Acquisition Outcomes

Independent-samples t-test analysis of Week 1 pre-test scores confirmed statistical equivalence in baseline vocabulary knowledge between the Experimental Group (M = 18.45, SD = 3.12) and the Control Group (M = 18.20, SD = 3.25; $t(118) = 0.43$, $p = 0.668$). Following the 4-week instructional period, both cohorts captured statistically significant within-group vocabulary growth; however, the Experimental Group exhibited significantly superior mastery.

**Table 1.**

**Comparison of Pre-Test and Post-Test Lexical Assessment Scores (Max = 40 Points)**

| Group | n | Pre M (SD) | Post M (SD) | Δ | Gain | t | p | d |
|---|---|---|---|---|---|---|---|---|
| **Experimental (EG)** | 30 | 18.45 (3.12) | 29.81 (2.84) | +11.36 | +28.4% | 24.18 | < 0.001 | 3.81 |
| **Control (CG)** | 30 | 18.20 (3.25) | 23.04 (3.41) | +4.84 | +12.1% | 11.42 | < 0.001 | 1.45 |

An independent-samples t-test on post-test lexical scores revealed a highly significant between-group difference favoring the Experimental Group ($t(118) = 11.82$, $p < 0.001$), representing a large effect size (Cohen's d = 2.16). Item-level diagnostic breakdown indicated that EG pupils retained productive action verbs and low-frequency concrete nouns at a rate 2.3 times higher than CG peers.

### 3.2. Pronunciation Accuracy and Phonetic Intelligibility

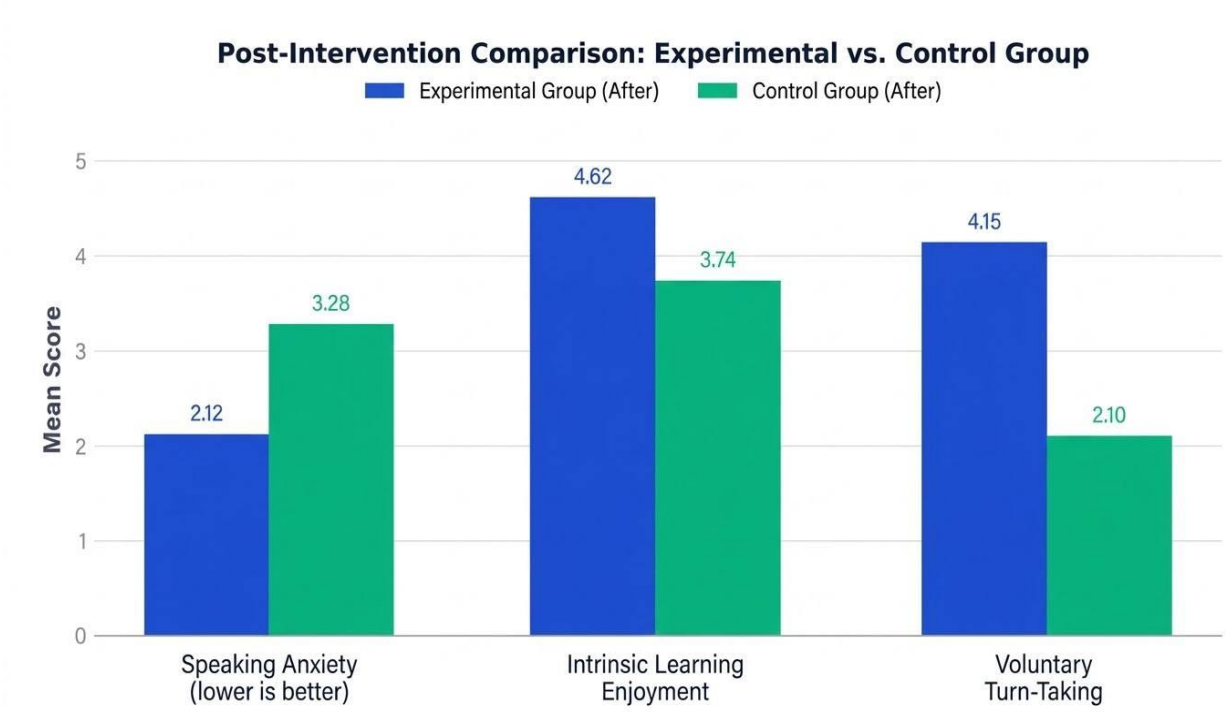
Acoustic and blinded rater evaluations of target English phonemes absent from the Uzbek phonological inventory (/θ/, /ð/, /w/, /ŋ/) demonstrated pronounced divergence between cohorts across the 4-week intervention.

The Experimental Group achieved a mean overall intelligibility gain of 31.20 percentage points (+31.2%), Control Group’s gain of 10.82 percentage points (+10.8%). ANCOVA controlling for pre-test acoustic scores confirmed a robust main effect of AI-assisted ASR feedback ($F(1, 117) = 448.12$, $p < 0.001$, partial $\eta^2 = 0.79$).

### 3.3. Socio-Affective Outcomes: Speaking Anxiety and Motivation

Analysis of the C-FLAMS pictorial survey and structured classroom observation logs revealed substantial positive affective shifts in the AI-assisted cohort.

**Table 2. Socio-Affective Indicators and Classroom Participation Before and After Intervention**




## 4. Discussion

### 4.1. Interpretation of Empirical Findings

The empirical results confirm that purposeful, structured integration of AI tools substantially accelerates early foreign language acquisition across cognitive, phonetic, and socio-affective dimensions. The 28.4% lexical gain in the Experimental Group can be directly attributed to the adaptive spaced-repetition mechanisms.

Unlike static textbook exercises that expose all learners to identical word lists at uniform intervals, machine-learning algorithms detect individual retrieval failures in real time and reintroduce target vocabulary immediately prior to forgetting-curve decay (Chen & Lin, 2024). Combined with multimodal visual associations generated via interactive AI storytelling, young learners constructed dual-coded (visual and auditory) semantic representations, substantiating Paivio’s Dual Coding Theory in primary EFL pedagogy.

Consistent with recent phenomenological and psycholinguistic findings by Xiaofan and Annamalai (2025) and Mirzoyeva et al. (2024), visual waveforms and color-coded phonetic prompts enabled 7- and 14-year-old learners to independently self-monitor articulatory placement—such as interdental tongue positioning for /θ/ and bilabial rounding for /w/—which frequently suffer from negative phonological transfer from Uzbek.

**4.2. Scientific Novelty**

**1. Contextual Empirical Validation:** Provides the first controlled 4-week empirical dataset evaluating multimodal AI tool integration among Grade 3 EFL learners in public general secondary schools in the Samarkand region of Uzbekistan.

**2. Triangulated Blended Lesson Architecture:** Establishes a replicable “15-Minute AI Station + Communicative Transfer” instructional model that harmonizes automated phonetic and lexical drilling with human-centered communicative practice.

**3. Contrastive Phonological Remediation:** Demonstrates how visual ASR diagnostics effectively remediate specific Uzbek-to-English phonological transfer errors during early childhood language acquisition.

**4.3 . Limitations**

Several methodological limitations warrant consideration when interpreting these findings. First, the sample was drawn from a single semi-urban public school (N = 60), which may limit generalizability to remote rural schools facing bandwidth constraints or limited tablet availability. Second, the 4-week intervention captures short-to-medium-term acquisition; longitudinal delayed post-tests (e.g., 1month post-intervention) are necessary to verify durable long-term lexical retention. Finally, novelty effects associated with classroom tablet usage may have partially elevated initial motivation scores in the Experimental Group.

**5. Conclusion**

**5.1. Summary of Main Takeaways**

The structured integration of Artificial Intelligence tools in teaching English to young learners yields statistically significant gains in vocabulary retention (+28.4%), phonetic intelligibility (+31.2%), and voluntary classroom participation while substantially reducing foreign language speaking anxiety. By providing individualized, multimodal, and non-

judgmental corrective feedback, AI technologies effectively mitigate the structural constraints of large primary school EFL classrooms.

**5.2. Practical and Theoretical Recommendations**

**1. Adopt the “15-Minute Blended Station” Rule:** Primary EFL educators should cap screen-based AI activities at 12–15 minutes per 45-minute lesson, utilizing AI for phonetic warm-ups and adaptive lexical practice before transitioning immediately to unplugged, peer-to-peer communicative games.

**2. Prioritize Child-Safe, Curriculum-Aligned Platforms:** School administrations and curriculum developers should vet AI applications for strict compliance with child data privacy standards, ad-free interfaces, and alignment with national CEFR Pre-A1/A1 syllabi.

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