(Research Article)

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Integrating Digital Tools into ESL Listening Instruction: A Mixed-Methods Study of Strategy-Based Technology Use

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Abstract

Listening is one of the most challenging skills for ESL learners, often underemphasized in instruction and lacking strong pedagogical support. While digital tools offer new opportunities for authentic listening practice, their effectiveness is inconsistent without structured guidance. This mixed-methods quasi-experimental study investigated the impact of technology-assisted, strategy-based listening instruction on 96 adult ESL learners, divided into a control group (traditional textbook instruction) and an experimental group using Ed Puzzle, TED-Ed, and ELSA Speak within a structured three-phase model: pre-task, during-task, and post-task reflection. Quantitative results showed significantly greater gains in the experimental group, especially in inferential comprehension, with large effect sizes. Qualitative findings from journals and focus groups indicated enhanced learner autonomy, increased metacognitive strategy use, and reduced listening anxiety. These outcomes suggest that when digital tools are embedded within a coherent instructional framework, they can substantially improve both listening performance and learner experience. The study contributes to the field of technology-enhanced language learning (TELL) by emphasizing the importance of pedagogical integration, strategy instruction, and reflective learning in designing effective ESL listening instruction

Keywords: ESL Listening Comprehension; Technology-Enhanced Language Learning (TELL); Ed Puzzle; Strategy-Based Instruction; Mixed-Methods Research

1. Introduction

Listening comprehension is a foundational component of second language acquisition (SLA), yet it remains one of the most underemphasized and underdeveloped skills in English as a Second Language (ESL) instruction (Nazarieh, Razmi, Azizian, & Ghani, 2022). In many classroom settings, listening continues to be taught as a passive activity, typically involving scripted audio texts followed by multiple-choice questions (Mogollon, 2023). Such approaches neglect the dynamic, cognitively demanding nature of real-time listening, which requires learners to decode speech, interpret meaning, manage cognitive load, and respond to auditory input under temporal constraints (Sohler, 2020). The consequences of this gap are far-reaching. Learners who struggle with listening often experience reduced confidence, limited engagement, and slower overall language development (Mukhtorova & Ilxomov, 2024).

In contrast to the long-standing view of listening as a receptive skill acquired through exposure, recent SLA theories and empirical studies argue for a more strategic and scaffolded approach (Abdujabbarovna, 2025). Listening involves both bottom-up processing (sound and word recognition) and top-down inferencing (drawing on prior knowledge, predicting content), as described in Field's Cognitive Processing Model of Listening (Chalabyan & Sahakyan, 2024). Furthermore, listening is inherently tied to affective variables such as motivation, anxiety, and autonomy. Traditional

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listening instruction often fails to address these affective and strategic dimensions, contributing to learner frustration and disengagement (Chen et al., 2023).

Amidst these pedagogical challenges, digital technologies have emerged as promising tools for enhancing listening instruction. Over the past two decades, ESL learners have gained access to a wide range of platforms that support individualized, flexible, and multimodal learning (SreeRekha, 2021). Tools such as Ed Puzzle, TED-Ed, and ELSA Speak offer features like speed control, replay ability, captioning, embedded questions, and real-time feedback. These affordances can potentially reduce listening anxiety, increase exposure to authentic speech, and promote metacognitive awareness, especially when paired with intentional instructional design (Sholekhah & Fakhrurriana, 2023). The global shift toward online and hybrid education during the COVID-19 pandemic further accelerated the integration of such tools in language classrooms, revealing both their potential and the limitations of their pedagogical use (Bruckner, 2023).

However, while digital tools are increasingly present in ESL programs, their use is often superficial or disconnected from instructional goals. Many teachers employ technology as a supplementary add-on rather than as an integrated component of the listening curriculum (Said, Sukor, Keong, & Ompok, 2023). Learners may be introduced to a platform without guidance on how to use its features strategically, and instructional time may prioritize tool navigation over listening skill development. This disconnect between tool availability and pedagogical integration limits the impact of technology-assisted instruction and may even lead to cognitive overload if learners are exposed to poorly designed multimedia or lack the strategic skills to manage complex input (Sohler, 2020).

Compounding this issue is the uneven distribution of teacher training and institutional support. While some educators are equipped to incorporate digital tools effectively, others lack the time, training, or confidence to align technology use with instructional objectives (Ibrahim & AYDOĞMUŞ, 2023). In the absence of clear frameworks, technology use in ESL listening instruction remains inconsistent, often failing to support learner engagement, comprehension, or strategic growth (Shamsitdinova, 2024).

Moreover, empirical research in this area remains limited. Although several studies have explored the use of digital tools for vocabulary development, pronunciation, or speaking fluency, relatively few have examined the impact of technology on listening comprehension specifically (Чайковська, 2022). Even fewer have investigated how learners experience these tools in the context of guided instruction, or how instructional strategies can mediate the effectiveness of technology in developing listening skills (Bakla & Demiröz, 2024). This gap in the literature highlights a pressing need for evidence-based research that evaluates both outcomes and instructional processes in technology-assisted listening instruction.

To address these pedagogical gaps, this study investigates how structured integration of digital tools can enhance listening comprehension among ESL learners. Specifically, it examines whether combining technology-assisted resources, such as EdPuzzle, TED-Ed, and ELSA Speak, with strategic instructional support leads to significantly better listening outcomes compared to conventional textbook-based instruction.

The objective of this research is to evaluate the effectiveness of technology-assisted listening instruction in improving ESL learners' comprehension skills. The study emphasizes not only the availability of tools, but their pedagogical integration through pre-task preparation, in-task guidance, and post-task reflection.

This inquiry is guided by the following central research question:

- To what extent does technology-assisted listening instruction improve ESL learners' listening comprehension skills compared to traditional instruction?
- To investigate this, a quasi-experimental design was employed involving 96 adult ESL learners, divided evenly into experimental and control groups. The experimental group engaged with digital listening tools embedded within a 10-week instructional cycle, while the control group followed a standard listening curriculum without digital integration. Data were collected through pretests and posttests, and analyzed using inferential statistical methods to assess differences in comprehension performance.

This study contributes to the ongoing discourse in second language acquisition and educational technology by providing empirical evidence on the instructional value of technology when used intentionally. Unlike prior research that often treats tools as isolated interventions, this study situates them within a broader pedagogical framework, demonstrating how structured integration, rather than tool availability alone, leads to meaningful learning gains. It aims to inform

classroom practice and curriculum development, particularly in settings where listening remains an underdeveloped and anxiety-inducing skill for learners.

2. Literature Review

2.1. Theoretical Frameworks for Technology-Enhanced Listening

Several complementary theories underpin the design and evaluation of listening instruction in digital environments.

Krashen's Input Hypothesis (1982) emphasizes the role of comprehensible input (i+1) in language acquisition. It argues that learners acquire language best when exposed to slightly challenging, meaningful input in a low-anxiety context (Luo, 2024). Digital listening platforms such as TED-Ed or YouTube ESL channels allow learners to access rich, varied, and scaffolded input with adjustable difficulty, aligning well with Krashen's principles (Sarbunan, 2024). Tools that offer speed control, captions, and pause-replay features make input more accessible, particularly for intermediate learners navigating unfamiliar vocabulary or speech rates (Mahalingappa, Zong, & Polat, 2024).

Vygotsky's Sociocultural Theory (1978) contributes the concept of the Zone of Proximal Development (ZPD), suggesting that learners achieve more with mediated support than alone. In listening instruction, this implies the need for teacher scaffolding, peer interaction, and guided tool use (Panhwar, Usman, Panhwar, & Surahio, 2025). Technology becomes a mediating artifact when it supports dialogic learning, such as through comprehension tasks embedded in EdPuzzle videos or collaborative discussions around podcast content. Studies have shown that such scaffolding not only supports comprehension but also builds learner autonomy and confidence (Ashidiq, 2022).

Field's Cognitive Processing Model (2008) highlights the dual nature of listening: bottom-up decoding (sounds, words) and top-down processing (expectations, background knowledge). Effective instruction, then, must support both layers (Chalabyan & Sahakyan, 2024). Digital tools such as ELSA Speak and Listen wise foster bottom-up skills through phonological practice and real-time feedback, while also offering predictive tasks and thematic contexts to encourage top-down comprehension. Various studies confirm that strategy-based digital listening practice enhances both literal and inferential comprehension (Khasanah, Herlina, & Rustandi, 2023).

Mayer's Cognitive Theory of Multimedia Learning (2005) warns against cognitive overload and promotes instructional design that balances visual and auditory input. In this model, multimedia must be carefully sequenced and simplified to support working memory (Cavanagh & Kiersch, 2023). ESL platforms that segment videos, embed focused questions, or reduce redundancy align with these principles. Conversely, poorly designed tools that overload learners with simultaneous stimuli or lack pacing options can hinder learning, especially among lower-proficiency users (Zheng, Jung, Li, & Yoon, 2022).

Together, these frameworks suggest that digital tools are most effective when paired with structured, cognitively appropriate, and socially mediated instruction. They also highlight the need for empirical validation of technology's role in supporting comprehension, not just access to input.

2.2. The Pedagogical Role of Listening in ESL

Listening is increasingly recognized as a core receptive skill essential to both language acquisition and academic performance. Unlike reading, which allows learners to revisit content, listening is transient and time-constrained, posing unique challenges for comprehension and memory (Siegel, Kuteeva, & Siegel, 2025). It plays a critical role in classroom interaction, assessment, and real-world communication, from lectures and meetings to phone calls and digital conversations.

Despite this, listening often receives less instructional time, assessment focus, and pedagogical innovation than speaking or writing. Instruction tends to prioritize comprehension checking over teaching learners *how* to listen (Du & Man, 2023). As Akram et al. (2024) observe, listening sections of standardized tests (e.g., TOEFL, IELTS) remain the most anxiety-inducing for ESL learners, who often lack exposure to diverse accents, discourse styles, and real-time processing strategies (Akram, Sadiq, & Rehman, 2024) . This anxiety is further amplified in classrooms where listening tasks offer no opportunity for learner control or repetition.

These challenges make listening a prime candidate for digital intervention. Technologies that allow learners to pause, replay, and control the pace of input can mitigate anxiety and increase comprehension. However, such benefits are contingent on thoughtful pedagogical integration, as discussed below.

2.3. Evolution of Technology in ESL Listening Instruction

The shift from Computer-Assisted Language Learning (CALL) to Technology-Enhanced Language Learning (TELL) has dramatically reshaped the landscape of ESL listening instruction. Whereas early CALL approaches prioritized repetitive drill-and-practice tasks with limited interactivity and context, modern TELL environments emphasize authentic, multimodal, and learner-controlled input (Vu, Lian, & Siriyothin, 2022). Today's digital tools support a range of interactive experiences that allow learners to engage with language meaningfully and autonomously. Platforms such as EdPuzzle offer video-based listening tasks with embedded comprehension checks and teacher feedback, while applications like ELSA Speak provide real-time pronunciation guidance through AI-powered feedback. Podcasts and curated audio content have also gained prominence, often coupled with reflective tasks that promote deeper metacognitive engagement (Tran & Vu, 2024).

Recent empirical studies reinforce the pedagogical promise of such tools. For instance, Chi e al. (2024) reported significant improvements in inferential comprehension among learners who used captioned video platforms, attributing these gains to the flexibility and scaffolding provided by visual-verbal integration (Chi, Chen, Tseng, & Liu, 2023). Bu et al (2025) found that learners exposed to multimodal input, videos supplemented with images, subtitles, and narration, demonstrated enhanced vocabulary retention and listening fluency (Bu, Pan, & Wang, 2025). Similarly, Prasongngern & Soontornwipast et al. (2023) highlighted the effectiveness of metacognitive strategies embedded within digital listening tasks, showing that reflective journaling and strategic tool use contributed to improved comprehension outcomes and learner autonomy (Prasongngern & Soontornwipast, 2023).

However, these promising findings must be interpreted with caution. A common limitation across many studies is the isolated use of technology, detached from a broader instructional strategy. Digital tools are often introduced without explicit pre-task preparation, in-task scaffolding, or post-task reflection. As a result, learners may engage with digital content passively, skimming videos, depending excessively on captions, or skipping comprehension checks, without applying cognitive or metacognitive strategies that support deeper learning (Liu, Hua, & Zhang, 2022). Moreover, in the absence of teacher mediation or peer interaction, learners may struggle to monitor their understanding or transfer listening strategies to new contexts.

Contextual variability further complicates implementation. In well-resourced educational environments, learners benefit from stable internet connections, institutional subscriptions to digital platforms, and trained instructors familiar with technology integration (Nafea, 2024). In contrast, under-resourced settings often face challenges such as limited device access, low digital literacy among both learners and teachers, and minimal professional development on instructional technology use. Waqar et al., (2024) underscores these disparities, noting that the effectiveness of digital listening tools is highly contingent on the availability of infrastructure and the quality of instructional integration (Waqar, Rashid, Anis, & Muhammad, 2024). These disparities reinforce the need for scalable, adaptable instructional models that embed digital tools within structured pedagogy while remaining sensitive to diverse educational contexts.

2.4. Gaps in the Literature

Despite increasing interest in technology-mediated language learning, there are several persistent gaps in the literature, particularly regarding ESL listening instruction. First, mixed-methods research designs, which combine quantitative outcome measures with qualitative insights into learner experience, remain relatively rare. Many existing studies rely on either small-scale case studies or large-scale survey research, with limited triangulation of data sources. As a result, nuanced understandings of both *what works* and *why it works* in digital listening instruction are often lacking.

In addition, while technology has been widely studied in relation to speaking, pronunciation, and vocabulary development, there is a paucity of empirical work focused specifically on listening comprehension. This imbalance limits our understanding of how digital tools impact the unique cognitive and affective demands of listening, especially in real-time, authentic language settings. Moreover, existing research has paid insufficient attention to the interaction between strategy instruction and technology use. Although many tools offer useful features, such as playback control or real-time feedback, they are frequently implemented without instructional scaffolding that teaches learners *how* and *when* to use these features effectively. In real classroom settings, where instructional time is limited and learner needs vary, this lack of integration can result in superficial engagement with technology and minimal skill transfer beyond the platform itself (Nasrullah et al., 2024).

Furthermore, the affective dimensions of digital listening, such as learner motivation, anxiety, and autonomy, are often underexplored. Given that listening is commonly associated with high cognitive load and language anxiety, especially among adult learners, these factors play a crucial role in determining both engagement and achievement (binti

Mohamad & Yacob, 2024). Yet, relatively few studies have examined how technology influences learners' emotional responses to listening tasks or their long-term confidence in dealing with real-world listening scenarios.

A considerable number of studies report tool effectiveness based on short-term interventions or self-reported perceptions, rather than measured improvements in listening performance. While such findings are valuable, they often lack the rigor needed to establish causal relationships or long-term effects. Longitudinal and comparative studies, particularly those incorporating control groups and standardized comprehension assessments, remain scarce in this area. These gaps clarify the need for well-designed empirical research that not only evaluates the effectiveness of digital tools but also investigates their pedagogical integration, learner perceptions, and sustained impact on listening development.

2.5. Contribution of the Present Study

The present study responds to these gaps by empirically examining whether technology-assisted listening instruction improves comprehension in ESL learners, using a quasi-experimental design with pre- and posttests. Unlike previous research that isolates digital tools as independent variables, this study embeds them within a pedagogically structured framework, including pre-task, during-task, and post-task activities. It evaluates not just tool efficacy, but instructional integration, testing the hypothesis that digital tools support learning only when mediated through strategic, teacher-supported instruction.

By combining theoretical grounding with performance data, this study offers new insights into how technology can be used not merely to deliver content, but to scaffold comprehension, support autonomy, and enhance learner outcomes in ESL listening.

3. Methodology

3.1. Research Design

This study employed a quasi-experimental, mixed-methods research design to evaluate the impact of technology-assisted listening instruction on ESL learners' comprehension skills. The design was chosen to balance the need for empirical measurement of learning outcomes with the exploration of learner experiences and instructional dynamics. A non-randomized control group design was used, involving two intact ESL classes at the same academic institution. One group received traditional textbook-based instruction (control), while the other received digitally supported instruction using interactive listening tools (experimental).

The quantitative component involved a pretest–posttest structure to assess comprehension gains, while the qualitative component included classroom observations, learner journals, and post-intervention reflections to contextualize the findings. The integration of both methods allowed for triangulation of results, thereby increasing the study's internal validity and providing a more comprehensive understanding of technology's instructional value.

3.2. Participants and Sampling

Participants were 96 adult ESL learners enrolled in a post-secondary English language program at an urban academic institution. The sample was divided into two equal groups:

- Experimental group (n = 48): Received technology-enhanced listening instruction.
- Control group (n = 48): Received conventional textbook-based listening instruction.

All participants were aged 18 and above, with English proficiency levels ranging from B1 to C1 on the Common European Framework of Reference for Languages (CEFR) scale. The sampling strategy was purposive and stratified to ensure demographic and proficiency-level comparability between the groups. Intact classes were selected to preserve the ecological validity of the instructional setting and reduce disruption to the academic schedule.

The demographic composition of both groups was diverse, including learners from over 10 linguistic and cultural backgrounds. Participants had varied levels of prior exposure to digital tools, but all had access to a device and internet connection during the intervention period.

3.3. Instructional Tools and Interventions

The experimental group used the following technology tools integrated into a structured instructional framework:

- Ed Puzzle – An interactive video platform with embedded comprehension questions, captions, and teacher feedback features.
- TED-Ed – A repository of educational videos, many of which include subtitles, vocabulary previews, and discussion prompts.
- ELSA Speak – A speech recognition-based mobile application providing feedback on pronunciation, intonation, and word stress.

These tools were selected based on their pedagogical relevance, accessibility, and alignment with listening comprehension skills. The control group followed a parallel listening curriculum using printed textbooks and audio CDs. Both groups received instruction over 10 weeks, with comparable lesson objectives, class time, and teacher support.

Each listening session in the experimental group was structured into three phases:

- Pre-task phase: Vocabulary activation, prediction tasks, or schema-building.
- During-task phase: Engagement with listening tools (e.g., Ed Puzzle video with embedded questions).
- Post-task phase: Reflection via journal writing, discussion, or strategy evaluation.

3.4. Data Collection Instruments

3.4.1. Pretest and Posttest

Listening comprehension was measured using a standardized test battery administered to both groups at the start and end of the 10-week period. The test included items measuring:

- Literal comprehension (e.g., identifying facts or sequences)
- Inferential comprehension (e.g., identifying implied meaning, speaker attitude)
- Global comprehension (e.g., gist understanding and theme recognition)

The test was adapted from a CEFR-aligned commercial assessment tool and reviewed for reliability and appropriateness by two ESL curriculum experts.

3.4.2. Learner Engagement Logs

Participants in the experimental group maintained weekly logs detailing their interactions with the digital tools, perceived usefulness, and time spent on tasks. These logs were used to gauge tool usage patterns and learner autonomy.

3.4.3. Reflective Journals and Focus Groups

Voluntary qualitative data were collected through weekly learner journals and two post-interventions focus group discussions (n = 6 participants per group). Prompts focused on perceived benefits and challenges of the tools, listening strategies used, and emotional responses to the learning process.

3.4.4. Classroom Observations

Non-participant observations were conducted by a trained researcher using a structured checklist that captured:

- Teacher scaffolding behavior
- Learner engagement patterns
- Instructional integration of tools
- Strategy modeling and discussion

3.5. Data Analysis

3.5.1. Quantitative Analysis

Pretest and posttest scores were analyzed using paired sample t-tests to measure within-group improvement and independent sample t-tests to assess between-group differences. Effect sizes (Cohen's d) were calculated to determine the magnitude of gains. Sub-skill analyses (literal vs inferential comprehension) were also conducted to explore which listening domains benefitted most from the intervention.

All statistical analyses were conducted using SPSS (Version 28), with a significance level set at $p < 0.05$. Data were screened for normality and outliers prior to analysis.

3.5.2. Qualitative Analysis

Qualitative data (journals, focus group transcripts, observation notes) were analyzed using thematic coding. An inductive approach based on grounded theory principles was employed to allow themes to emerge from the data. Coding was conducted in two cycles:

- Open coding to identify key categories (e.g., tool usability, anxiety reduction, strategy awareness).
- Axial coding to explore relationships among categories and align them with the research objective.

To ensure trustworthiness, two researchers coded the data independently and discussed discrepancies until consensus was reached. Triangulation across journals, focus groups, and observations enhanced credibility.

3.6. Ethical Considerations

This study adhered to the ethical guidelines of the institution and received formal approval from the Institutional Review Board (IRB). Key ethical measures included:

- Informed Consent: Participants were briefed on the study's aims, procedures, and voluntary nature. Written consent was obtained for both the quantitative and qualitative components.
- Anonymity and Confidentiality: All participant data were anonymized using coded identifiers. Personal information was stored securely and separately from data files.
- Data Security: Digital data (e.g., test scores, journals) were stored in encrypted formats on password-protected devices.
- Right to Withdraw: Participants could withdraw from the study at any time without academic penalty.
- Minimizing Harm: The intervention was designed to supplement existing instruction, ensuring that no participant was disadvantaged. Care was taken to avoid overwhelming learners with technology, and additional support was provided where needed.

4. Results

This section presents the findings of the quasi-experimental study, comparing the performance of the experimental group (technology-assisted instruction) and the control group (traditional textbook instruction) on a listening comprehension task. Quantitative results are presented first, followed by qualitative insights to contextualize the observed trends.

4.1. Pretest and Posttest Performance

Both the experimental and control groups completed identical listening comprehension pretests and posttests. Results showed that while both groups demonstrated improvement, the experimental group achieved significantly greater gains.

The experimental group had a mean pretest score of 61.4 (SD = 7.3) and a mean posttest score of 78.2 (SD = 6.9), yielding a mean gain of 16.8 points. In contrast, the control group showed a more modest increase, from 60.8 (SD = 6.8) to 67.5 (SD = 7.2), with a gain of 6.7 points.

An independent samples t-test confirmed that the posttest score difference between the two groups was statistically significant ($t(94) = 7.61$, $p < .001$). The effect size (Cohen's d = 1.36) indicates a large practical effect, suggesting that the digital tools, when embedded within structured instruction, significantly improved listening comprehension.

4.2. Sub-Skill Gains

A breakdown of the listening test revealed that the experimental group outperformed the control group in both literal and inferential comprehension categories. Notably:

Inferential comprehension improved by 9.4 points in the experimental group compared to 3.1 points in the control group.

Literal comprehension gains were more balanced, but still higher in the experimental group (7.1 vs. 3.6 points).

These findings, as illustrated in Figure 1, support the hypothesis that digital tools not only enhance factual recall but also help learners engage with deeper meaning and speaker intent, particularly when accompanied by strategy instruction and scaffolding.

Figure 1. Mean gain scores in literal and inferential comprehension sub-skills for experimental and control groups. The experimental group showed greater improvement in both areas, with particularly notable gains in inferential comprehension.
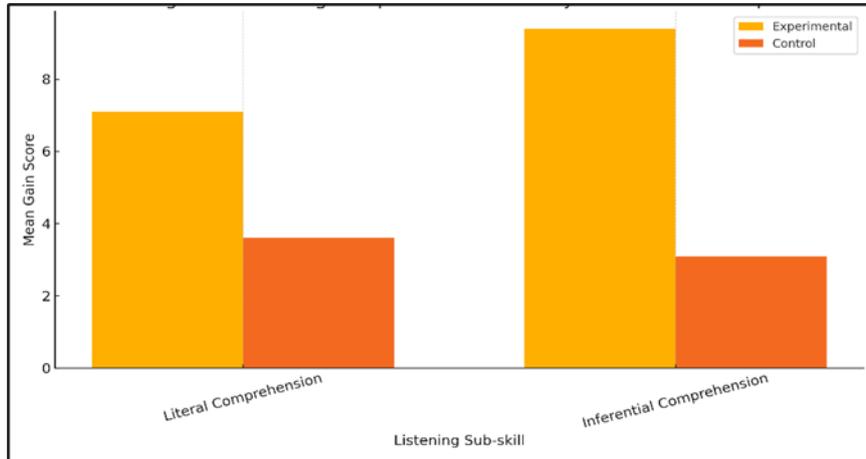

Figure 1 Listening comprehension gains by sub skill and group

4.3. 4.3 Visualizing the Gains

Figure 2 Comparison of pretest and posttest mean listening comprehension scores for experimental and control groups. Learners receiving technology-assisted instruction demonstrated significantly greater gains (p < .001), with a mean gain of 16.8 points compared to 6.7 in the control group.
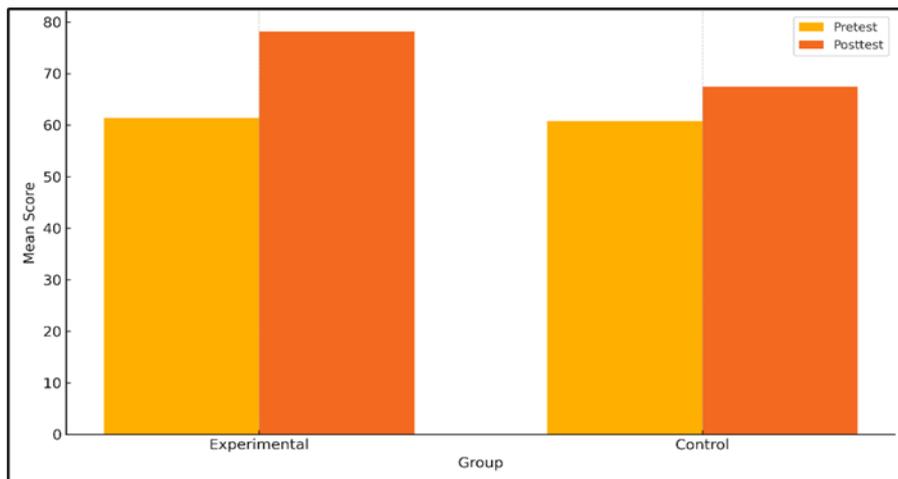

Figure 2 Comparison of pre-test and post-test scores in experimental and control groups.

Figure 2 illustrates the pretest and posttest mean scores for both groups. The experimental group shows a more dramatic improvement, visually reinforcing the statistical results.

4.4. Learner Engagement and Tool Usage

Engagement logs showed that students in the experimental group used the digital platforms 3.2 times per week on average, spending approximately 28 minutes per session. The most commonly used features included:

- Replay and pause functions (87% of learners)
- Subtitles and caption toggling (79%)

- Interactive quizzes and comprehension checks (72%)

Interestingly, learners reported frequent replaying of difficult sections, especially in TED-Ed videos, as a key strategy for comprehension, as shown in Figure 3.

Figure 3. Weekly average time (in minutes per session) spent by learners in the experimental group using digital listening tools. Engagement was sustained across the 10-week period, with a peak in weeks 5–6.
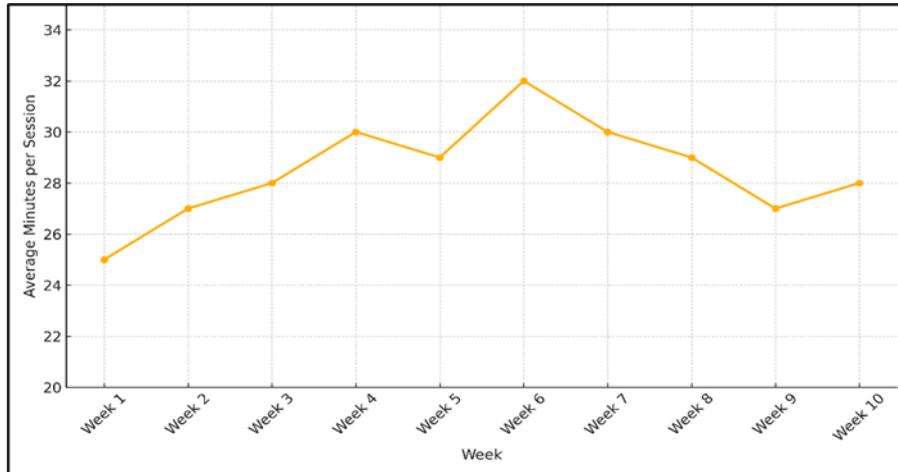

Figure 3 Weekly average time spent on digital listening tools

4.5. Qualitative Insights

Thematic analysis of learner journals and focus group transcripts revealed three dominant themes:

- Increased Autonomy and Confidence

Learners appreciated being able to control the pace and sequence of listening. One learner noted, *"I no longer feel lost in class, I can pause and repeat without feeling embarrassed."*

- Metacognitive Awareness

Many learners became more aware of their listening process. Reflective entries frequently referenced predictions, note-taking, and self-monitoring strategies. These strategies aligned with the instruction provided during the intervention.

- Reduced Listening Anxiety

Several participants reported feeling less anxious during listening activities, attributing this to the ability to control playback and receive instant feedback. Tools such as ELSA Speak helped build phonological awareness and reinforced learner confidence.

Observation notes further corroborated these findings. Learners in the experimental group demonstrated higher classroom engagement, more frequent strategy use (e.g., note-taking and self-questioning), and better on-task behavior compared to the control group. These findings are illustrated in Figure 4.

Figure 4. Emergent themes from learner reflections, journals, and focus group discussions. Themes such as autonomy, metacognitive awareness, and reduced anxiety were most frequently cited by learners in the experimental group.
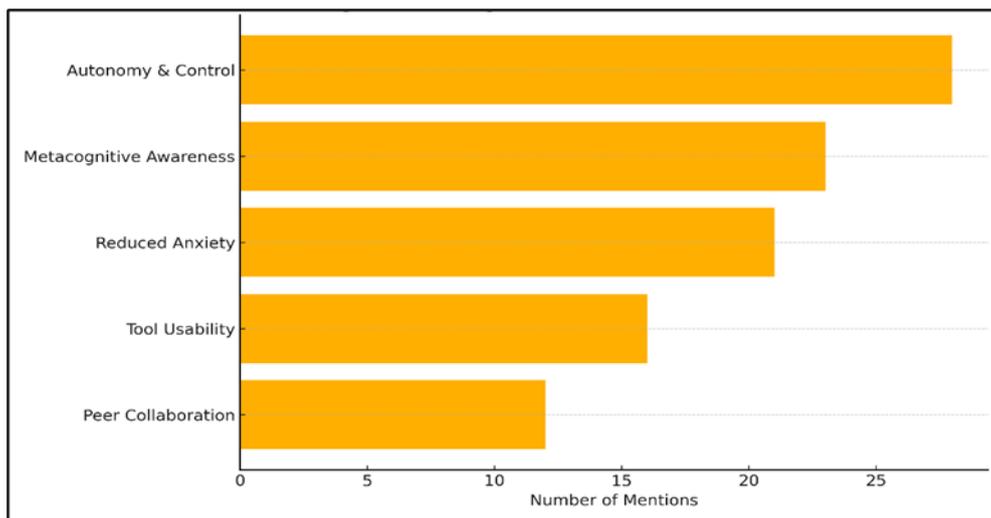
Figure 4 Emergent themes from learner reflections

4.6. Summary of Key Findings

The experimental group outperformed the control group significantly in overall listening comprehension. Sub-skill analysis revealed greater gains in inferential listening for the experimental group.

Engagement with digital tools was consistent and focused, particularly around comprehension-enhancing features.

Qualitative data suggest that structured integration of tools fostered autonomy, reduced anxiety, and promoted metacognitive development.

5. Discussion

This study set out to examine whether structured, technology-assisted listening instruction improves ESL learners' comprehension skills more effectively than traditional methods. The findings provide strong evidence that when digital tools are embedded within a coherent instructional framework, through pre-task preparation, in-task support, and post-task reflection, they can significantly enhance listening outcomes.

The experimental group achieved statistically higher posttest scores than the control group, with particularly notable gains in inferential comprehension. This supports Field's Cognitive Processing Model, which highlights the importance of developing both bottom-up decoding and top-down inferencing skills (Chalabyan & Sahakyan, 2024). Learners using EdPuzzle and TED-Ed engaged in comprehension tasks that required prediction, interpretation, and inference, suggesting these tools helped strengthen higher-order cognitive processing.

The results also align with Krashen's Input Hypothesis, which emphasizes the value of comprehensible input in a low-anxiety environment (Luo, 2024). Features such as playback control, captioning, and interactive feedback likely contributed to this environment. Learners reported feeling more confident and less anxious, reflecting findings from Mahalingappa et al. (2024) and Chen et al. (2023), who observed reduced listening anxiety when learners had control over input pace and content (Chen et al., 2023; Mahalingappa et al., 2024).

Beyond performance data, qualitative insights revealed important shifts in learner behavior and attitudes. Many learners demonstrated greater autonomy in managing their listening tasks, as well as increased metacognitive awareness. This mirrors the findings of Prasongngern and Soontornwipast (2023), who also noted that digital tools, when paired with strategy instruction, helped learners plan, monitor, and evaluate their listening (Prasongngern & Soontornwipast, 2023). Such findings are grounded in Vygotsky's Sociocultural Theory, particularly the concept of the Zone of Proximal Development, where learners advance through scaffolded, mediated interactions (Panhwar et al., 2025).

The structured use of digital tools was a key differentiator in this study. Unlike previous research that introduced tools in a limited or isolated way (Liu et al., 2022; Said et al., 2023), this study incorporated them as part of a lesson sequence.

The three-phase structure ensured learners had time to activate prior knowledge, interact meaningfully with content, and reflect on their listening strategies. This design aligns with Mayer's Cognitive Theory of Multimedia Learning, which warns against overloading learners with unstructured multimedia content (Cavanagh & Kiersch, 2023). Participants specifically cited the usefulness of Ed Puzzle's embedded questions and TED-Ed's repayable segments, suggesting these features were instrumental in fostering focused engagement.

In practical terms, the findings suggest that ESL instructors should not rely on digital tools as standalone enhancements but rather integrate them into pedagogically structured activities. Teachers should scaffold listening tasks by preparing learners with vocabulary previews, modeling strategies during listening, and facilitating post-task reflection. This aligns with the recommendations of Hatmanto et al. (2025), who emphasize that technological success depends more on instructional design than on the tools themselves (Hatmanto, Pratolo, Nafi'ah, Alsulami, & Gendroyono, 2025). Additionally, instructors need training not only in operating digital platforms but also in aligning these tools with instructional goals. Without such guidance, learners may misuse features or engage passively, undermining the intended benefits.

Nevertheless, it is important to consider the role of access and context. The learners in this study had consistent access to devices, internet, and instructor support. In lower-resource settings, digital instruction may face barriers such as unstable connectivity or limited teacher training, as highlighted by Waqar et al. (2024) (Waqar et al., 2024). The promising results seen here may not generalize to all environments. However, the core instructional principles, preparation, strategy support, and reflection, can be adapted even in low-tech contexts, using tools like offline videos or audio recordings.

Tool-specific usage data also provided useful insights. Learners consistently used replay and caption features, indicating a preference for tools that offer control over pacing and input clarity. This supports previous findings by Mahalingappa et al. (2024), who showed that such features are especially helpful for intermediate learners navigating unfamiliar speech patterns (Mahalingappa et al., 2024). The frequent use of embedded comprehension tasks suggests that learners benefit from structured prompts that guide attention and processing during listening.

Finally, these findings point to several directions for future research. Longitudinal studies could assess whether the observed comprehension gains and strategy use persist over time. Comparative studies could examine differential impacts across proficiency levels or learning settings, including self-paced and hybrid models. Further research might also explore how digital tools influence broader communicative skills, such as note-taking for academic lectures or interpreting spoken instructions in workplace settings. Additionally, future work should investigate how professional development programs can support teachers in aligning technology use with cognitive and affective goals of listening instruction.

Hence, this study confirms that digital tools, when purposefully integrated into pedagogical design, can lead to meaningful improvements in ESL listening comprehension. More importantly, they can empower learners with the autonomy, confidence, and strategic awareness needed to become more effective and independent listeners.

5.1. Instructional Design Implications

One of the central contributions of this study is the emphasis on designing listening instruction as a process, rather than an isolated task. The pre-task, during-task, and post-task structure used in the experimental group aligns with best practices in instructional design and multimedia learning (Sayyadi, Rahimi, Ebrahimpour, & Amiri, 2024). It ensured that learners were prepared, engaged, and able to reflect, all of which contributed to stronger learning outcomes.

These findings carry practical implications for ESL instructors. Rather than simply assigning a TED Talk or EdPuzzle video, teachers should consider:

- Introducing relevant vocabulary and context beforehand (pre-task)
- Guiding learners during listening with embedded tasks or questions
- Facilitating reflection and strategic evaluation afterward

Additionally, instructors must be trained not only in tool operation, but in pedagogical integration. Tools should support learning objectives, and not be introduced for novelty or engagement alone. Without guidance, learners may misuse or underutilize key features, as seen in earlier studies that reported passive engagement (Wang & Romero, 2025).

5.2. Equity and Access Considerations

While the experimental design was effective in this study's setting, its scalability across diverse contexts requires caution. As discussed in the literature review, not all classrooms have access to high-speed internet, personal devices, or platform licenses. Furthermore, digital literacy varies across learner populations. In low-resource or multilevel classrooms, additional scaffolding and differentiated instruction would be needed to ensure equitable access and benefits.

Nevertheless, the structured framework proposed, centered around pedagogical stages rather than specific tools, could be adapted to other tools and environments, including offline or low-bandwidth versions. Future research should explore such adaptations, particularly in under-resourced or rural settings.

5.3. Limitations of the Study

Several limitations should be acknowledged. First, the quasi-experimental design, while practical and ecologically valid, does not allow for random assignment. Although both groups were comparable in size and proficiency, other unmeasured variables (e.g., motivation, outside exposure) could have influenced outcomes.

Second, the study relied on a 10-week intervention, which, while sufficient to show short-term gains, may not capture long-term retention of listening skills. Follow-up testing weeks or months later would be needed to assess whether strategy use and comprehension improvements persist.

Third, while the qualitative data added depth, it was collected only from the experimental group, limiting comparative insight into learner perceptions in the control group. Including interviews or reflective tasks for the control group could have enriched the interpretation of engagement and affective shifts.

5.4. Directions for Future Research

Future studies should explore the longitudinal effects of structured digital listening instruction and whether gains in comprehension lead to broader communicative competence. Research should also consider differentiated impacts across proficiency levels, age groups, or learning styles, especially in hybrid and self-paced learning models.

Another valuable direction is the design of professional development models that help teachers align digital tools with listening strategy instruction. Such training could focus not only on technical tool use, but also on cognitive scaffolding, task sequencing, and affective support for learners. In addition, the interaction between learner agency, tool customization, and teacher mediation deserves further exploration. As digital learning environments become more personalized, understanding how learners choose and adapt tools, and how teachers guide those choices, will be key to optimizing outcomes.

6. Conclusion

This study investigated the effects of structured, technology-assisted instruction on ESL listening comprehension. Using a quasi-experimental design, findings revealed that learners in the experimental group, who received digital listening instruction embedded within pre-, during-, and post-task scaffolding, achieved significantly greater gains than those in the control group. Notably, the greatest improvements occurred in inferential comprehension, a skill closely tied to higher-order cognitive processing. Beyond performance data, qualitative insights highlighted increased learner autonomy, reduced listening anxiety, and greater use of metacognitive strategies. These outcomes emphasize a key point: technology alone is insufficient unless paired with intentional, pedagogically sound design. When digital tools are integrated into a structured instructional sequence, they support not just comprehension but also confidence and strategic engagement.

The study contributes to the field by moving beyond tool-centric research to demonstrate the importance of instructional framing. It underscores the need for teachers to align digital content with learning goals, provide strategy instruction, and offer reflective opportunities that deepen processing. While the study was limited by its duration and context, it lays a foundation for future research into long-term effects, learner-driven tool use, and broader applications across diverse proficiency levels and settings. Ultimately, this study affirms that technology can enhance ESL listening outcomes, but only when used purposefully, within a clear pedagogical structure that centers learners and their cognitive development.

Compliance with ethical standards

Disclosure of Conflicts of interest

The authors have no relevant financial or non-financial interests to disclose.

Statement of Ethical approval

This study received ethical approval from the Institutional Review Board at the Center for Applied Linguistics Research, Urban International College (UIC), and all participants provided informed consent prior to participation.

Statement of informed consent

All participants provided informed consent prior to their involvement in the study, in accordance with the ethical guidelines of Urban International College (UIC).

Authors' contributions statement:

- The authors collaboratively conceptualized and designed the study.
- Dr. B Jain A.R. Tony led the manuscript drafting and revisions.
- Data collection and analysis were conducted by Ms. Haleema Tauseef
- All authors reviewed and approved the final version of the manuscript and are accountable for its integrity and accuracy.

References

[1] Abdujabbarovna, Kamilova Zulfira. (2025). Teaching Listening Strategies Through Genre-Based Approaches. European International Journal of Pedagogics, 5(01), 70-76.

[2] Akram, Nazia, Sadiq, Maqsooda, & Rehman, Jawaria. (2024). Exploring Gender Based Listening Anxieties in Computer Based IELTS Tests: An In-depth Investigation. Journal of Asian Development Studies, 13(1), 666-674.

[3] Ashidiq, Yasa Ayatina. (2022). Enhancing Learner Autonomy through Collaborative Learning in a Distance Language Classroom of Morphology Class. ENLIT, 2(1), 62-73.

[4] Bakla, Arif, & Demiröz, Hakan. (2024). English language learners' experiences of using interactive videos in EFL listening. The JALT CALL Journal, 20(2), 1-32.

[5] binti Mohamad, Mimi Mazlina, & Yacob, Raja Nur Hidayah Raja. (2024). Unravelling The Level and Factors of Listening Comprehension Anxiety in ESL Flipped Classroom Setting. Malaysian Journal of Social Sciences and Humanities (MJSSH), 9(10), e003058-e003058.

[6] Bruckner, Alina. (2023). Teaching in the Post-COVID Context. Challenges and Opportunities of Blended Learning. Dialogos, 24(40), 12-22.

[7] Bu, Zihan, Pan, Sunyun, & Wang, Ziyi. (2025). Enhancing Vocabulary Learning: Multimodal Engagement in English Teaching Social Media Video. Arts, Culture and Language, 1(3).

[8] Cavanagh, Thomas M, & Kiersch, Christa. (2023). Using commonly-available technologies to create online multimedia lessons through the application of the Cognitive Theory of Multimedia Learning. Educational technology research and development, 71(3), 1033-1053.

[9] Chalabyan, Susanna, & Sahakyan, Arpine. (2024). TEACHING LISTENING COMPREHENSION IN THE ARMENIAN CLASSROOM USING BOTTOM-UP AND TOP-DOWN STRATEGIES. Вестник Армянского государственного экономического университета(2), 111-120.

[10] Chen, Shangwen, Wallace, Matthew P, Ieng, Ho Sok, Chen, Yuwei, Lam, Wong Kuan, & de Oliveira, Samuel Correia. (2023). Foreign Language Listening Comprehension and Listening Anxiety. Tesl-Ej, 27(2), n2.

[11] Chi, Chen, Chen, Hao-Jan Howard, Tseng, Wen-Ta, & Liu, Yeu-Ting. (2023). Efficacy of different presentation modes for L2 video comprehension: Full versus partial display of verbal and nonverbal input. ReCALL, 35(1), 105-121.

[12] Du, Guohui, & Man, Deliang. (2023). Mediating effect of metacognition on the relationship between listening self-efficacy and L2 listening comprehension. The Asia-Pacific Education Researcher, 32(5), 655-664.

[13] Hatmanto, Endro Dwi, Pratolo, Bambang Widi, Nafi'ah, Aisyah Umi, Alsulami, Naif Daifullah, & Gendroyono, Gendroyono. (2025). Navigating English learning in the digital era: Millennial students' strategies at a private university in Yogyakarta. Teaching English as a Foreign Language Journal, 4(1), 1-15.

[14] Ibrahim, Mohamed, & AYDOĞMUŞ, Mevlüt. (2023). Examining ESL preservice teachers' personal factors that best predict their confidence to integrate technology in future classrooms. Journal of Education and Recreation Patterns, 4(1), 134-152.

[15] Khasanah, Fajar Royani, Herlina, Rina, & Rustandi, Andi. (2023). The Use of Digital Storytelling to Stimulate Learners' Listening Comprehension. Journal of English Education Program (JEEP), 10(2), 155-160.

[16] Liu, Zhengxia, Hua, Jie, & Zhang, Zixu. (2022). Scaffolding instruction in virtual language learning. Journal of Language Teaching and Research, 13(2), 386-391.

[17] Luo, Zixu. (2024). A Review of Krashen's Input Theory. Journal of Education, Humanities and Social Sciences, 26(1), 130-135.

[18] Mahalingappa, Laura, Zong, Jiaxuan, & Polat, Nihat. (2024). The impact of captioning and playback speed on listening comprehension of multilingual English learners at varying proficiency levels. System, 120, 103192.

[19] Mogollon, Joibel Tadea Gimenez. (2023). of Educational Sciences and Arts (IJESA).

[20] Mukhtorova, Mokhlaroyim, & Ilxomov, Xojiakbar. (2024). How To Improve Listening Skills Of Both ESL And EFL Students. QO 'QON UNIVERSITETI XABARNOMASI, 11, 84-86.

[21] Nafea, Dorgham Ahmed. (2024). The Impact of Technology Integration on Language Proficiency in English Learners. Thi Qar Arts Journal, 2(45), 177-177.

[22] Nasrullah, Nasrullah, Rosalina, Elsa, Umar, Vebrianti, Ningsih, Rahma Pitria, Nor, Hidayah, Fauziah, Salsabila, & Fadillah, Arfa SN. (2024). Technology Integration in English Language Teaching and Learning.

[23] Nazarieh, Mehrdad, Razmi, Mohammad Hasan, Azizian, Mahdieh, & Ghani, Muhammad Usman. (2022). A brief history of listening comprehension in second language teaching and learning. Education Research International, 2022(1), 3894457.

[24] Panhwar, Intikhab Ahmed, Usman, Muhammad, Panhwar, Faiza, & Surahio, Tahreem Akhter. (2025). Exploring the Impact of Zone of Proximal Development and Scaffolding in Second Language Acquisition: A Comparative Study of Vygotskian and Freirean Approaches. Social Science Review Archives, 3(1), 1166-1176.

[25] Prasongngern, Poonlarp, & Soontornwipast, Kittitouch. (2023). Effects of Listening Strategy Instruction Incorporating Intensive and Extensive Listening on Listening Skills and Metacognitive Awareness. International Journal of Instruction, 16(4).

[26] Said, Noraini, Sukor, Nur Suhaidah, Keong, Tan Choon, & Ompok, Connie Cassie. (2023). Developing ESL Teachers' TPACK Through Evaluation of Digital Resources. European Proceedings of Educational Sciences.

[27] Sarbunan, Thobias. (2024). Intensive listening and cutting-edge strategies unlock language mastery. Journal of Language, Literature, and English Teaching (JULIET), 5(1), 37-52.

[28] Sayyadi, Mehran, Rahimi, Mehrak, Ebrahimpour, Reza, & Amiri, S Hamid. (2024). Applying multimedia learning principles in task design: Examination of comprehension development in L2 listening instruction. English Teaching & Learning, 48(1), 73-96.

[29] Shamsitdinova, Manzura. (2024). Developing Multimodal Listening Skills in English for Specific (or special) Purposes: A pedagogical framework. The American Journal of Social Science and Education Innovations, 6(06), 15-21.

[30] Sholekhah, Miratu Fitria, & Fakhrurriana, Ria. (2023). The Use of ELSA Speak as a Mobile-Assisted Language Learning (MALL) towards EFL Students Pronunciation. JELITA: Journal of Education, Language Innovation, and Applied Linguistics, 2(2), 93-100.

[31] Siegel, Joseph, Kuteeva, Maria, & Siegel, Aki. (2025). Monitoring Listening Comprehension in Real Time: Early Observations from the ReMoDEL Project. TESOL Quarterly.

[32] Sohler, Sydney. (2020). Developing listening comprehension in ESL students at the intermediate level by reading transcripts while listening: A cognitive load perspective: Brigham Young University.

[33] SreeRekha, R. (2021). Impact of ICT Resources on Addressing Listening Comprehension Needs of ESL Learners. Journal of the Faculty of Education, 11(17), 37-47.

[34] Tran, Dang Khoi, & Vu, Thi Kim Chi. (2024). Investigating Learners' Perspectives on ELSA Speak Integration to Enhance Autonomy and Oral Language Proficiency in English Classes. Paper presented at the Proceedings of the AsiaCALL International Conference.

[35] Vu, Danh Cong, Lian, Andrew-Peter, & Siriyothin, Peerasak. (2022). Integrating natural language processing and multimedia databases in CALL software: Development and evaluation of an ICALL application for EFL listening comprehension. Computer-Assisted Language Learning Electronic Journal, 23(3), 41-69.

[36] Wang, Lu, & Romero, Christina. (2025). Promoting Students' Active Engagement in Online Teacher Education Courses. EIKI Journal of Effective Teaching Methods, 3(1).

[37] Waqar, Yasira, Rashid, Sumera, Anis, Faisal, & Muhammad, Yaar. (2024). Digital divide & inclusive education: Examining how unequal access to technology affects educational inclusivity in urban versus rural Pakistan. Journal of Social & Organizational Matters, 3(3), 1-13.

[38] Zheng, Hua, Jung, Eulho, Li, Tong, & Yoon, Meehyun. (2022). Effects of Segmentation and Self-Explanation Designs on Cognitive Load in Instructional Videos. Contemporary Educational Technology, 14(2).

[39] Чайковська, Ольга Володимирівна. (2022). IMPLEMENTATION OF RANDALL'S ESL CYBER LISTENING LAB MATERIALS FOR IMPROVING HIGH STUDENTS'LISTENING COMPREHENSION. Електронне наукове фахове видання "ВІДКРИТЕ ОСВІТНЄ Е-СЕРЕДОВИЩЕ СУЧАСНОГО УНІВЕРСИТЕТУ"(13), 153-160.

Appendix

Appendix A: Technology-Assisted Listening Questionnaire

Instructions: Please indicate how much you agree or disagree with the following statements by circling the appropriate number on the scale.

Scale

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

Technology Use in Listening Practice

- I found the listening tools (e.g., TED-Ed, ELSA Speak, EdPuzzle) easy to use.
- Using technology made the listening lessons more interesting.
- The listening tasks through online tools were relevant to my learning needs.
- I felt confident navigating digital listening platforms.
- I liked having control over features such as pause, replay, and speed.
- Listening Comprehension and Skills
- My ability to understand spoken English improved through these tools.
- The listening activities helped me focus on both the main ideas and details.
- I became more aware of listening strategies (e.g., prediction, inferencing).
- I was able to notice pronunciation and intonation more clearly.
- I found the multimodal content (video, text, audio) helped me understand better.

Motivation and Engagement

- I was motivated to complete listening tasks when using technology.
- I found myself more engaged during digital listening sessions than traditional ones.
- I enjoyed the flexibility of completing tasks at my own pace.
- The digital tools encouraged me to listen more frequently.
- I would recommend using such tools to other learners.

Learner Autonomy

- I felt more responsible for my own listening progress.
- The tools helped me identify my strengths and weaknesses.
- I used the feedback from tools to improve my listening performance.
- I explored additional listening content outside of class.
- I feel I can continue improving my listening using these technologies independently.

Open-Ended Questions (Optional)

- What feature of the listening tools did you find most helpful?
- What challenges, if any, did you face using these tools?
- Do you feel more confident in your listening abilities after this intervention? Why or why not?

Appendix B: Semi-Structured Interview Questions

Purpose: These interviews aim to gather deeper insights into students' experiences with digital tools for listening practice and their perceived impact on listening skills, motivation, and autonomy.

Experience with Technology

- How did you feel about using digital tools like TED-Ed, EdPuzzle, or ELSA Speak during the listening lessons?
- Which tool or activity did you enjoy the most? Why?
- Were there any tools or features you found difficult or confusing to use?

Perceived Improvement in Listening Skills

- Do you think your listening skills have improved after using these tools? In what way?
- Can you describe a specific moment when you understood something better because of the digital activity?
- Did you notice any changes in your ability to focus or understand different accents or speech speeds?

Motivation and Engagement

- Did the technology-based lessons make you feel more motivated to practice listening? Why or why not?
- Were you more engaged in lessons with technology compared to traditional listening activities?
- Did you feel more confident in participating or responding after doing the digital tasks?

Learner Autonomy and Habits

- Did you do any extra listening practice outside of class because of your experience with these tools?
- Did you feel more in control of your own learning during this period?
- Would you continue using any of these tools after the course ends?

Final Reflections

- What suggestions would you give to improve how technology is used for listening in language classes?
- Is there anything else you'd like to share about your experience?