A Suggested Programme Based on Cognitive Load-Management Strategies to Enhance EFL Prospective Teachers Listening Comprehension Skills

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Abstract

*T*he current study delves into enhancing EFL listening comprehension skills through a suggested programme based on Cognitive Load-Management Strategies among prospective English teachers. The participants included 60 4th-year students from the Faculty of Education, Menoufia University, who were divided into two equal groups: an experimental group (N=30) and a control group (N=30). The researchers prepared a listening comprehension pre-posttest, a listening skills checklist, and a suggested programme based on Cognitive Load-Management Strategies. The experimental group was taught using the suggested programme during the second semester of the academic year 2022/2023, while the control group received the regular instruction. Findings proved that there are statistically significant differences between the two groups in favor of the experimental group after using the suggested programme.

Keywords: EFL listening comprehension skills, Cognitive Load-Management Strategies, Suggested Programme, prospective English teachers.

Introduction

An EFL listening comprehension skill is a vital skill that needs concentration and a focus on the spoken text to gain the main idea, identify specific details, receive information, and acquire the correct accent of native

speakers. This helps in understanding meaning and recognizing the differences between similar words. It is believed that listening is the foundation upon which all other skills are built and the main way students improve their initial interaction with the target language and its culture. Students who do not listen effectively may find it difficult to comprehend what is being said, which makes effective communication impossible. People require this ability to communicate in their daily lives, as it is necessary for offering both content and meaningful responses (Sari, 2023).

The concept of listening is one that is complex to understand and analyze. This implies that defining listening succinctly and clearly is challenging (Gilakjani & Sabouri, 2021). However, it can be referred to as one of the four essential language skills that are taught, and it is one of the two receptive skills used in oral communication (Richards & Rodgers, 2022). Furthermore, the term "listening" in education also encompasses "speech recognition," "speech perception," and "spoken language understanding" (Vandergrift & Goh, 2021). The fact that listening is such an active process implies that, in addition to processing what we hear, we also integrate it with previously learned material. Thus, through this active process, we interpret what we hear by fusing it with the information already stored in our thoughts (Wilson, 2020). The listening process is often described through several stages, which can include receiving, comprehending, remembering, evaluating, and responding (Jones, 2022).

According to recent research, there are a variety of factors that contribute to listening comprehension difficulties, including unfamiliar accents, rapid pronunciation, speech rate, vocabulary deficiencies, inattention, anxiety, and poor audio quality (Chen, 2023).

The nature of the language being alien and rarely encountered by learners in real life is a primary cause of the challenges faced by English teachers. Among the most prevalent challenges are those resulting from hearing reduced forms of words and a general inability to focus.

To address these challenges and make listening simpler and more efficient, various instructional approaches are needed. Cognitive Load Theory (CLT) provides a framework for understanding the cognitive demands of learning (Sweller, 1988). CLT suggests that instruction should be designed to optimize the load on working memory to facilitate learning. "Cognitive Load-Management Strategies" can therefore be defined as deliberate instructional techniques and learner approaches aimed at regulating the amount of mental effort involved in processing information, particularly during complex tasks like EFL listening. These strategies focus on managing intrinsic load (inherent difficulty), minimizing extraneous load (ineffective load from poor design), and optimizing germane load (effective load for schema construction). This study proposes a programme based on such strategies. The concept of managing task demands, previously explored under "workload" (Leppink & van den Heuvel, 2021), is relevant here as unmanaged task demands can exacerbate cognitive load. The proposed programme aims to help prospective teachers manage the cognitive demands of listening tasks to enhance their comprehension.

Context of the problem

The researchers observed from their work experience that the prospective English teachers have great problems in listening skills which forbid them to understand the spoken message. Previous studies have assured that students have problems in EFL listening skills. In most cases, they have problems with different accents, the speed

of the spoken texts and listening for specific details. The researchers conducted a pilot study to document the problem. It aimed at measuring students' performance level in EFL listening comprehension skills and determining which subskills they have difficulty in. The test measured listening subskills (literal skills, inferential skills, critical skills). The results of the test proved the prospective teachers' weakness in listening comprehension skills. The test's results are summarized in Table (1).

Table (1): The Correlation Coefficient between each sub- Skill with The Total Score and the Significance Level

	Sub -Skill	Pearson Correlation
Literal	**Listening for the main idea(s)**	**0.817**[**]
	Listening for details	**0.798**[**]
	Listening for specific information	**0.802**[**]
	Recognizing the intonation patterns (rising – falling – sustained) correctly	**0.826**[**]
	Recognizing consonant clusters	**0.818**[**]
Inferential	**Making inferences**	**0.809**[**]
	Drawing conclusions from what a speaker says	**0.784**[**]
	Predicting what a speaker will say	**0.835**[**]
	Inferring meaning of words from context	**0.803**[**]
	Making appropriate responses	**0.796**[**]
Critical	**Determining the speaker's purpose**	**0.811**[**]
	Determining the speaker's attitude	**0.826**[**]
	Discriminating between similar sounds	**0.813**[**]
	Discriminating between voiced and voiceless sounds	**0.812**[**]
	Distinguishing between short and long vowels	**0.814**[**]

Statement of the problem

The problem of the current study could be stated in the weakness of EFL listening comprehension skills among prospective English teachers. That is why the current study investigated the development and effectiveness of a

suggested programme based on Cognitive Load-Management Strategies to enhance these skills.

Aim of the study

The current study aimed at developing a suggested programme based on Cognitive Load-Management Strategies and evaluating its effectiveness in enhancing EFL listening comprehension skills among prospective English teachers.

Questions of the study

The current study attempted to answer the following questions:

- What are the EFL listening comprehension skills that ought to be enhanced by prospective EFL teachers?
- What are the features and components of the suggested programme based on Cognitive Load-Management Strategies used to enhance prospective EFL teachers' listening comprehension skills?
- What is the effect of the suggested programme based on Cognitive Load-Management Strategies in enhancing prospective EFL teachers' overall EFL listening comprehension skills?
- What is the effect of the suggested programme based on Cognitive Load-Management Strategies in enhancing prospective EFL teachers' specific EFL listening comprehension subskills (literal, inferential, critical)?

Significance of the study

The present study is significant as its suggested programme might help:

- Prospective teachers: as it helps them to enhance their EFL listening comprehension skills through the application of Cognitive Load-Management Strategies.

- EFL teachers: as it provides them with practical strategies and activities, derived from the programme, to enhance EFL listening comprehension skills by managing cognitive load.
- EFL curriculum: as it facilitates the enhancement of teaching methods for EFL listening comprehension skills by offering a structured, theoretically-grounded programme.

Hypotheses of the study

- There is a statistically significant difference at the level of (0.05) between the mean scores of the experimental and control groups in the post-administration of the overall EFL listening comprehension skills test in favor of the experimental group.
- There is a statistically significant difference at the level of (0.05) between the mean scores of the experimental and control groups in the post-administration for each of the EFL listening comprehension subskills (literal, inferential, critical) in favor of the experimental group.
- There is a statistically significant difference at the level of (0.05) between the mean scores of the experimental group's pre-post administrations of the overall EFL listening comprehension skills test in favor of the post-administration.
- There is a statistically significant difference at the level of (0.05) between the mean scores of the experimental group's pre-post administrations for each of the EFL listening comprehension subskills (literal, inferential, critical) in favor of the post-administration.

Delimitations of the study

- A group of 30 EFL prospective teachers, Faculty of Education, Menoufia University.

- Some EFL listening comprehension skills including (literal, inferential, and critical comprehension).
- The second semester of the academic year 2022/2023.

Definition of Terms

- Cognitive Load Theory (CLT) explains the cognitive connection between formal instruction and learning (Sweller, 1988). It posits that working memory is limited, and instruction should be designed to optimize this limited capacity.
- Cognitive Load-Management Strategies are defined in this study as instructional and learning techniques derived from CLT principles, aimed at regulating the cognitive demands on learners. These strategies focus on managing intrinsic cognitive load (inherent task difficulty), minimizing extraneous cognitive load (resulting from suboptimal instructional design), and fostering germane cognitive load (devoted to learning and schema construction). This may involve techniques such as the segmentation of information, dual coding (multisensory presentation where appropriate and non-redundant), pre-training key concepts, guiding attention, and structuring tasks to manage complexity. The related concept of "workload," which can be understood as the result of a mismatch between task demands and a person's available cognitive capacity, is a factor that can induce high cognitive load if not managed (Kalyan & Varghese, 2022).
- Operationally, in this study, the "Suggested Programme based on Cognitive Load-Management Strategies" refers to a structured sequence of learning activities and instructional approaches designed to give prospective

teachers opportunities to listen to EFL contexts under varying, managed levels of cognitive demand (e.g., by manipulating task complexity, presentation format, and required processing) to enhance their listening comprehension skills, including understanding different accents and listening for details. This includes managing both mental and physical aspects of tasks that contribute to overall cognitive load.

EFL Listening Comprehension Skills

Listening is often considered the first and most basic skill in learning a new language. As a receptive skill, it is the primary way learners acquire new vocabulary and understand grammatical structures from spoken input. The proficiency developed in listening directly impacts productive skills; learners who are good at listening typically develop a stronger competency in speaking and writing (Rost & Wilson, 2023). More than just the physical act of hearing, effective listening is an active cognitive process that involves perception, attention, and interpretation of the message (Goh & Vandergrift, 2022).

The current study defined listening comprehension operationally as a receptive skill that requires focused concentration to communicate and understand a spoken message. The suggested programme aims to develop this skill by employing Cognitive Load-Management Strategies, which may involve guiding learners through tasks with varying levels of demand, and sometimes under managed pressure, to build robust comprehension abilities.

Review of Literature

The Importance of Listening Comprehension

Among the four language skills, listening is widely regarded as an essential skill that requires prioritization in

language curricula (Kim & Lee, 2023). It serves as the foundational component for oral communication and plays a crucial part in the overall process of acquiring a second or foreign language (Garcia & Martinez, 2024). Historically, the importance of listening has long been acknowledged in EFL teaching methodologies, with its pedagogical focus evolving significantly over the decades (Thompson, 2021). Consequently, improving listening comprehension is seen as critical for enhancing learners' overall language competency and communicative abilities (Chen & Liu, 2023).

Strategies of Listening

Listening strategies are conscious plans and activities that learners employ to enhance their comprehension and retention of auditory information. These strategies are commonly categorized based on the type of cognitive processing involved, primarily distinguished as top-down and bottom-up processes (Vandergrift & Goh, 2023).

- Top-down strategies are listener-based, meaning the learner utilizes their background knowledge—including their understanding of the topic, the context, and linguistic conventions—to comprehend the text. This prior knowledge allows the listener to form expectations, interpret what is heard, and predict what might come next. Key top-down strategies include listening for the main idea, predicting content, making inferences, and summarizing.
- Bottom-up strategies, conversely, are text-based. These involve processing the input sequentially, starting from the smallest units. The listener decodes the message by relying on sounds, words, and grammatical structures to

construct meaning. Common bottom-up strategies include listening for specific details, recognizing cognates, and identifying word-order patterns.

The Listening Skills Checklist

A recent framework proposed by Al-Rashidy and Al-Sabbagh (2023) outlines key listening skills, which they categorize into three hierarchical levels of comprehension: literal, inferential, and critical. Although the source mentions eight skills, it divides the following seven across the three levels:

- Literal Skills (Processing stated information):
  - Listening for the main idea(s)
  - Listening for details
  - Listening for specific information
- Inferential Skills (Interpreting unstated information):
  - Drawing conclusions from what a speaker says
  - Predicting what a speaker will say
- Critical Skills (Evaluating the information):
  - Determining the speaker's purpose
  - Determining the speaker's attitude

Process of listening

The listening process can be broken down into five distinct stages: receiving, understanding, remembering, evaluating, and responding (Adler et al., 2023). (See Figure 1).

1. Receiving (Hearing)

The initial stage, Receiving, is the physiological process of perceiving sound waves. While hearing is a prerequisite for listening, the two are not the same; listening requires attention to selectively focus on specific auditory stimuli while filtering out others. It is this

conscious attention that transforms the physical act of hearing into the first step of the listening process.

2. Understanding

The next stage, Understanding, involves decoding and interpreting the message. To achieve this, a listener must assign meaning to the symbolic stimuli they have received, which includes not only words but also nonverbal cues like tone of voice or applause. The meaning assigned depends on the listener's prior knowledge, experiences, and the context of the communication. For communication to be successful, the listener's interpretation should align with the sender's intended meaning.

3. Remembering

Remembering is the process of committing the message to memory for later recall. It is a crucial stage because it demonstrates that the message has been not only processed but also retained. However, memory is selective; what a listener recalls is often a reconstruction and may differ from the original message based on what they deemed most important at the time.

4. Evaluating

During the Evaluating stage, the listener critically assesses the message. Effective listeners typically defer judgment until they have fully understood the message to avoid prematurely ending the listening process. This stage involves judging the speaker's credibility, distinguishing fact from opinion, identifying potential biases, and weighing the evidence presented.

5. Responding

Finally, Responding is the stage where the listener provides feedback to the speaker. This feedback, which can be verbal or nonverbal, is the only overt way for the

speaker to verify that the message has been received and understood, thus completing the communication loop. Without a response, the speaker cannot be certain if their message was successful.

Cognitive Load Theory (CLT) and its Management

Cognitive Load Theory (CLT), developed by John Sweller and his colleagues, is an influential theory of education that explains the cognitive architecture underlying learning (Sweller, 1988; Sweller et al., 2019). The theory distinguishes between two types of knowledge: biologically primary knowledge, which is acquired effortlessly (e.g., listening to a native language), and biologically secondary knowledge, which requires explicit instruction and is the primary focus of CLT.

The fundamental tenets of CLT are based on our understanding of human cognitive architecture, particularly the interplay between a severely limited working memory and a vast long-term memory. Long-term memory stores information in "schemas," which are cognitive constructs that organize elements of information. When schemas are automated through practice, they can be retrieved and used by working memory as a single element, which frees up cognitive resources for other processes (Sweller et al., 2019).

Applying Cognitive Load Theory to Language Learning

While Cognitive Load Theory (CLT) is a general framework for instruction, its direct application to second language acquisition (SLA) is a subject of ongoing discussion. Although it has been proposed that CLT's principles could extend to guided L2 instruction, the evidence for its effectiveness remains debated, and several theoretical challenges exist (Plass & Jones, 2023).

A key challenge is that language learning involves both implicit (biologically primary) and explicit (biologically secondary) processes, which complicates CLT's traditional focus on purely secondary knowledge. Furthermore, languages are not monolithic systems; they are characterized by significant variability in pronunciation, vocabulary, and grammar, which adds another layer of complexity for learners (Hall, 2022). Thus, it is helpful to take into account our understanding of cognitive load in second language learning when creating "principled" practice in connection to CLT. The suggested programme in this study attempts to apply such principled practice.

Cognitive Load-Management Strategies

Cognitive Load-Management Strategies are specific, evidence-based techniques derived from CLT to design instruction that aligns with human cognitive architecture. The goal is to reduce unproductive load (extraneous) and manage essential load (intrinsic) to free up working memory resources for the productive load of learning (germane). The following are detailed strategies for each type of load (Paas & van Merriënboer, 2020).

1. Strategies for Managing Intrinsic Cognitive Load Intrinsic load is determined by the complexity of the learning material itself. While this complexity cannot be eliminated, it can be managed through instructional design to make learning more accessible. Key strategies focus on breaking down and sequencing complex information to align with the learner's gradual process of schema construction (Mayer & Fiorella, 2022).

- Segmentation: This involves breaking down a complex lesson into smaller, self-contained parts. Learners study

each part before moving to the next, allowing them to process and understand one segment at a time without being overwhelmed by the entire topic at once.

- Pre-training: Before tackling a complex task, learners are pre-trained on essential prerequisite knowledge, such as key vocabulary, concepts, or procedures. This ensures that foundational knowledge is already stored in long-term memory, reducing the intrinsic load of the main task.
- Simple-to-Complex Sequencing: Information is presented in a logical sequence, starting with the simplest elements and gradually building toward more complex ones. This allows for the incremental construction of schemas.

2. Strategies for Reducing Extraneous Cognitive Load

Extraneous load is generated by the way information is presented and is considered unproductive. The goal is to minimize it as much as possible by applying established principles of multimedia and instructional design (Mayer & Fiorella, 2022).

- The Modality Principle: When possible, present information in both visual and auditory formats (e.g., a diagram explained by audio narration) rather than purely visual formats (e.g., a diagram with a block of explanatory text). This leverages both the visual and auditory channels of working memory without overburdening a single channel.
- The Redundancy Principle: Avoid presenting the same information in multiple forms simultaneously (e.g., narrating on-screen text verbatim). This forces learners to process redundant information, which increases extraneous load and hinders learning.

- The Coherence Principle: Eliminate all extraneous, non-essential information from instructional materials. Interesting but irrelevant pictures, sounds, or stories can distract learners and consume valuable working memory capacity.
- Signaling (or Cueing): Use visual or auditory cues (such as highlighting, arrows, or vocal emphasis) to direct learners' attention to the most critical elements of the material. This reduces the mental effort needed to search for relevant information.

3. Strategies for Optimizing Germane Cognitive Load

Germane load is the productive mental effort dedicated to deep learning and schema construction. Instructional design should encourage and support this type of load by prompting learners to engage in effortful but desirable cognitive processes (Leppink & van den Heuvel, 2021).

- Self-Explanation Prompts: Encourage learners to explain concepts or procedures to themselves as they learn. Prompts like "Can you explain why that step is necessary?" push learners to process the material more deeply and integrate it with their existing knowledge.
- Variability of Practice: Once learners understand a concept, provide them with a variety of practice problems or case studies. Practicing with varied examples helps them build more flexible and robust schemas that can be applied to a wider range of situations.
- Elaborative Interrogation: Prompt learners to ask "why" questions about the material. This encourages them to make connections within the content and with their prior knowledge, fostering a more intricate and durable understanding.

The principles of CLT are closely related to the concept of "academic workload," which refers to students' perception of the demands of their coursework. Research shows that when students perceive their workload as excessively high, it can induce cognitive overload. This encourages counterproductive, surface-level learning strategies instead of the deep processing required for robust schema construction (Kember & Ginns, 2022). Therefore, a programme based on Cognitive Load-Management Strategies inherently addresses workload by structuring tasks to be cognitively manageable.

Method

Participants of the study

The participants of the study included thirty prospective teachers from the College of Education, Shebin El-Kom, Menofia University in the academic year 2022-2023. (Slight rephrase for consistency)

Instruments and materials of the study
- An EFL listening comprehension checklist.
- A pre-posttest to measure EFL listening comprehension among prospective teachers (see Appendix A).
- A Suggested Programme based on Cognitive Load-Management Strategies.

Listening comprehension test
- Aim of the test: The aim of the test (appendix A) was to measure EFL listening comprehension skills before and after applying the Suggested Programme among prospective teachers of the Faculty of Education, Menoufia University, using Cognitive Load-Management Strategies.

- Description of the test: The listening test includes listening sub-skills (literal, inferential, critical).
- Test validity: The test was submitted to a panel of jurors who are specialists in TEFL to validate it in terms of clarity and suitability. The juror's comments were very useful and effective for the study.
- Test reliability: To establish the reliability of the test, the test and retest reliability was used. The test was administered to 20 students (not part of the experimental or control group). After two weeks, the test was administered again to the same students. Students' scores on both tests were correlated.

Aim and objectives of the Suggested Programme based on Cognitive Load-Management Strategies

The programme aims at enhancing EFL listening comprehension skills through Cognitive Load-Management Strategies among prospective English teachers.

Upon completion of the programme, participants are expected to achieve the following objectives:

- Demonstrate the ability to apply learning activities designed with Cognitive Load-Management principles to improve their listening comprehension.
- Effectively manage the intrinsic, extraneous, and germane cognitive loads inherent in challenging listening tasks through the application of targeted strategies.
- Exhibit enhanced comprehension of spoken English across a range of accents and contexts.

Instructional Materials

The instructional materials for the programme include a curated collection of authentic EFL listening texts and a set

of corresponding worksheets. These activities are specifically designed in accordance with the principles of Cognitive Load Management to support the learning objectives.

Sessions Overview

The programme's sessions were structured systematically to build skills progressively, drawing upon established instructional design frameworks for complex learning (e.g., van Merriënboer & Kirschner, 2018). The sequence was designed to move learners from foundational knowledge to practical application and finally to metacognitive reflection.

The initial phase focused on building a theoretical foundation. Participants were first introduced to the core concepts of Cognitive Load Theory and its relevance to listening comprehension (15 min). Following this, they engaged in diagnostic analysis, examining challenging listening texts to identify specific sources of cognitive load, such as speech rate or vocabulary density (20 min). The programme then transitioned to strategy development, where participants brainstormed and were introduced to a range of evidence-based management options, such as segmentation and pre-listening activities (15 min). This culminated in a planning stage, where they selected and prioritized the most appropriate strategies for specific listening challenges, effectively creating a personalized action plan (30 min). The final phase was dedicated to practical application and reflection. Participants implemented their chosen strategies on new listening tasks (20 min), and each session concluded with a review period where they reflected on the effectiveness of the strategies and their impact on comprehension (15 min).

Detailed Lesson Plan: Developing Inferential Listening Skills

1. Learning Objectives:

Upon completion of this session, participants will be able to:

- Differentiate between literal meaning (what is said) and inferential meaning (what is meant).
- Identify specific vocal cues (tone, intonation, pace, stress) that signal a speaker's attitude, purpose, or emotion.
- Apply Cognitive Load-Management strategies to reduce extraneous cognitive load while focusing mental resources on the complex task of making inferences.
- Make logical predictions about a speaker's future statements or a story's outcome based on implicit cues.

2. Materials and Equipment:

- EFL Listening Texts:
  - Clip 1 (Attitude/Tone): A 45-second dialogue where one speaker's words are polite, but their tone is clearly sarcastic or annoyed (e.g., "No, it's fine. I just love waiting.").
  - Clip 2 (Prediction): A 90-second narrative or story that builds suspense and stops at a critical moment, just before the resolution.
- Worksheets & Handouts:
  - Handout 1: "An Introduction to Inferential Listening" (defines the skill, provides a list of key vocal cues to listen for).
  - Worksheet 1: "Reading Between the Lines" (for Clip 1).
  - Worksheet 2: "Predicting the Outcome" (for Clip 2).

- Equipment:
  - Projector and screen
  - Computer with quality speakers
  - Whiteboard or flip chart with markers

3. Session Procedure

This session builds on the foundational CLT concepts from the previous session, applying them to the higher-order skill of inference.

Part 1: Understanding Inferential Listening (15 minutes)

- (5 min) Introduction & Warm-Up: The facilitator welcomes participants and revisits the core idea of CLT. The facilitator then says the same simple phrase twice with different intonations (e.g., "That's a great idea." once sincerely, once sarcastically). The group is asked: "What was the difference?"
- (10 min) Defining the Skill: The facilitator introduces the concept of Inferential Skills using Handout 1 (drawing conclusions, predicting, determining purpose/attitude). This is framed within CLT: "Making an inference has a higher intrinsic load than literal comprehension. Our goal today is to learn strategies to manage that load so we can focus on understanding the hidden meaning."

Part 2: Analyzing Implicit Cues (20 minutes)

- (5 min) Task Setup: The facilitator explains that the group will diagnose a conversation to find the "real" meaning behind the words.
- (15 min) Activity:
  - The facilitator plays Audio Clip 1 (Sarcastic Tone).
  - In pairs, participants use Worksheet 1 to answer questions like: "What is the speaker's literal

meaning?", "What is their inferred meaning?", "What specific vocal cues (tone, word stress, pace) revealed their true feelings?".

o This focuses their attention on specific, manageable data points, reducing extraneous load.

Part 3: Developing Strategies for Inference (15 minutes)

- **(15   min)   Group   Discussion   &   Strategy Introduction:**

- The facilitator invites pairs to share their analysis of the vocal cues from Worksheet 1.
- The facilitator introduces specific strategies for inferential listening on the whiteboard:
  o "Listen for the Music": Actively shift focus from what is said to how it's said (tone, rhythm, pitch).
  o "Ask the 'Why' Question": Constantly ask yourself, "Why would they say it like that?" This promotes germane load for deeper processing.
  o "Mind the Gaps": Pay attention to pauses and hesitations, as they often signal uncertainty or a hidden thought.

Part 4: Planning to Predict (30 minutes)

- (10   min)   Scenario   Introduction: The   facilitator introduces the next task: listening to a story and predicting the ending (Audio Clip 2).
- (20 min) Action Plan Activity:
  o In pairs, participants use Worksheet 2 ("Predicting the Outcome").
  o They must decide which of the new inferential strategies they will use to make a logical prediction.
  o They write down their plan (e.g., "We will 'Listen for the Music' to understand the story's mood and 'Ask Why' the main character made certain choices to predict their final action.").

Part 5: Implementing Prediction Strategies (20 minutes)

- (5 min) Preparation: Participants review their action plan on Worksheet 2.
- (15 min) Application:
  - o The facilitator plays Audio Clip 2 (Story), stopping it at the pre-determined cliffhanger moment.
  - o Participants use their planned strategies to write down a detailed prediction of what happens next.
  - o The facilitator then plays the actual ending of the story for comparison and discussion.

Part 6: Reviewing and Reflecting on the Process (15 minutes)

- (15 min) Concluding Reflection:
  - o The facilitator leads a final whole-group discussion.
  - o Key questions for reflection:
    - "How did focusing on 'the music' instead of just the words change your listening?"
    - "Was it difficult to predict the outcome? How did the strategies help manage that difficulty?"
    - "How can you teach these inferential skills to your future students while being mindful of their cognitive load?"
  - o The facilitator connects the activity back to the goal of becoming more skilled listeners and more effective, empathetic teachers.

4. Assessment and Evaluation:

- Formative Assessment: The facilitator assesses understanding through:
  - o The depth of analysis on vocal cues in Worksheet 1.
  - o The logic of the prediction strategies chosen in Worksheet 2.
  - o The quality and insightfulness of the contributions during the final reflection period.

- Summative (Task-based) Assessment: The written prediction on Worksheet 2 serves as a tangible product of the participants' ability to apply inferential strategies.

Results and discussion

Hypothesis One

There is a statistically significant difference at ≤ (0.05) level between the mean scores of the experimental and control groups overall EFL listening comprehension skills post-test in favor of the experimental group.

In order to validate this hypothesis, data had been described and summarized through calculating the mean, the standard deviation of the two groups; the experimental group and the control group as shown in table (2).

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Table (2): Descriptive Statistics to the Scores of Pupils of the Control Group and the Experimental Group in overall EFL listening comprehension test.

	Group	N	Mean	Std. Deviation	Minimum	Maximum	Mean Diff.	Total
Overall EFL listening comprehension skills	**Experimental**	30	26	1.91	22	30	9.7	30
	Control	30	16.30	1.68	14	20		

Table (2)shows that the value of the overall EFL listening comprehension skills' mean score of the experimental group was (26) which is higher than that of the control group which was (16.3). As table (1) shows, there existed a raise in the scores of the experimental group than those of the control group in the post administrations

of EFL listening comprehension test. It also shows the increasing homogeneity of grades of the experimental group than the control group (= Std. Deviation / Mean) due to teaching the experimental group through Workload multi-sensory Based Approach.

This is represented graphically in figure (1)

Figure (1) of the Mean Scores of the Control Group and the Experimental Group in the overall EFL listening comprehension skills.

Table (3): The t-Value to Signify the Difference between the Mean Scores of the Two Groups in the Post adm.
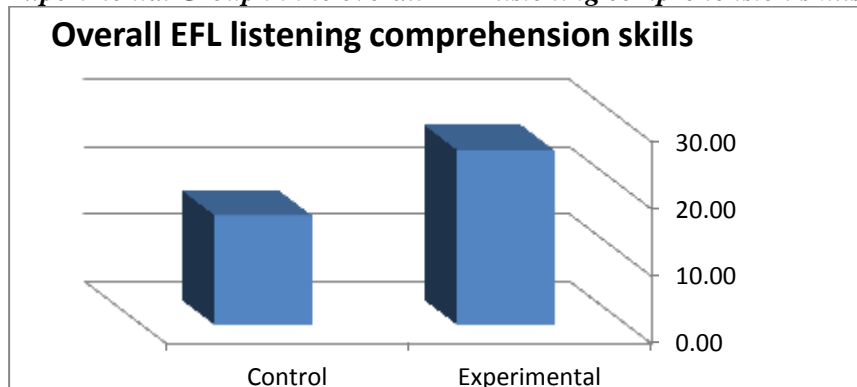
It was shown from the previous diagram that significant differences existed between the scores of the two groups in favor of the experimental group. To study the significance of the differences, t-value was calculated for the difference between the mean scores of the two groups; as illustrated in table (3):

	Group	Mean	Std. Deviation	t-value	d.f	sig	η^2	Effect size (d)	Effectiveness
Overall EFL listening comprehension skills	Experimental	26	1.91	20.85	58	Significant at (0.01)			Significant & educationally important
	Control	16.30	1.68				0.88	5.48	

It is clear from table (3) that the calculated value of "t " (20.85) is higher than the tabulated value of "t" at 58 degrees of freedom and significant level "0.01" ; which meant that the difference between the mean scores of the two groups reached the level of statistical significance.

Determining the Effect Size:

To investigate the effect and educational importance of the results, the value of ETA squared (η^2) and the effect size (d) were calculated. " using the following equation.

$$\eta^2 = \frac{t^2}{T^2 + d.f}$$

Table (3) Reference standers of (η 2) and (D) values.

Test	Effect volume		
	Small	Medium	Large
η^2	0.01	0.06	0.14
D	0.2	0.5	0.8

ETA squared was 0.88 reflecting its practical significance. And in the light of this, It can be said that 88% of the variations between the scores of Teachers in the EFL listening comprehension skills could be due to Workload multi-sensory Based Approach, and the effect size (d) = 5.48 and that there was height effect and educational importance for improving and developing EFL listening comprehension.

Thus, the hypothesis was accepted which indicated that " There is a statistically significant difference at ≤ (0.01) level between the mean scores of the experimental and control groups overall EFL listening comprehension skills post-test in favor of the experimental group

The results indicated that 88% of the variations between the scores of Teachers in the EFL listening comprehension skills could be due to the Suggested Programme based on Cognitive Load-Management Strategies.

Hypothesis Two

There is a statistically significant difference at $\leq (0.05)$ level between the mean scores of the experimental and control groups each of EFL listening comprehension skills (literal, inferential, critical) post-test in favor of the experimental group.

In order to validate this hypothesis, data had been described and summarized through calculating the mean, the standard deviation of the two groups; the experimental group and the control group as shown in table (4).

Table (4): Descriptive Statistics to the Scores of Pupils of the Control Group and the Experimental Group in Each of EFL listening comprehension skills (literal – inferential – critical) test.

	Group	N	Mean	Std. Deviation	Minimum	Maximum	Mean Difference	Total score
Literal comprehension	Experimental	30	8.67	0.84	7	10	2.04	10
	Control	30	5.57	0.73	4	7		
Inferential Comprehension	Experimental	30	8.63	0.85	7	10	1.69	10
	Control	30	5.40	0.67	4	7		
Critical Comprehension	Experimental	30	8.70	0.65	7	10	1.77	10
	Control	30	5.33	0.96	4	7		

Table (4) shows that the value of the each of EFL listening comprehension skills (literal – inferential – critical) mean scores. As table (4) shows, there existed a raise in the scores of the experimental group than those of the control group in the post administrations of Each of EFL listening comprehension skills (literal – inferential –

critical) test due to teaching the experimental group through Workload multi-sensory Based Approach.

This is represented graphically in figure (2)

Figure (2) the Mean Scores of the Control Group and the Experimental Group in the Each of EFL listening comprehension skills (literal – inferential – critical).
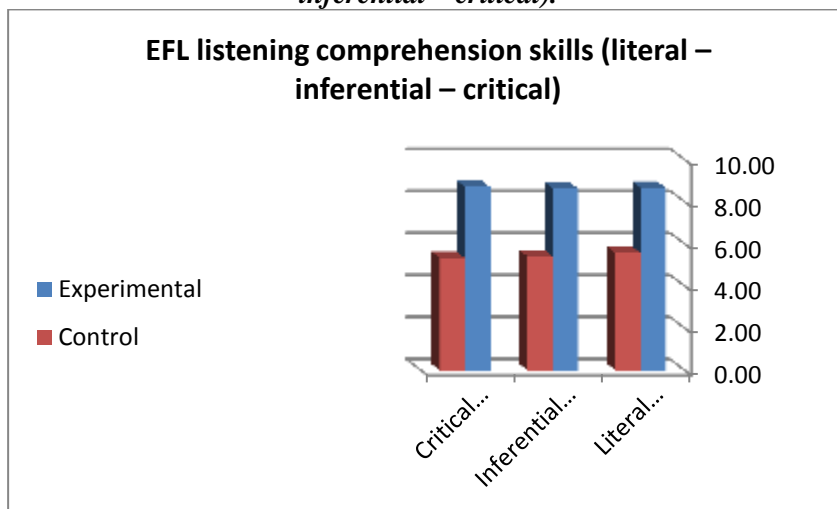
To study the significance of the differences, t-value was calculated for the difference between the mean scores of the two groups; as illustrated in table (5):

Table (5): The t-Value to Signify the Difference between the Mean Scores of the Two Groups in the Post adm.

	Group	Mean	Std. Deviation	t-value	d.f	sig	η^2	Effect size (d)	Effectiveness
Literal comprehension	Experimental	8.67	0.84	15.232	58	at (0.01)	0.80	4.00	Significant & educationally important
	Control	5.57	0.73						
Inferential Comprehension	Experimental	8.63	0.85	16.316	58	at (0.01)	0.82	4.28	Significant & educationally important
	Control	5.40	0.67						
Critical Comprehension	Experimental	8.70	0.65	15.908	58	at (0.01)			Significant & educationally important
	Control	5.33	0.96				0.81	4.18	

It is clear from table (5) that the difference between the mean scores of the two groups reached the level of statistical significance.

Thus, the hypothesis was accepted which indicated that " There is a statistically significant difference at ≤ (0.01) level between the mean scores of the experimental and control groups Each of EFL listening comprehension skills (literal – inferential – critical) post-test in favor of the experimental group.

Hypothesis Three

There is a statistically significant difference at ≤ (0.05) level between the mean scores of the experimental group's pre-post administrations of overall EFL listening comprehension skills in favor of posttest.

In order to validate this hypothesis, the data obtained from the pre-posttest had been described and summarized through calculating the mean, the standard deviation of the pre-posttest; as shown in table (6).

Table (6   ): Descriptive Statistics to the Scores of Pupils of the pre posttest in overall EFL listening comprehension test.

		N	Mean	Std. Deviation	Minimum	Maximum	Mean Difference	Total
Overall EFL listening comprehension skills	**Post-test**	30	26	1.91	22	30	12.73	30
	Pre-test	30	13.27	2.64	8	18		

Table (6) shows that the value of the overall EFL listening comprehension skills' mean score of the posttest was (26) which is higher than that of the pretest which was (13.27). due to teaching the experimental group through Workload multi-sensory Based Approach.

This is represented graphically in figure (3)

Figure (3) the Mean Scores of the pre posttest in the overall EFL listening comprehension skills.
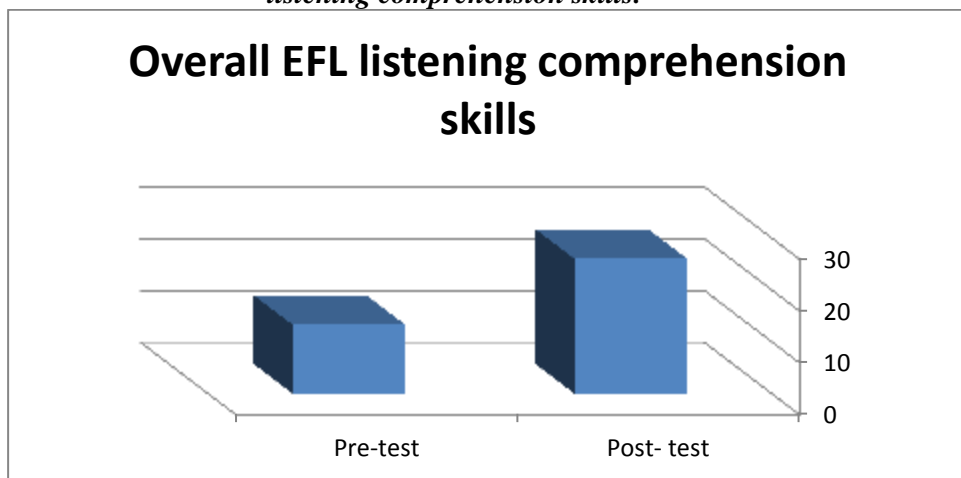
To study the significance of the differences, Paired Samples Test : t-test was calculated for the difference between the mean scores of the two adms; as illustrated in table (7):

Table (7): The t-Value to Signify the Difference between the Mean Scores of the pre posttest.

	Paired Differences Mean	Paired Differences Std. Deviation	t-value	d.f	sig	$^2\eta$	Effect size (d)	Effectiveness
Overall EFL listening comprehension skills	12.73	3.38	20.617	29	Significant at (0.01)	0.94	3.83	Significant & educationally important

It is clear from table (7) that the calculated value of "t " (20.617) is higher than the tabulated value of "t" at 29 degrees of freedom and significant level "0.01" ; which meant that the difference between the mean scores of the pre posttest reached the level of statistical significance.

Determining the Effect Size:

To investigate the effect and educational importance of the results, the value of ETA squared (η) and the effect size (d) were calculated.

ETA squared was 0.94 reflecting its practical significance. And in the light of this, It can be said that 94% of the variations between the scores of Teachers could be due to using a Workload multi-sensory Based Approach, and the effect size (d) = 3.83 and that there was height effect and educational importance for improving and developing EFL listening comprehension skills. The effect size d is large as it is more than 0.80. These gains confirm that the using of Workload multi-sensory Based Approach was effective in developing EFL listening comprehension skills.

Thus, the hypothesis was accepted which indicated that " There is a statistically significant difference at $\leq$ (0.01) level between the mean scores of the experimental group's pre-post administrations of overall EFL listening comprehension skills in favor of the post test.

ETA squared was 0.94 reflecting its practical significance. It can be said that 94% of the variations between the scores of Teachers could be due to using the Suggested Programme based on Cognitive Load-Management Strategies. These gains confirm that the using of the Suggested Programme based on Cognitive Load-Management Strategies was effective in developing EFL listening comprehension skills.

Hypothesis Four

There is a statistically significant difference at the level of (0.05) between the mean scores of the experimental group's pre-post administrations for each of EFL listening

comprehension skills (literal, inferential, critical) in favor of the post test.

In order to validate this hypothesis, the data obtained from the pre-posttest had been described and summarized through calculating the mean, the standard deviation of the pre-posttest as shown in table ( ).

Table (8): Descriptive Statistics to the Scores of Pupils of the Control Group and the Experimental Group in Each of EFL listening comprehension skills (literal – inferential – critical) test.

		N	Mean	Std. Deviation	Minimum	Maximum	Total score
Literal comprehension	Post-test	30	8.67	0.84	7	10	10
	Pre-test	30	4.43	1.45	1	7	
Inferential Comprehension	Post-test	30	8.63	0.85	7	10	10
	Pre-test	30	4.37	1.43	1	6	
Critical Comprehension	Post-test	30	8.70	0.65	7	10	10
	Pre-test	30	4.47	1.46	1	7	

Table (8) shows that the value of the each of EFL listening comprehension skills (literal – inferential – critical) mean scores. As table (8) shows, there existed a raise in the scores of the posttest than those of the pretest of Each of EFL listening comprehension skills (literal – inferential – critical) test due to teaching the experimental group through Workload multi-sensory Based Approach.

This is represented graphically in figure (4)

Figure (4) the Mean Scores of the pre post test in the Each of EFL listening comprehension skills (literal – inferential – critical).
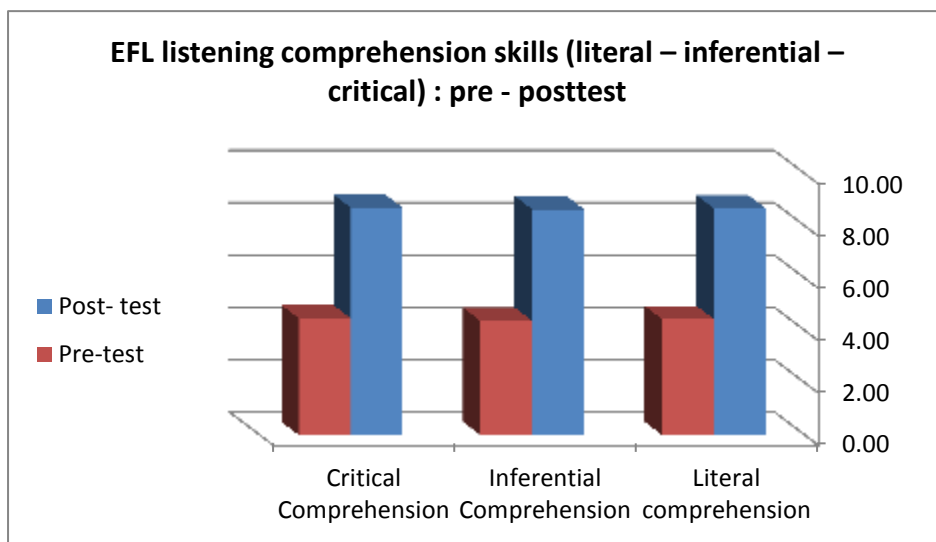
To study the significance of the differences, Paired Samples Test : t-test was calculated for the difference between the mean scores of the two adms; as illustrated in table (9):

Table (9): The t-Value to Signify the Difference between the Mean Scores of the pre posttest.

	Paired Differences Mean	Paired Differences Std. Deviation	t-value	d.f	sig	$\bar{\eta}$	Effect size (d)	Effectiveness
Literal comprehension	4.23	1.83	12.65	29	Significant at (0.01)	0.85	2.35	large
Inferential Comprehension	4.27	1.70	13.74	29	Significant at (0.01)	0.87	2.55	large
Critical Comprehension	4.23	1.59	14.58	29	Significant at (0.01)	0.88	2.71	large

It is clear from table (9   ) that the difference between the mean scores of the two adms reached the level of statistical significance.

Thus, the hypothesis was accepted which indicated that " There is a statistically significant difference at the level of (0.01) between the mean scores of the experimental group's pre-post administrations for each of EFL listening comprehension skills (literal – inferential – critical)in favor of the post test.

Discussion of Results

The positive outcomes of the study may be attributed to several factors inherent in the design of the programme, which was grounded in Cognitive Load Theory (CLT):

- The prospective teachers showed significant interest in the programme's explicit focus on providing practical, theory-based strategies to overcome common listening challenges. This high level of engagement is a key factor in the success of any educational intervention.
- The programme explicitly trained participants to become more aware of their own cognitive processes during listening. They learned to actively diagnose sources of high intrinsic and extraneous load in authentic listening tasks, a foundational step in developing self-regulated learning skills (Paas & van Merriënboer, 2020).
- The gradual increase in task complexity was likely a critical factor. In line with instructional design principles that manage intrinsic load (van Merriënboer & Kirschner, 2018), the programme began with tasks designed to be cognitively manageable. The difficulty was then progressively increased, for instance, by accelerating the speed of recordings in controlled increments. This allowed participants to build robust schemas for understanding spoken text under more challenging conditions.

- Rather than just listening passively, participants were equipped with a toolkit of CLM strategies. They practiced techniques such as focusing on key vocabulary to grasp the main idea before tackling details, which helped them manage the intrinsic load of information-dense texts.

- The programme emphasized strategies for making the learning process more efficient and effective. By learning to identify and prioritize the most crucial information in an auditory stream—for instance, by focusing on stressed words that signal importance—participants could dedicate their finite cognitive resources more effectively to the process of deep comprehension and schema construction (Leppink & van den Heuvel, 2021).

- The Cognitive Load-Management Strategies employed in the programme (e.g., segmentation, guided instruction, structured practice, opportunities for repetition with variation) were suitable for applying listening skills effectively.

- The programme, through structured practice and by managing cognitive load effectively, helped prospective teachers build confidence and reduce anxiety associated with listening to native speakers, thus minimizing a potential source of extraneous load.

Conclusion

The Suggested Programme based on Cognitive Load-Management Strategies has proven its effectiveness in developing prospective EFL teachers' listening comprehension skills as a whole and each subskill (literal, inferential, critical) separately. This was achieved through

using explorative and motivating activities designed to manage cognitive load and promote active processing, which led to developing the inductive learning process and enhancing comprehension. (Conclusion rephrased and corrected from "geographical reading skills") These results align with the principles of Cognitive Load Theory and studies that demonstrate the benefits of structured, cognitively informed instruction in language learning (e.g., Elmansi, 2021; Boontam, 2022; Guan, 2013, which showed effectiveness of programs in developing language components like vocabulary and grammar, which are integral to managing cognitive load in listening).

Recommendations

Based on the results of the current study, the following recommendations are offered:

- Enhancing EFL listening through using the Suggested Programme based on Cognitive Load-Management Strategies in different educational stages.
- Preparing courses for EFL in-service teachers based on the principles of the Suggested Programme for further curriculum development in EFL listening comprehension skills, focusing on Cognitive Load-Management.

Suggested researches

- Using a programme based on Cognitive Load-Management Strategies in enhancing creative thinking skills for different stages.
- Using a programme based on Cognitive Load-Management Strategies in treating learning disabilities for different stages.

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