

The Effects of AI-Assisted Vocabulary Support on Cognitive Load and EFL Reading Comprehension among High School Students in Dak Lak Province

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Introduction

Unfamiliar vocabulary can interrupt EFL reading, trigger word-by-word translation and repeated searches, and consume working-memory resources needed for comprehension. AI-based lexical support may provide brief, context-sensitive assistance without completing the reading task for learners.

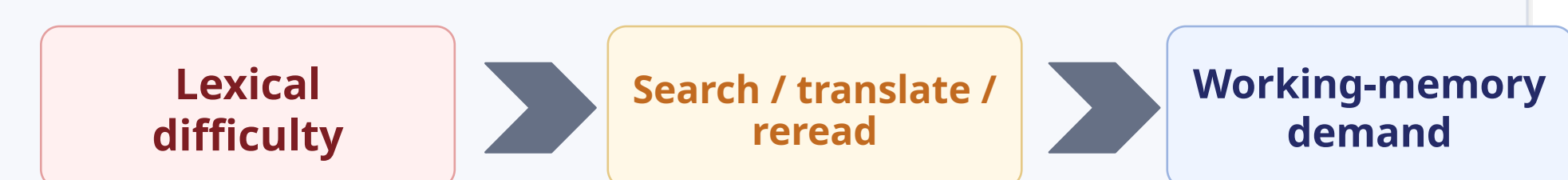
Research Questions

- Does EFL reading-comprehension performance improve following AI-assisted vocabulary support?
- Does students' perceived cognitive load during EFL reading decrease following the intervention?

Theoretical Framework

Cognitive Load Theory

Working memory has limited capacity. Repeated lexical problem-solving can compete with higher-level comprehension.



AI lexical scaffolding

Contextual definitions, brief translations when needed, synonyms, simplified explanations, and examples may shorten lexical interruptions and support continuity of meaning construction.

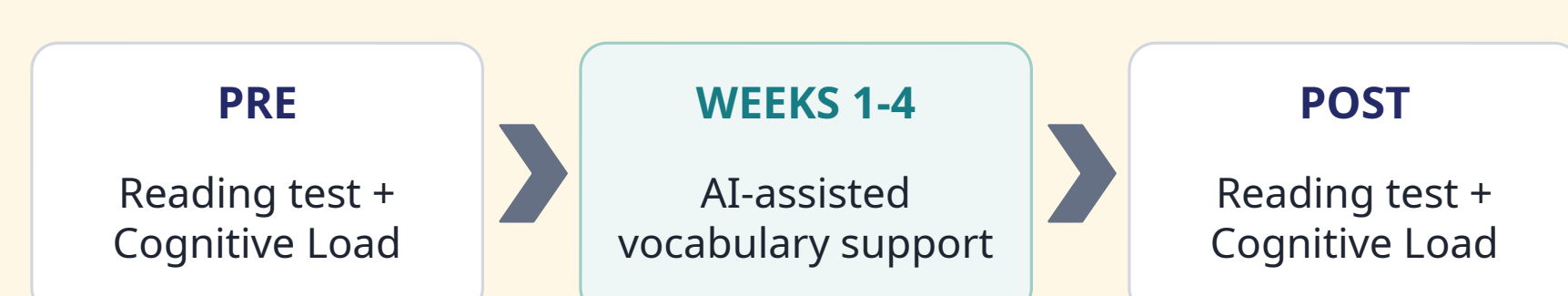
Methodology



Setting: Y Jut High School, Dak Lak Province

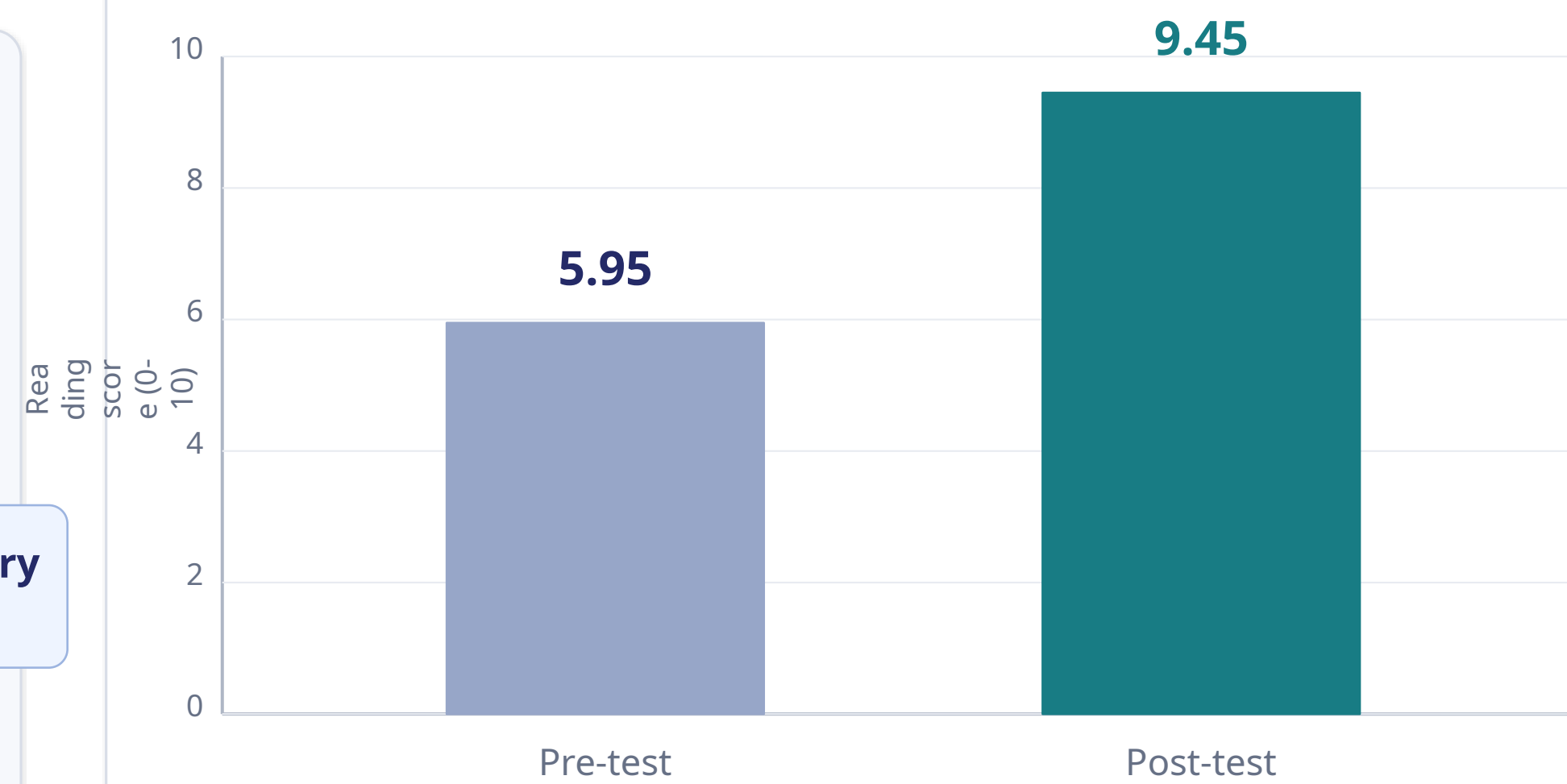
- Reading comprehension measured pre/post on a 10-point scale.
- Cognitive load measured immediately after reading using CL1-CL8 on a 5-point Likert scale.
- AI support restricted to vocabulary assistance; students completed comprehension independently.
- Analysis: descriptive statistics, Cronbach's alpha, paired-samples t-tests, 95% CIs, and Cohen's dz.

Intervention Design



Key Finding 1: Reading Comprehension

Large improvement after the four-week intervention



+3.50

Mean gain

$p < .001$

Paired t-test

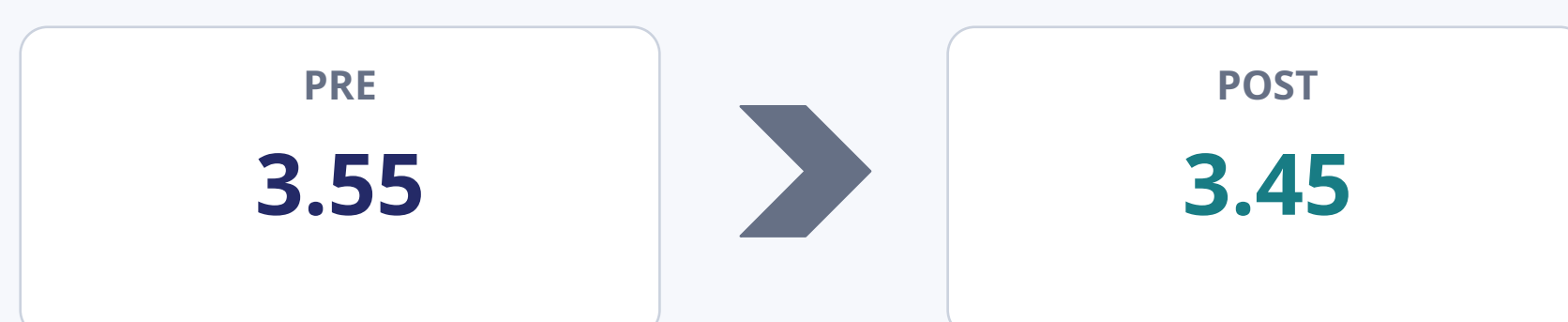
$dz = 1.55$

Large effect

28 of 29 students improved; 1 was unchanged; none declined.

Key Finding 2: Cognitive Load

Reliable scale, but no significant pre-post reduction



Mean change = -0.10 | $t(28) = -0.96$ | $p = .347$ | $dz = -0.18$

Cronbach's alpha: .92 (pre) and .94 (post)

Interpretation: reading performance improved strongly, but a reduction in perceived cognitive load was NOT empirically supported.

What the Findings Mean

The reading result is consistent with a lexical-scaffolding account: immediate, context-sensitive support may help learners resolve vocabulary difficulties while maintaining reading continuity.

However, the cognitive-load result qualifies the mechanism.

- The mean load score moved slightly in the expected direction, but the change was small and non-significant.
- Learners may have used available cognitive resources for deeper comprehension rather than experiencing the task as subjectively easier.
- Cognitive-load reduction remains a plausible theoretical mechanism, not a confirmed mediator.

Pedagogical Implications

- Use AI selectively for short definitions, synonyms, examples, and context-sensitive explanations.
- Do not allow AI to answer comprehension questions on behalf of learners.
- Teach students to verify whether AI-generated lexical information fits the sentence and wider text.
- Treat improved comprehension as the current evidence; do not assume reduced cognitive load.

Limitations & Next Steps

- $n = 29$ complete matched cases limits generalizability.
- No complete matched control-group dataset was available for the final analysis.
- Cognitive load was measured by post-task self-report.
- Future work: larger control groups, parallel tests, repeated task-level load measures, Group $\times$ Time and mediation analyses.

Take-Home Message

AI-assisted lexical scaffolding was associated with a large improvement in EFL reading comprehension, while perceived cognitive load did not decrease significantly.

Use AI to remove lexical bottlenecks - not to replace reading.

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