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INTEGRATING COMPUTER-SUPPORTED LANGUAGE LEARNING FOR DIGITAL READING IN SAUDI ARABIA

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ABSTRACT

Digital transformation is swiftly paving its way in English language learning. Among some effective methods, Computers for language development, termed as CSLL (computer-supported language learning), has been explored as a fascinating learning style that satisfies the essentials of modern learning. Giving credence to its implications, the current enquiry focused on viewing the computers' utilization in English as a second language (ESL) classrooms for the development of reading comprehension in the Kingdom of Saudi Arabia. The population for this investigation was Saudi Arabian ESL learners, while the sample was picked in two steps. At first, 10 public schools from the Eastern Province of Saudi Arabia were chosen by a purposive sampling technique. Then, 100 participants studying in grade 10 from these schools were chosen by means of a simple random sampling technique. The analyses were done by a quantitative research method. To begin the research procedure, a pre-test was conducted, and the test-takers were placed in two sets of 50 learners according to their scores in the pre-test. One set of learners was taught by (traditional printed book-learning method (control group), while the other learners' group (experimental group) learnt by CSLL. The time span for the treatment was 15 days. The intervention time was 40 minutes each day, and then a final test was conducted. The final test showed a substantial difference in the scores of pre- and post-tests of the control and experiment groups. Thus, proving the efficacy of CSLL as an effective method in elevating reading comprehension. The results exhibited that the CSLL method is potent for ESL learning.

KEYWORDS: Computer-supported Language Learning, ESL learning, Grade 10, CSLL tools, Saudi Arabia.

1. INTRODUCTION

The unceasing advancement of digitalization has affected academia and pedagogy. When considering English language learning methods, the inclusion of computers has brought about incredible outcomes (Ali, 2024; Zhang & Umeanowai, 2025). However, acquiring English language skills and particularly reading skills for non-native speakers remains challenging. Saudi ESL learners face various challenges in acquiring basic English skills, precisely academic reading skills may be due to the limited English language proficiency, traditional teaching methods, underdeveloped vocabulary, differences between Arabic and English sentence structures, and a lack of reading practices (Allaithy & Zaki, 2025; Alnasser & Almoaily, 2022; Alrashdi, 2024).

Under the digital initiatives of Saudi Vision 2030, precisely in education, the plan is to move towards smart education and digital skills, comprising on nationwide e-learning platform and the employment of many digital training programs like AI into education for the modern Skills initiative (Abdullateef, Alsheikh, & Mohammed, 2023). The learners often struggle to attain text, context, pragmatic, reading stamina, and semantic comprehension (Pardede, 2019). Most importantly, the use of computers is allowed, but internet usage is restricted in the schools inside classrooms. Conclusively, all these factors affect their capability to develop effective reading skills. Therefore, CSLL can serve as an effective method for the elevation of reading skills (Almalki, 2020); Alqahtani, 2022).

1.1. Digital Reading Skills through CSLL

Computer-supported language learning (CSLL) refers to the use of computers for language learning. CSLL is an instructional way for optimizing language learning. The CSLL method is designed to share lesson contents through digital books, digital games, dynamic images, and problem-solving strategies (Bahari, Han & Strzelecki, 2025). Customary methods rely on paper-based books, which are no longer appreciated by the readers due to their limited interactivity, disinterested tasks, and rote learning methods for learning (Jakobsson, Loberg & Kjörk, 2024).

Digital reading through CSLL has gained much appreciation from the researchers and scholars. CSLL chaperons the users in their learning affairs by providing multiple in-built and internet-based apps that assist to use various functions, such as highlighting, semantic and pragmatic comprehension, exploring synonyms, rephrasing to text rephrasing, text summary and the facility of multimedia aids like sounds, graphics, photographs, references and online dictionary (Soltvedt, 2024). A unique feature of computers in education is their ability to interact with students (Almaiah et al., 2022). Further, the purposefully constructed activities and interactive exercises support autonomous learning (Yapp et al., 2023).

1.2. Digital Reading Tools

There are a variety of apps offered by CSLL for providing ease in reading both online and built-in. Online apps have provided promising results, yet there is connectivity, user-familiarity, validity, and reliability issues with them, particularly in the local Saudi classrooms (Alrumaih, 2025). Therefore, in this exploration, built-in software and apps were focused on. These built-in tools are effective even in places where the internet signals are not working properly. Therefore, they support ubiquity in learning. Among the tools used in this study were Microsoft Immersive Reader, OneNote, and Text-to-Speech software. These tools assist in summarizing, paraphrasing the text into simpler language and provide a semantic and pragmatic explanation of the text. They also facilitate reading comprehension by highlighting important aspects of the text. Moreover, synonyms and providing possible question-answers for the text are its major characteristics.

1.3. Statement of the Problem

Outdated teaching approaches have become ineffective in getting satisfactory results in L2 learning. As a result, several issues are faced by the learners. English language acquisition requires concentration, comprehension, and focused learning. This demands the adoption of attractive and engaging methods. On the contrary, the orthodox instructional methods, outdated curriculum, and customary tools for learning contribute to poor student performance. These aspects generate a lack of enthusiasm and disengagement among learners. As a result, learners have low scores in English language reading courses. However, the use of computers in language learning classrooms can address many of these issues, especially those related to teaching methodology and the inclusion of innovative digital tools in English reading skills.

1.4. Purpose of the Investigation:

In response to the problems encountered by the local learners in developing their English reading skills, the researchers aimed to investigate the effectiveness of the digital reading method through CSLL for improving ESL student reading skills in

Saudi Arabian schools. This area pursues digital integration, which can produce positive outcomes. Reading, being a pivotal skill, has been incorporated in the local curriculum, yet it is practiced in an outmoded, conventional way. The inception of digital reading through CSLL in academia, schools, colleges, and institutions can revalorize the language learning environment by making it both entertaining and purposeful. This will improve the academic performance and reading proficiency of learners. The study also aims to raise awareness among teachers and learners regarding the effectiveness of CSLL methods.

1.5. Significance of the Research

Computers are commonly used to improve teaching and learning. In a developing country like Saudi Arabia, raising awareness about the usefulness of CSLL and other connected initiatives is crucial. Many research publications have provided evidence to support the success of CSLL programs. This study is significant because it explores the effectiveness of CSLL to develop digital learning comprehension of ESL students through built-in tools. In this way, it will eliminate the problem of internet connectivity and external software apps. Using computers effectively in English language classrooms can enhance learners' reading comprehension. Teachers have to adjust their methods accordingly. In this way, reading can be more meaningful and productive.

1.6. Research Objectives

The research objectives in this study are as follows:

- To what extent can CSLL affect students' achievements in the development of reading skills?

1.7. Research Question

- What effect does digital reading have on Saudi ESL learners?
- Do students in the experimental group outscore the control group students?

2. LITERATURE REVIEW

2.1. Importance and Effects of Csll

CSLL combines technology and language instruction, providing dynamic and engaging tools to improve reading skills effectively. The integration of digital textbooks, multimedia, interactive exercises, ubiquitous learning, and quick feedback in CSLL accommodates a variety of learning styles, making reading activities more engaging and effective (Abdolmaleki & Saeedi, 2024). The value of CSLL stems from its capacity to create tailored learning experiences, adjust to specific student needs, and foster autonomous learning.

2.2. Theoretical Framework

2.2.1. Digital Literacy Theory

A recent theory related to Computer-Supported Language Learning (CSLL) is the "Digital Literacies Theory" in language learning, which focuses on the integration of digital skills into language acquisition. Digital Literacy Theory emerged from the collective work of scholars in the digital age who recognized the significance of digitalization in modern education. One of the early contributors, Gilster (1997), introduced the term "digital literacy" in his well-known book, defining it as the ability to understand and utilize information in multiple formats through computers. Lankshear & Knobel (2008) made further contributions by proposing the concept of "new literacies," adding that digital literacy includes social dimensions like identity, social class, community, and online social practices.

Their work shifted digital literacy from a purely technical skillset to a techno-social and cultural competency. Additionally, Kress (2009) introduced the concept of multimodality in literacy, exploring how communication through various modes (such as audio, image, and text) ties into digital literacy foundations. He argued that digital environments demand new reading approaches that go beyond traditional print-based methods to enhance understanding. This theory emphasizes the importance of equipping learners not only with language proficiency but also with digital competencies that are essential for effective communication and comprehension in a technologically advanced, globalized world.

Some key elements of digital literacies theory are as follows.

- Creating an effective learning ambiance in the digital era.
- Using various media forms to develop critical thinking, promote cultural awareness, and analyze digital environments.
- Moreover, they emphasize social connections (digital connections in a digital atmosphere)

The theory promotes the idea that digital literacy is essential for navigating, communicating, and learning in today's digital world. Thus, making it particularly relevant in education and language learning contexts, such as CSLL (Computer-Supported Language Learning).

2.2.2. *Applied Framework*

Anderson's ACT (Adaptive Control of Thought) was applied as a framework in this research under the digital literacy theory (Anderson, 2013). Developed by John R. Anderson, ACT-R is a cognitive architecture designed to model the underlying mechanisms of human thought and learning. It posits that knowledge acquisition occurs systematically and progressively, moving through three distinct stages of skill development. This theoretical framework consists of three learning stages, i.e., cognitive, associative, and autonomous.

- **Cognitive Stage**:

At the beginning, learners acquire an initial conceptual understanding of the task. This stage is characterized by a reliance on explicit instructions, rules, and examples. Learning is effortful and conscious, often accompanied by frequent mistakes. Digital tools and guided instruction are especially beneficial at this stage to support learners in building foundational knowledge.

- **Associative Stage:**

As learners gain experience, they begin to link relevant concepts and refine their performance. Errors become less frequent, and task execution becomes smoother as procedural knowledge begins to develop. Interactive methods such as feedback, peer collaboration, and digital simulations play a critical role in reinforcing learning during this phase.

- **Autonomous Stage:**

In the final phase, learners can perform tasks with minimal conscious effort. Skills become automatic, allowing for rapid and accurate task execution. At this stage, learners typically require little external guidance and are capable of engaging in more complex or real-world tasks independently.

ACT-R highlights the progression from declarative knowledge (understanding facts and concepts) to procedural knowledge (application through action), making it particularly relevant in technology-integrated learning environments. In the context of this research, the framework supported the design of instructional activities that promoted gradual skill acquisition through individual, collaborative, and digitally mediated learning experiences (Kim & Nam,2020).

2.3. *Digital Reading And* CSLL

Digital learning refers broadly to learning that is enhanced or enabled by technology. This concept includes diverse forms of education, such as e-learning, virtual learning, online learning, and mobile learning (m-learning). Though distinctions between these formats exist, they are often grouped under the umbrella of digital learning, making precise categorization less essential (Vargas et al., 2024). Digital reading is an inclusive term referring to the use of all types of technologies, including computers, mobile devices, and other digital tools.

Digital learning encompasses:

- Traditional classroom education enriched with technology.
- Instruction delivered through computers, mobile devices, or internet-connected tools, often allowing for remote or distance learning.
- Blended learning, which combines traditional methods with technology-based approaches.
- Mobile learning, utilizing smartphones as the primary learning tool.
- Accessing online resources, including databases and materials for independent study and research (Liao et al., 2024).

Beyond merely digitizing content, digital learning represents a transformative approach to teaching and learning, introducing new methods to engage learners and foster educational innovation. Digital reading is a modern-day technique applied to transform conventional learning styles. However, the major focus of digital reading is online tools and applications, which are internet-dependent. There are many instances where either due to infrastructural, cultural, and technical problems, internet availability can be a problem in the classroom. This limits students' ability to access and use these online applications. Therefore, the built-in tools can be advantageous in this regard.

2.4. *Related Research*

Mohsen et al. (2024) conducted a meta-analysis about Computer-Supported language learning (CSLL) and shared that it has evolved as a key interdisciplinary field bridging applied linguistics and educational technology. A scientometric analysis of 4,631 articles from 1980–2021 highlights robust theoretical grounding in socio-cultural and second language acquisition theories. It concluded that CSLL has influenced some major research areas related to writing, speaking, listening, and reading. It further shared that CSLL has opened some new branches like mobile-assisted learning, computer-mediated communication, and data-driven approaches. This study concluded that the CSLL method has been effective and impactful for ages. Recent studies show that CSLL has a positive impact on reading skills. Moskovsky (2018) conducted research with 5th-grade children using CSLL technologies and discovered a considerable increase in reading comprehension and vocabulary learning.

The study stressed the importance of interactive and multimedia features in engaging and improving pupils' reading ability.

Moskovsky (2018) findings revealed that students who used CSLL online tools showed greater excitement and engagement in reading activities, which led to improved reading proficiency. The study also found that CSLL tools helped students acquire critical reading abilities, including inference and summarization. Moreover, the use of CSLL tools, particularly those with interactive narrative aspects can significantly improve students' reading comprehension and love of reading. Asan & Şahan (2023) investigated to gather the opinions of pre-service teachers regarding digital learning. By analyzing variables such as time spent on digital vs. print reading and the volume of reading materials, they concluded that teachers like to read digitally, and they believe that digital reading should be a regular aspect of classroom teaching and learning.

Gonzales et al. (2023) performed a study using computers for reading. They looked at the digital reading habits and found out that the learners developed concentration, comfort, and comprehension in digital reading scenarios. Appraising a few previous investigations from the framework of digital literacy theory, Jang et al. (2021) conducted a comparative study on 194 Korean and 192 Finnish youngsters to explore the digital and information literacy from the perspective of digital literacy theory. By applying structural equation modelling, data analysis was performed. The data showed that information literacy had a clear impact on digital literacy. The strong influence of information and digital literacy showed the complete intentions of the participants in using digital technologies. Thus, the participants of both countries reflected that they are envisioned and prepared for using digital technologies in educational contexts.

Going further, Chiu, Sun, & Ismailov (2022) studied technology's effect on learning support from a digital literacy perspective. They chose 63 10th-grade learners who were randomly assigned to the groups. They found that technology learning support and self-determination have strong effects on digital literacy. It makes the user autonomous and competent to develop digital literacy. Han & Geng (2023) also conducted a study in the scenario of technology-enhanced learning, where they studied the online learners' approaches for online learning ambiance during the COVID-19 pandemic. Through a survey, they collected replies from 7210 Chinese undergraduate learners and concluded that the quality of learning is tied to online technologies used in learning.

2.5 Past Studies On Computers' Built-In Tools

Looking at some studies about digital built-in tools used for reading, Kruse et al. (2023) concluded that MS Word has become a widely adopted tool for writing, reading, and effective editing. For reading, it provides several options like thesaurus, editing, auto summarize, providing an explanation of the text, and word synonyms. Monika (2024) studied the importance of thesaurus in MS Word in the academic writing context. A survey was conducted on 152 students and faculty of engineering. It was found that thesaurus is beneficial due to the variety of options like providing synonyms, identification of perfect word choice, and improvement of the writing flow by giving a summary of the text. It was recommended that best practices should be followed to optimize the implementation of the thesaurus rigorously by training users effectively.

San et al. (2022) studied the value of MS OneNote in the mathematics classroom. They proved that MS OneNote is useful and convenient due to its real-time aspects, and it is a strong tool that can support conventional classroom teaching. They further explained that the OneNote tool is helpful in online and physical settings as it complements both face-to-face and online education. Baldwin (2024) studied and shared that OneNote is a utility tool serving as a flexible tool for managing research projects amongst undergraduate learners. He shared that this tool develops the interest of young learners in researching effectively. These findings demonstrate the effectiveness of reading through CSLL. Surprisingly, in the kingdom of Saudi Arabia, there is hardly any study that focuses on the influence of the built-in digital tool, i.e., CSLL, on the reading ability of secondary school learners in an ESL learning context. Though due to the cultural and societal hindrances, the use of the internet in the classroom is not supported in Saudi Arabia. Also, digital learning techniques using CSLL have not been used in public sector schools of Saudi Arabia. Therefore, this research aims to address this gap and will emphasize looking at the impact of CSLL on the reading comprehension of Saudi ESL learners.

3. METHODS OF RESEARCH

To assess CSLL's impact via digital reading, a quantitative method was applied in which a descriptive analysis was performed for data presentation and analysis. Two testing points were chosen for the learners' assessment, i.e., before the commencement of the experiment and after its

completion. Scores from these tests were collected and analyzed with SPSS version 25.

3.1. Population And Sampling

The population for this study came from Saudi Arabia, specifically the learners of English as a second language. Furthermore, the sample consisted of 100 grade 10 students from 10 public sector English medium schools across the eastern province. 10 students each from one school were selected to make the data diverse and truly represent the population. Eastern Province was picked by purposive sampling as it was convenient for the researchers to collect real-time data. Participants and the schools were chosen using a simple random sampling technique. This provided an equal chance of being part of the study to every individual in the sample.

Following the pre-test, participants were stratified based on their test scores to ensure balanced proficiency levels across both groups. Then, students were randomly assigned to either the experimental or control group using a computer-generated random number list created in Microsoft Excel's RAND function. Each student was assigned a number, and those with even numbers were placed in the control group, while those with odd numbers were placed in the experimental group. Full concealment regarding randomization was observed to avoid bias in the distribution of participants in the group. This act also avoids bias and supports the validity and reliability of data. These 100 learners were placed into two groups of mixed ability learners (50 each). One was a conventional group (control) and the other was a treatment group (experiment). Most importantly, ethical considerations were considered, and prior permission was taken from each school's management for the experiment. The same applies to all the participants.

3.2. Research Tools

The CSLL method, comprised of many built-in tools, was implemented to assess whether it is effective in developing reading skills. The CSLL method has previously demonstrated effectiveness, validity, and reliability (Mohsen et al., 2024). For assessing the efficacy of the method, a pre- and post-test was administered. The major tool in this enquiry was a computer and the built-in tools like immersive technologies, OneNote, and text-to-speech that aided the experiment procedures. Moreover, tests served as an important tool for extracting results. The content for the experiment was taken from the Ministry of Education's prescribed English syllabus in Saudi Arabia (Appendix A). Ten passages were randomly chosen from these books. It was ensured to pick passages that can be attempted by mixed-skill learners to avoid any content bias. This ensured the validity of the content. These ten passages were utilized by the experimental and control groups. The control group learned from the printed English for grade 10 textbook, while the other group used a digital format under the CSLL method. Further details of the integration of these tools are presented in the research process.

3.3. Research Process

The research process spanned 15 days. The class time for each session was 40 minutes. The students were offered to practice the reading passages to provide replies to the comprehension questions and other pertinent questions accordingly to the syllabus. The teacher of the control group instructed them using by using a teacher-focused method. This method consisted of textbook-structured lessons led by the teacher. Every session started with the previous lesson. Then, the direct instructions were given for various guided reading activities. The lecture and discussion technique was applied by the teachers to pace their lessons. This was significant to ensure that learners had comprehended the content before moving further. Moreover, the learners were involved in silent reading, which was then followed by individual and group discussions for strengthening their understanding. Throughout the treatment period, comprehension questions and pertinent worksheets were used to train and assess the learning of the control group.

However, the experimental group learnt in a different ambiance. The participants used Microsoft Immersive Reader, OneNote, and Text-to-Speech tools during the lessons. Teachers facilitated sessions through the demonstration of each tool's step-by-step, i.e., highlighting difficult vocabulary with Immersive Reader's features (like breakdown of syllables and picture dictionaries). Then presenting the summary of the paragraphs through OneNote's note-taking and summarization function, and lastly, the use of Text-to-Speech for the practice of pronunciation for explicit comprehension of the reading text. Learners applied these tools autonomously and then in small groups during their reading assignments.

This approach fostered collaborative tasks such as summarizing texts and discussing keywords extracted through the tools. All the tools were integrated within the lesson and were used in 45-minute sessions for the 20-day intervention period. This allowed the continuous practice and cover-up of

the issues and problems they could face. Moreover, it also provided an opportunity for teacher feedback. Both groups' learning time was 45 minutes, while at the end, a final test was conducted, which consisted of four reading passages with a period of 50 minutes.

3.3.1. Tool Implementation Framework

The tools were employed through a developed lesson plan and framework, which consisted of the following steps.

- Each session began with a teacher-guided demonstration of one or more tools
- Then, structured tasks were performed, such as annotating a passage in OneNote, using Immersive Reader to decode new vocabulary
- Finally, listening to selected excerpts through Text-to-Speech supported reading comprehension.

It is significant to share that this experimental design had core features of elements from Anderson's ACT (Adaptive Control of Thought) theory as a framework. Learners participated in a range of activities individually, in pairs, and groups. In all the situations, digital tools were systematically incorporated into reading tasks, comprehension exercises, and the construction of summaries.

3.3.2. Variables

This study involved two independent variables: CSLL and content, while learning served as the dependent variable. Additionally, several confounding variables such as teachers' behavior, learners' intellectual level, and information regarding demography were considered. To address these, only experienced teachers with over ten years in the field were selected for participation. All the learners were native Arabic speakers studying English as a foreign language and shared similar intellectual backgrounds, as they were science group students. It was ensured to place mixed-ability learners in both groups. Their placement was done keeping in view their previous performance in the English subject. The passages were chosen to suit mixed-ability learners, providing each student an equal opportunity to engage with the material.

The study also accounted for various moderating variables, including gender, race, age, prior academic performance (Grade 9 scores), classroom atmosphere, teaching method, test structure, timing, and digital familiarity. All participants were of the same demographic profile: male, Arabic, and Asian, within the age bracket of 16 to 17. Their English scores from prior exams (Class 9 final-term exams) were compared to ensure similar levels of cognitive development

The classroom environments were consistent, providing comfortable, well-equipped spaces, and instruction was conducted in English. The test format was familiar to the learners, aligning with their standard curriculum. Moreover, all participants demonstrated digital proficiency, having long-term experience with computers.

In this experiment, Microsoft Immersive Reader, OneNote, and Text-to-Speech were employed cohesively to integrate the CSLL approach to support reading comprehension. Therefore, their independent application was avoided due to their specialized characteristics, like Immersive Reader primarily assists with vocabulary decoding and text annotation, OneNote facilitates note-taking and summarization activities, and Text-to-Speech supports pronunciation and auditory comprehension. So, all these tools were utilized according to their specific characteristic to assess the overall impact of the CSLL method. Importantly, all these tools were used in the same intervention period. This resulted in the engagement of learners with each tool for specific tasks within the framework of the lesson.

4. RESULTS

Results excerpted from the data collection are linked up for analyzing the data. The outcomes are established through findings received from the t-tests (paired & independent). Tables 1–7 exhibit the scores of two study groups, control and experimental, for t-tests. The comparison between the two student groups was observed at two distinct points of time: the beginning and the conclusion of the study. In addition, for establishing the validity of data, kurtosis and skewness analyses were applied. Importantly, all inferential tests in the study used a two-tailed hypothesis with an alpha level of $\alpha = .05$, as we aimed to identify any significant difference in reading comprehension performance, regardless of direction.

4.1. Comparing the Treatment Circumstances and Initial Assumptions

Before conducting illative analyses to compare treatment circumstances, early assumptions were calculated. This was also comprised of examining the skewness and kurtosis of the constructs. The standard deviation gauges the intensity or extent of variability within and among the samples. Thus, it is a prevalent tool across statistical analyses and holds significant weight across disciplines. It also contributes crucial insights into data variability and

distribution. When data is not normally distributed, the mean may not accurately reflect the representative value. Therefore, applying a normality test helps to check if the mean is presenting true reflection of the dataset.

Prior to the inferential analyses for the comparison of treatment conditions, preliminary assumptions were measured. This encompassed investigating the skewness and kurtosis of the understudy constructs to ensure the normality of data. Standard deviation was also calculated to examine the degree of variability within and between samples, serving as a widely used tool in statistical analysis due to its relevance across disciplines. Standard deviation provides essential insight into data variability and distribution patterns. Thus, supporting the overall reliability of the findings.

Table 1: Key Terms Mentioned In the Tables of the Analysis.

Mean Value	MNV
Standard Deviation	SDN
Skewness	SNS
Kurtosis	KUT
Shapiro-Wilk	SPWK
Control Group	CTLG
Experimental Group	EPLG
Confidence Interval	CDI
Lower Limit	LRLT
Upper Limit	URLT
Cohen's *D*	CND

Table 2: Statistics presentation of pre- and post-testing: CTLG and EPLG groups (no. of participants= 50), including SNS and KUT. 2.69.

TC		*MNV*	*SDN*	*SNS*	*KUT*	*SPWK*
CTLG	Pre-test	6.77	1.20	0.57	0.57	2.79
	Post-test	9.69	1.02	0.20	0.19	2.90
EPLG	Pre-test	6.78	1.20	-0.05	-0.64	2.93
	Post-test	15.98	0.59	0.28	-0.19	2.03

In Table 2, the pre- and post-test data for the two groups involved (CTLG and EPLG) are shown. It also includes some key metrics such as mean values (MNV), standard deviation (SDN), skewness (SNS), and kurtosis (KUT). Additionally, Shapiro-Wilk (SPWK) values for both groups are provided, where SPWK confirms data normality if values fall within the -2 to +2 range for skewness, as supported by Louarn et al. (2024). The SPWK test results were also non-significant, confirming a normal distribution across both groups. Furthermore, analyses were conducted using the 5000-sample bootstrap method, a widely recognized and reliable approach for estimating sample distribution (Long & Rooklyn, 2024).

Table 3: Independent-Sample T-Test Pre-Test Results (CTLG And EPLG), N = 100.

Variable	EPLG (50)		CTLG (50)				*95% CI*		
	MNV	*SDN*	*MNV*	*SDN*	*t (98)*	*P*	*LRLT*	*URLT*	*CND*
Pre-test	6.78	1.20	6.77	1.20	-2.90	.005	-1.43	-0.31	0.008

Glass's delta = (6.77 - 6.78)/1.2 = 0.008333. Hedges' g = (6.77 - 6.78)/1.2 = 0.008333.

For sample data analysis for the treatment groups, an independent-sample t-test was performed by SPSS 25. The MNV of CTLG and EXLG were 6.77 and 6.78. This indicates a very slight difference in scores of the participants in the two groups. Standard deviation (SDN) which reflects the degree of variability around the mean, for CTLG and EXPLG were (SDN = 1.20), confirming minimal variance in data spread between the two groups. The assumption of homogeneity of variance was upheld, as evidenced by an F-value of 0.016 and a P-value greater than 0.05, signifying that pre-test score variances remained stable across the two groups. Investigating the pre-test data by applying an independent-sample t-test revealed significant differences, indicating comparable group performance before the intervention. However, the t-test statistic (t = -2.90) produced a P-value of 0.005, falling below the alpha threshold of 0.05, suggesting that the two sample groups may represent distinct populations.

The confidence interval for the t-test ranged from -1.43 to -0.31, suggesting that the true mean difference between groups likely lies within this interval. Notably, the exclusion of zero within this range highlights the statistical significance of the observed effect at the selected confidence level. The effect size, calculated using Cohen's D(CND), was 0.008, indicating a negligible difference in the pre-test values between the experimental and control groups. Thus, suggesting the groups were practically equivalent at baseline (Cohen's, 1988). This finding was corroborated by effect size measurements using Glass's delta (0.008) and Hedges' g (0.0083), both of which confirmed the effect magnitude and sample standard deviations.

Table 4: Independent-Sample T-Test Post-Test Results (CTLG and EPLG), N = 100.

Variable	EPLG(50)	CTLG(50)				*95% CI*	
	MNVSDN	*MNV*	*SDN*	*t (49)*	*P*	*LRLTURLT*	*CND*
Post-Test	15.980.59	9.69	1.02	-26.01	.005	-5.931-3.989	0.09

The performance of the CLG and EXPG groups was evaluated through comparative analysis, showing that the mean value (MNV) of the EPLG (15.98) was very high in comparison to the CTLG (9.69). This considerable difference suggests a strong effect of the intervention tool. The standard deviation (SDN = 0.59) of EPLG group points to a wider spread of data points from the mean, indicating the superior performance of the EPLG over the CTLG, which had a standard deviation of 1.02. The assumption of homogeneity of variance was met, with an F-value of 1.3111 and a P-value greater than 0.05, confirming consistent variance in post-test scores across both groups.

The t-test statistic (t = -26.01) supports the conclusion that the two groups represent significantly distinct populations, with the EPLG showing a much higher mean than the CTLG. The confidence interval for the t-test, between -5.931 and -3.989, indicates that the true population parameter likely falls within this range, and the absence of zero within this interval verifies the statistical significance of the observed effect at the selected confidence level. The effect size, measured by Cohen's D (CND), was 0.09, which indicates a large difference between the groups, following Cohen's (1988) guidelines.

Table 5: Comparison Of Pre-Test And Post-Test Scores In The Control Group Using Paired-Sample T-Test (N = 50).

VR	Pre-test		Post-test				*95% CI*		
	MNV	*SDN*	*MNV*	*SDN*	*t (49)*	*P*	*LRLT*	*URLT*	*CND*
CTLG	6.77	1.20	9.69	1.02	-26.89	.001	-3.01	-2.8	0.12

CTLG group's analysis was done via a paired-sample t-test, which examined their performance across initial and final assessments. The mean value (MNV) in the pre-test was 6.77, which rose to 9.69 in the post-test. Thus, indicating that traditional teaching methods had a limited effect on learning outcomes. In terms of data spread, the standard deviation (SDN) was 1.20 for the pre-test and decreased to 1.02 in the post-test, showing a narrow clustering of the data points around the mean in the post-test, which suggests a slight increase in consistency.

The comparison of pre- and post-test scores is further supported by the t-value (t (49) = -26.89, p < .001), which specifies that though the post-test mean (9.69) was somewhat higher than the pre-test mean (6.77), the difference was not substantial. The t-test result (t = -26.89, with df = N-1 49) and a P-value of 0.001 (below the α level of 0.05) show minimal significant variation between the pre-test and post-test scores for the CTLG group. This proposes that, although there was a slight improvement in students' average performance, the increase was not pronounced.

The 95% confidence interval limits (CL) indicate that the population mean difference (μd) likely falls within this interval, supporting the reliability of the observed changes. Despite some improvement in scores, this increase was relatively minor. Lastly, the effect size, represented by Cohen's D (CND) at 0.12, points to a small effect according to Cohen's (1988) standards, underscoring that while there was minor improvement, the intervention had a minimal impact on the CTLG group's outcomes.

Table 6: Summary Item Statistics.

	MVN	Min (pre-test)	Max(post-test)	Range (x1 & x2)	Ratio = Max / Min	VC	NI
Item Means	mc = 8.23	m1 = 6.77	m2 = 9.69	DM = 2.92	RM= 1.413	vb = 2.639	2
Item Variances	vp = 1.251	v1 = 1.080	v2 = 1.559	vd = 0.579	vr = 1.371	vv = 0.157	2
Inter-Item Correlations	.785	.785	.785	1.000	-	.000	2

The values mentioned substantiate the divergence of the CTNG in their pre-test denoted by x1, post-test denoted by x2 (Table 5). The minimum value is x1, while the highest is x2. Additionally, x1 / m1 = 6.77 and x2 / m2 = 9.69. This explains the diverse array of MNV signified as DM = (m2 – m1) = 2.92, whereas MNV ratio RM = (m2 / m1) = 1.413 = (0 + 01.4%). The joint MNV (m1, m2) is calculated through a center point CM = 8.23, and the variance between them (m1, m2) is calculated by vp = 1.251 relating the unpredictability among the groups. Congruently, v1 (variance) is x1 = 1.080, and v2 (variance) is x2=1.599. Thus, justifying the change in the variance showed by vd (v2 – v1) = 0.479, and also the ratio of variance denoted by vr (v2 / v1) = 1.451. Going ahead, v1, v2 are the pooled variance (vb = 2.639), which represents the average variability across pre- and post-test scores, and vv = 0.157 designates the change of variance of groups (x1, x2). The paired-sample confirmations pointedly have a positive correlation (i.e., r = 0.768) amongst pre- and post-test clusters.

Table 7: Comparison of Pre-Test and Post-Test Scores In the Experimental Group Via Paired-Sample T-Test (N = 50).

VR	Pre-test		Post-test				95% CI		
	MNV	SDN	MNV	SDN	t (49)	P	LWRL	UPRL	CND
EPLG	6.78	1.20	15.98	0.59					

The performance of a single group (EPLG) in the initial and final tests is measured by a paired-sample *t*-test (Table 6). The MV in the initial test (6.70) is vividly significant compared to the MV value in the final test (16.65). This elucidates that the intervention instrument has had a substantial effect on students' scores. Here and now, viewing the data disparity, the STDV is 1.24 in the pre- and 0.61 in the post-test group. This verifies that the post-test group displays wider data points spread around the MV in contrast to the pre-test group, representing high variance in the scores in the post-test.

The inequalities amid the pre-test and post-test of the EPLG are mentioned through the *t*-value (t = -63.75, with df = 49) having a *P*-value of 0.000* < (α = 0.05). This *t*-test statistic value designates that both sample groups are from varied populations, thus suggesting a better performance of the participants in the post-test group compared to the pre-test group. Further, the effect size of CND was 1.72, signifying a higher difference, as per Cohen's classification (1988). This increase validates the inclusion of the tool used for the experiment. Overall, the scores display that the null hypothesis (Ho: ρ = 0) is to be rejected, suggesting that there is a significant and positive correlation between the two populations.

Table 8: Summary Item Statistics.

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	No. of items
Item Means	mc = 11.675	m1 = 6.70	m2 = 16.65	md = 9.95	mr = 1.291	vb = 4.867	2
Item Variance	vp = 3.284						
	v1 = 1.112	v2 = 3.284	vd = 2.312	vr = 2.953	vv = 2.981	2	

The figures declared authenticate the aberration of EPLG in their pre-test as x1 and post-test as x2 (Table 8). The least value is x1, and the highest is x2. Also, x1 or m1 = 6.70 and x2 or m2 = 16.65. This explicates the mean diverseness md = (m2 – m1) = 9.95, where MV ratio mr = (m2 / m1) = 2.481 = (2 + 48.1%). The common ME (m1, m2) is measured at a middle point mc = 11.685, and the variance between them (m1, m2) is premeditated by vp = 3.284, displaying the variance among the groups. Correspondingly, consider v1 (variance = x1 = 1.112) and v2 (variance = x2 = 3.284). Therefore, authenticate the variance change signified as vd (v2 – v1 = 0.485). The ratio of variance is vr (v2 / v1 = 2.953). Moving forward, v1, v2 are the pooled variance (vb = 4.987), which represents huge variability across pre- and post-test scores. This paired-sample affirmation has a positive correlation

(i.e., r = 0.739) between pre- and post-test participant groups.

5. DISCUSSION

This investigation exhibited the efficacy of the CSLL method through the results. The claim that CSLL is an effective method can be justified by the performance of EPLG, which outclassed CTLG. The outcomes suggest that CSLL elevated the reading abilities of the learner, which reflected in their better performance in the post-test. Although the CTLG learners' scores were also improved but it was not significantly, which may be due to the conventional settings and outdated method.

This view is also advocated by Hınız (2024), who proved that traditional teaching has failed to give the desired outputs. On the contrary, a marked difference was observed in the pre- and post-test scores of EPLG, which validated the integration and impact of CSLL. Sharma et al. (2023) opined that CSLL is an interactive and modern teaching method in English language learning situations.

The integration of built-in computer-supported language learning (CSLL) tools into ESL reading instruction within Saudi Arabian public schools presents significant pedagogical advantages, particularly in areas with limited internet connectivity. When deployed through offline platforms or locally hosted systems, these tools enable uninterrupted access to interactive reading content, vocabulary development features, and instant formative feedback, thereby supporting students' reading proficiency without reliance on stable internet access. Such tools facilitate individualized and adaptive instruction, proving especially beneficial for learners in remote or resource-constrained settings. Moreover, the use of offline-compatible CSLL solutions reduces dependency on external digital networks, complementing national initiatives aimed at enhancing educational equity and advancing technological integration in schools. Nonetheless, effective adoption necessitates targeted teacher professional development and strategic investment in basic digital infrastructure, including the provision of reliable hardware and preloaded instructional content across classrooms.

Going through the built-in features of computers utilized in this research through CSLL methods, here, the participants used an immersive reader like Microsoft Word. Word offers a variety to users like text customization and formatting, which helps the user to read easily.

Microsoft Immersive Reader was used primarily for vocabulary scaffolding and guided reading. This tool enabled learners in the decoding of complicated vocabulary words using pictures, the separation of syllables, and contextualized translation. Moreover, OneNote supports annotation and student-generated summaries.

The students utilized it for generating a list of keywords, creating mind maps, and organizing reading responses. Finally, Text-to-Speech assisted with pronunciation modelling and auditory reinforcement for better reading comprehension. Additionally, classroom-ready practices and lesson integration strategies were included to demonstrate how these tools can be embedded in common instructional models. This practice develops comprehension in the learners and encourages them to apply these tools in their learning.

Kruse et al. (2023) also reported that MS is widely adopted for writing, reading, and editing tasks. Yulanda (2023) also stated that text formation develops concentration in reading.

Further, the reading aloud is another feature that supports reading as the learners can not only read but can also hear the text. This audio and visual combination can improve the comprehension of the text. Vargas et al. (2024) corroborated that sometimes reading becomes monotonous, and reading aloud can serve as an additional tool to benefit the comprehension process.

Going on, the participants here utilized the functionality finding and searching feature of MS Word. This feature permitted them to understand the text in context. Meaning can be misunderstood without focusing on the context. Therefore, the integration of this feature can provide clarity in understanding the context. Liao et al. (2024) supported this aspect that without understanding the connotative meanings, no text can be understood completely. Further, the inclusion of thesaurus in MS Word provides multiple benefits for the learners. Here in this experimental process, the learners used it to look at the synonyms of difficult words. This made them understand the use of words in the text. Vaughn, Boardman, and Klingner (2024) also shared that the multiple options provided by the thesaurus allow learners to develop their vocabulary unconsciously, which in the end improved their performance. Monika (2024) suggested that thesaurus use in MS Word boosts learning.

Another tool utilized in this study was Microsoft OneNote. The learners exploited this tool for organizing notes using pages and sections. This improved the structure of the passages and made them easier to access. San et al. (2022) also viewed

that reading structure allows synchronization of text, which maintains cohesiveness. OneNote Class Notebooks are able to provide a real-time, synchronized space for all the mathematical work. The convenience, usefulness, and real-time features of OneNote Class Notebook via MS Teams make it a powerful tool and a substitute for the traditional classroom. Also, the tag and search feature was added as a benefit for them, as they can search particular notes, text highlighting, and keywords. This can avoid irritation, distraction, and assist in smooth reading.

In general, real-time collaboration with flexible learning was also made possible as learners can access their computers even outside the classrooms, and they can engage in peer study and collaborative understanding of text. Baldwin (2024) also suggested various pertinent digital activities that assisted in their overall knowledge development. Looking at some studies about digital built-in tools used for reading, Kruse et al. (2023) concluded through a report that MS Word has conquered people's minds to use it for writing, reading, and effective editing. This study joins with the results concluded by Monika (2024) who studied the importance of thesaurus in MS word in the academic writing context and stated that thesaurus is beneficial due to variety of options like providing synonym, identification of perfect word choice and improvement of the writing flow by giving summary of the text.

Glancing from the perspective of Digital Literacy Theory, this study corroborates with the earlier research from the theoretical perspective. A major element of Digital Literacy theory is the emphasis on training learners with digital knowledge for better performance. This element can be seen in this research also, where the learners were equipped with digital tools, so consequently, they found it easy to use according to their needs. This elevated their performance.

Further, the impactful atmosphere created by a variety of digital tools is another aspect of this theory. This develops critical thinking. Here in this study, the immersive tools helped learners to think critically and evaluate sensibly. This helped them respond more effectively to the comprehension questions better which provided them with better results. Ismailov (2022) also studied digital technology in learning. Moreover, the social connections performed by the digital collaborations helped the learners here to perform better; rather, they created a digital ambiance for the learners that was not restricted to the classrooms.

This is identical to the research performed by Han & Geng (2023), who concluded that in the scenario of technology-enhanced learning, digital approaches for online learning led to better performance. This study strongly joins the elements of Anderson's ACT (Adaptive Control of Thought). The Anderson's framework talks about the cognitive stage at first. It is vivid here that the cognitive stage involves learners' understanding the basics of reading comprehension strategies, which was supported through teacher guidance and tools like the immersive reader, which simplifies the complex words. Thus, permitting participants to learn to develop a focus on a preliminary understanding of the text. Then, OneNote supports the associative stage, where learners practice organizing ideas and summarizing content with guided feedback. This is parallel to the opinion by Kim & Nam (2020), who shared that these stages helped the learners to develop their reading techniques by repetition and refinement. Further, the autonomous processing stage of this framework is reflected in the use of the Text-to-Speech, which aided pronunciation and auditory processing. This reinforced automatic word recognition over time. The repeated use helped them to achieve the next stage, which is incremental practice, which is key to developing automaticity.

These three important stages of skill are significant in the development of learning. The overall results are connecting with the conclusions made by Moskovsky (2018) who shared that CSLL technologies considerably increase the efficiency of learners in reading comprehension and vocabulary learning. This study also aligns with Moskovsky (2018), who concluded that students who used CSLL showed greater excitement and engagement in reading activities, which led to improved reading proficiency. Their study also found that CSLL tools helped students acquire critical reading abilities, including inference and summarization.

Finally, the outcomes in this study suggest that there is a positive effect of CSLL on reading skills among primary school children and these are beneficial for efficient learning.

6. CONCLUSIONS

Some pivotal insights have been shared regarding CSLL for ESL learners. In this investigation, the results validated the value of the CSLL method, which was reflected through the scores of two student groups. The quantitative analyses of data advocate that the learners' experience with CSLL for reading was effective and productive. It elevated their reading comprehension. Reading skills have a

substantial place in language learning. Precisely, in English language learning. The performance results indicate that CSLL facilitated English language learning and allowed users to develop flexibility in learning. Moreover, the learners also found it a smart way of learning outside the classroom environment. Additionally, CSLL's built-in digital features supported seamless learning. Due to these features, learners did not face any internet connectivity issues.

In summary, the integrated tools played specific roles, i.e., Microsoft Immersive Reader was primarily employed to support vocabulary scaffolding and facilitate guided reading. This tool aided learners in decoding complex vocabulary through features such as visual representations, syllable segmentation, and contextualized translations. OneNote was utilized to enhance annotation practices and support the creation of student-generated summaries; learners used it to compile keyword lists, develop mind maps, and organize their reading responses effectively. Additionally, the Text-to-Speech function provided pronunciation modeling and auditory reinforcement, contributing to improved reading comprehension through multimodal input. In conclusion, it is noted that CSLL can be an effective way to transform the learning requirements of modern learners. Even without using the internet, the variety of features offered by CSLL through computers can boost learning and learners' performance. So, for reading comprehension and the development of reading skills, this method is pertinently effective.

6.1. Limitation of the Study

This study had certain limitations, like only the Eastern Province was included for the experiment, as for the researchers it was easier to collect data, but this may constrain the generalizability of the findings across other regions in Saudi Arabia. Secondly, only public sector schools were made part of this experiment, as private schools and international schools have variations in syllabi, which could have affected the reliability of the content of this experiment. Further, another limitation was selecting male institutes only, as in Saudi Arabia, male and female schools are separate. So, the study chose to focus on one gender to focus the research parameters perfectly. Additionally, the study targeted a specific grade level, thereby limiting the applicability of the results to learners at other educational stages.

These steps helped narrow the population to ensure valid and reliable data collection and analysis. The combined approach of using Built-in tools was another limitation, but due to the logistical and resource constraints, it was almost impossible to conduct separate controlled experiments for each tool within the current study.

6.2. Practical Implications of this Study

There are some key practical implications of the study. This study can have substantial value and implications to relevant stakeholders. It can be gainful for educational institutes, relevant ministries, curriculum and syllabus developers, and institutional administrators. The positive performance of experimental group learners has validated the value of CSLL as a method. This research can pave the way for further investigation in connection with CSLL, where some other built-in features of computers can be used for facilitating English language learning. Moreover, the other important English language skills can be taught using CSLL method.

Further, the internet and various software can be used through the CSLL method, which can add variety to learning. The CSLL method could also support reforms in Saudi Arabia's current education system. From the pedagogical viewpoint, the teachers can use CSLL methods to develop interest in learners. Furthermore, curricula and syllabi can be made in a way that incorporates tasks connected with CSLL. In this way, it can be innovative and cost-saving. From the learners' view, CSLL methods should be encouraged to be used to explore online and more built-in tools. In this way, learners can enhance their digital literacy and explore innovative learning methods.

6.3. Recommendation

- CSLL should be implemented vigorously throughout across Saudi Arabia.
- Effective planning must be done for its implementation.
- Teachers should be provided with a syllabus that supports CSLL methodologies.
- Classrooms should have complete infrastructure for CSLL.
- Learners should be given proper training to use computers for educational purposes.

Future research should pursue longitudinal designs to assess the long-term impact of CSLL tool integration on language development. Expanding the geographical scope to include diverse provinces and educational contexts would improve the external validity of the findings.

Furthermore, examining various grade levels and evaluating the pedagogical efficacy of specific CSLL features, such as adaptive learning mechanisms, gamified elements, and speech-to-text

functionalities, could offer more nuanced insights for enhancing technology-supported ESL instruction.

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