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RESEARCH ARTICLE

Fostering English speaking and writing subskills for the Cambridge B2 First through technology-mediated tasks

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Abstract

Recent studies on technology-mediated task-based learning have shown the impact of task design and modality on English as a foreign language (EFL) learning. However, it is unclear what effect technology-mediated tasks have on learners' English language skills. This paper presents a classroom-based study that showed how using technology-mediated tasks impacted students' learning experiences and fostered the development of specific speaking and writing subskills in an EFL secondary education context. Forty-two EFL intermediate learners completed two speaking and two writing tasks from the Cambridge B2 First exam using mobile devices. The participants were divided into a pen-and-paper group ($N = 21$) and an iPad group ($N = 21$). Learning outcomes were measured using a pre-test/post-test design with a statistical comparison of ratings across tasks. A qualitative content analysis of lesson observations and student and teacher interviews served as an additional dataset to shed light on learners' experiences. Descriptive statistics revealed that the iPad group achieved higher scores in pronunciation and accuracy (speaking) and essay organisation features (writing). Tasks involving the active use of the tool for content creation, rehearsing speaking performances, and accessing authentic materials were the most successful among students.

Keywords: task-based language teaching; speaking; writing; technology-mediated task

1. Introduction

Over the past two decades, technology integration in schools has undergone a significant transformation, shifting from being primarily associated with entertainment to becoming an essential educational tool. This has been driven by the recognition of technology's potential to enhance and enrich students' learning experience across various subjects and disciplines. Task-based language teaching (TBLT) has proved an effective approach for integrating technology into English language instruction due to its strong connection to authentic language use.

González-Lloret (2014) emphasized the importance of a technology-mediated TBLT framework, stressing that technology should be carefully chosen and integrated into task design (Chapelle, 2014). Although there has been considerable research on the application of technology-mediated TBLT with adult and advanced learners, few studies in the existing literature (e.g. Morgana, 2023) have focused on secondary school learners and specific language subskills. To bridge this gap, this paper claims that a technology-mediated TBLT approach facilitates learning experiences and promotes the development of speaking and writing subskills, namely accuracy, pronunciation, and text organization – essential for producing well-structured and coherent texts.

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This mixed-methods study involved 42 intermediate English as a foreign language (EFL) secondary school learners. The research focused on using mobile devices (iPads) to implement four technology-mediated pedagogic tasks that aimed to enhance communicative competence (Hymes, 1972). The study sought to assess language improvement and examine students' learning experiences. The tasks and assessment criteria were aligned with the speaking and writing components of the Cambridge B2 First examination, which the students were preparing for at the end of the semester.

2. Research questions

The study aimed to address the following research questions:

1. To what extent do technology-mediated tasks affect the development of specific speaking and writing subskills among EFL secondary school learners?
2. What are the factors that shape secondary students' learning experiences within the context of technology-mediated TBLT, and how do students perceive these factors?

3. Theoretical background

Over the last 20 years, second language acquisition (SLA) theories have served as a theoretical framework for ground research in computer-assisted language learning (CALL) and technology-mediated TBLT environments. Cognitive-interactionist views have informed many of the studies in this field of SLA. Cognitive theories focus on how a second language (L2) is acquired and the mental process behind this (Ellis, Skehan, Li, Shintani & Lambert, 2019). The interactionist approach suggests that interaction fosters L2 development by providing learners with modified input, feedback, and opportunities to evaluate their interlanguage and produce output (Ellis, 2018; Long, 2015). In this respect, technology-mediated tasks support and foster implicit cognitive processes.

However, around 1990, researchers' interest in the social nature of L2 acquisition started to spread. Sociocultural theory (SCT) emerged as highly relevant in the field of TBLT (Zuengler & Miller, 2006) because it emphasizes the connection between individuals and the diverse contexts and objects (i.e. material or symbolic artefacts) that shape and modify cognitive processes. Drawing from the work of Vygotsky (1978), SCT sees the classroom as a social context that fosters language development, also allowing explicit attention to form during the performance of a task. A recent application of SCT (Lantolf, Thorne & Poehner, 2014) emerged in TBLT studies. The social use of a language, including computer-based interaction, activates cognitive processes that lead to L2 acquisition. The study presented here is grounded in this recent application of SCT (Lantolf *et al.*, 2014) in TBLT. Tasks within various contexts are not isolated from social dynamics; rather, they are subject to their influence. One such dynamic that significantly impacts the field of EFL is, in fact, the incorporation of technology.

3.1 Key concepts in SCT

Mediation and scaffolding represent fundamental concepts within SCT. Mediation refers to the process by which an intermediary element influences, shapes, or directs our interactions with the world (Swain, Kinnear & Steinman, 2015). In L2 learning, students interact with social artefacts (e.g. language or teachers) and physical tools (e.g. technologies) that serve as mediators for learning (Lantolf, Poehner & Swain, 2018). Artefacts and tools do not automatically serve as mediating means; students must engage and utilize them in various ways, thus creating diverse opportunities for language development (Swain *et al.*, 2015). Through this intentional usage, artefacts acquire the power to shape learning. In this respect, tasks themselves are designed to play

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a mediating role in learning, and the mode of tasks (e.g. mobile-based tasks) significantly influences how L2 learners engage with the language (Oskoz & Elola, 2014).

Scaffolding is another pivotal concept within SCT, referring to the interactive support provided by more knowledgeable individuals or resources (the teacher, as well as a tool) as students engage in new or challenging tasks. Thus, scaffolding helps learners accomplish a language skill beyond their individual capability (Ellis *et al*., 2019). Scaffolding in language learning involves various strategies and techniques employed by teachers, peers, or tasks to facilitate language development (e.g. breaking down complex tasks, offering prompts, etc.). In this study, the interaction between students, teachers, tasks, and technology acts as a mediating force, scaffolding the learning process and fostering learners' conscious awareness of language features (noticing).

4. Technology-mediation in TBLT and CALL research

This literature review focuses on examining the role of technology-mediated speaking and writing tasks in SLA processes. The reviewed studies encompassed a range of investigations, with some focusing on the design and learners' perceptions of speaking and writing tasks in language learning (e.g. Pellerin, 2014). However, research evaluating the performance of learners in speaking and writing tasks, specifically in relation to the tasks themselves and SLA processes, remains relatively limited in the existing literature (e.g. Levy, 2006; Tang, 2019; Winke, 2014).

4.1 Developing speaking skills

The majority of research findings indicate that synchronous interaction with computer-mediated communication (CMC) has a positive impact on learners' overall speaking skills (Abdous, Camarena & Facer, 2009; Stockwell, 2010), discourse management (Thomas & Reinders, 2010), and pragmatics (Sykes, 2005). However, there is mixed evidence regarding the effectiveness of technology-mediated approaches in improving speaking skills. Nielson (2014) examined the effects of technology-enhanced TBLT in an online Chinese as a foreign language course, focusing on students' participation and proficiency rates. The results demonstrated significant improvements in speaking proficiency. Conversely, Tang (2019) investigated the influence of task modality on L2 learners' pragmatics by comparing task-based interaction between two groups, one utilizing CMC and the other standard face-to-face (FTF) interaction. Despite the promising outcomes of previous studies on CMC and TBLT (Stockwell, 2010), Tang's (2019) research revealed that the FTF group outperformed the CMC group and employed a greater number of learning strategies, including self-repetitions and self-corrections. Similarly, Sauro (2012) found no significant differences in a study conducted with two groups of university students.

In contrast, Winke (2014) examined the development and assessment of L2 oral skills supported by technology-mediated tasks, specifically investigating students' self-monitoring of their oral skills after task performance. More recently, Morgana (2023) looked at the factors influencing learners' speaking development in technology-mediated TBLT, with encouraging results. Similarly, this study focuses on the role of technology in designing and implementing asynchronous speaking tasks.

4.2 Developing writing skills

Technology-mediated communication, whether synchronous or asynchronous, mostly takes written form. However, it cannot be considered a single genre, as various media can be associated with multiple genres (Kern, 2014). A large group of studies focusing on synchronous technology-mediated environments showed how task-based interaction through written text chat could boost vocabulary learning (Smith, 2004), improve accuracy through corrective feedback (Sauro, 2009),

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and generally enhance L2 language development by providing learners with a visual representation of their writing (Kern, 2014; Pellettieri, 2000).

Other studies address the use of a technology-mediated TBLT approach to develop L2 writing skills in asynchronous communication (Adams, Alwi & Newton, 2015; Lee, 2010; Lomicka & Lord, 2012; Mak & Coniam, 2008; Solares, 2014). For example, Mak and Coniam (2008) analysed a collaborative writing task's written outcomes on a wiki created by 24 EFL secondary school students in Hong Kong. Data revealed that learners produced longer and more complex texts. Similarly, using writing tasks for blogging improved learners' writing fluency and motivation in Lee (2010), confirming that asynchronous written technology-mediated tasks offer learners opportunities to reflect on their output and grammatical accuracy (Yamada, 2009). Solares' (2014) study with EFL learners in Mexico investigated a multi-stage online writing task with three groups engaged in three instructional designs, with and without technology-mediated tasks. Results showed that learners reached the same linguistic competence, but their perception of the task design and its link with technology differed considerably in terms of input quality and quantity. Similarly, the study presented here explores asynchronous writing tasks performed with and without digital tools to understand their impact on students' cognitive writing processes (i.e. planning, drafting, revising, editing) and proficiency.

In summary, recent classroom-based investigations on TBLT and technology have revealed how various learning conditions (e.g. using digital tools) impact students' learning experiences (Morgana, 2023). In technology-mediated contexts, learners can work at their own pace (Tsai, 2011), facilitated by the scaffolding digital tools provide (Chen, 2012). Furthermore, they gain access to authentic texts (Park, 2012) and multimodal resources (Abrams, 2016). These factors have frequently resulted in reported positive language advancements. However, most of these studies have primarily focused on university-level learners. The question of how and whether integrating technology-mediated tasks into the secondary school EFL curriculum enhances language proficiency remains largely unexplored.

4.3 Pedagogic and technology language tasks

Pedagogic language tasks (PLTs) are classroom activities that require learners to utilize, interact with, and comprehend the target language in order to convey meaning and focus on the linguistic form. On the other hand, pedagogic technology tasks (PTTs) concentrate on the specific technological tool employed to carry out the target task. Technology-mediated TBLT incorporates both pedagogic and technology language tasks, wherein language serves as both the objective and a tool to accomplish the L2 technology task (González-Lloret & Ortega, 2014). Typically, the PLT drives the PTTs. In fact, PLTs establish the framework for PTTs, as learners typically require the language skills acquired through PLTs to execute PTTs successfully (González-Lloret, 2014). The tasks devised for the present study adhere to these guidelines.

5. Method

5.1 Participants

The research team comprised one researcher and three EFL teachers. The participants were 42 Italian 17-year-old secondary students taking part in English language classes in line with the state requirements. All students were Italian L1 speakers and had similar digital skills. Their digital proficiency was formally assessed through an online questionnaire, which also served as a needs analysis for the main study. The integration of TBLT and technology requires learners to acquire complex digital literacies, encompassing intercultural understanding and a comprehensive communicative competence that extends beyond linguistic proficiency to encompass sociocultural aspects (Lai & Li, 2011). These intricate literacies find expression in the Cambridge B2 First

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speaking and writing assessment criteria, which emphasize "the ability to sustain and develop interaction and negotiation towards a desired outcome" (adapted from Cambridge B2 First Assessment Criteria), necessitating more than just linguistic competence (see also Morgana, 2023). The findings indicated that students were familiar with social networking platforms (e.g. Instagram and Facebook), instant messaging applications (e.g. WhatsApp and Telegram), internet search engines, and video-sharing services (e.g. YouTube). However, they rarely used apps specifically designed for English language learning. The students were provided with iPads for their self-regulated study within and outside school.

5.2 The tasks

In this study, language and technology tasks were carefully organized and sequenced according to complexity, drawing upon the works of Long (2015) and Ellis (2003). The task design adheres to the principles and characteristics outlined in Chapelle (2001) and González-Lloret and Ortega (2014), which encompass authenticity, focus on meaning, learner suitability, potential for language learning, and positive impact. Within this study, authenticity pertains to the Cambridge B2 First tasks that have been fashioned to resemble real-world tasks closely.

5.3 The context: Speaking and writing modules

The study was divided into two parts (speaking and writing) that integrated mobile devices (iPads) into the classroom task design. For research purposes, students were divided into an iPad and a pen-and-paper group. Teachers worked to ensure the two groups were balanced in terms of language proficiency, gender, and digital literacy. At the beginning of the academic year, the students' language proficiency was assessed using the standardized Oxford placement test to ensure a baseline measure of their abilities. When categorizing the students into two distinct groups, meticulous attention was paid to variations associated with language proficiency levels, such as distinguishing between pre-intermediate and intermediate levels, as well as specific language skills, such as speaking, reading, and others. Notably, students in the pen-and-paper group were explicitly instructed and prohibited from utilizing iPads or any other electronic devices for the duration of the study. This restriction aimed to maintain a consistent and controlled environment for this group, enabling a direct comparison between their performance and the technology-mediated group. Both groups received equal time to complete the tasks, ensuring a fair and balanced comparison between their performances. All tasks were conducted within the controlled environment of the classroom, maintaining consistency in the learning context. However, it must be acknowledged that the two groups experienced certain distinctions in terms of personalized feedback and interaction. These differences in instructional approaches and support may have influenced each group's learning experiences and outcomes. In the forthcoming Discussion section, the issue of comparability between the groups will be thoroughly analysed. The study adheres to a pre-, post- and delayed post-test design, as illustrated in Figure 1.

6. Procedures

A Cambridge B2 First past paper was used to discuss task procedures and outcomes with the students in the preparation stage. Task 1 (pre-test) consisted of a standard speaking and writing task without using an iPad. Thanks to the scaffolding lesson in the preparation stage, learners fully understood the task structure. Immediately after the pre-test, students were divided into two groups (iPad and pen and paper). Four technology-mediated tasks were then designed and implemented. These were all product oriented: each task required students to produce an outcome that the teachers assessed. Two of the tasks targeted speaking skills, whereas the other two targeted writing. Both speaking and writing tasks included receptive skills activities (i.e. reading and

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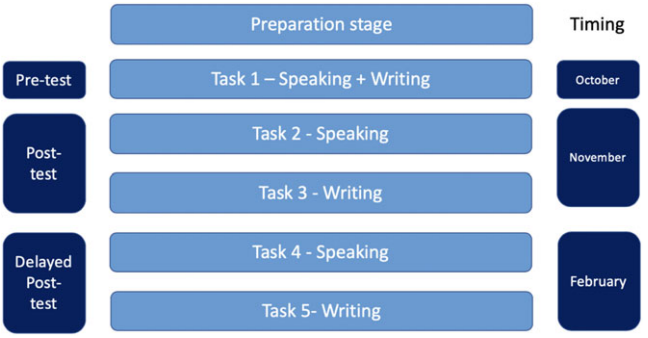

Figure 1. Structure of the study

listening) to trigger cognitive processes and serve as a model for the production stage. Task 2 (Speaking) and Task 3 (Writing) were used as the post-test, while Task 4 (Speaking) and Task 5 (Writing) were used as the delayed post-test (see Figure 1). Specifically, in *The Globe Theatre* (Task 2 – speaking, post-test), the target task was to be able to talk fluently about the theatre. To get closer to achieving this, a series of pedagogic tasks were planned: students listened to a podcast on the theatre with some information for tourists. They then had to think about and discuss a voice-over presentation (performance) that they needed to create about the theatre.

Similarly, in *Indoor and outdoor sports* (Task 3 – writing, post-test), students were asked to practise writing and produce an essay in the target language. Pedagogic tasks required students to read an essay, discuss it, and find common structures and expressions. They then used these in their own essay writing. *After-school activities* (Task 4 – speaking, delayed post-test) consisted of discussing and planning possible after-school activities. Finally, *The best way of learning a foreign language* (Task 5 – writing, delayed post-test) focused on developing the ability to write an essay in English about learning an L2.

6.1 New ways of approaching TBLT for the Cambridge B2 First exam

6.1.1 Speaking

In Task 2 (speaking), *The Globe Theatre*, learners were required to listen to a podcast, focus on some descriptive language features (e.g. narrative tenses), and then produce a similar presentation for tourists. Each learner in the iPad group worked with their own individual iPad, although they could share the device for collaborative tasks. Learners in the pen-and-paper group were allowed to listen to the podcast twice through classroom speakers.

As a first step (A), both groups watched and listened to a podcast on YouTube. This was 8 minutes long, so learners had about 10 minutes to complete the task. Learners from the iPad group could listen to it as many times as they wanted independently.

The next pedagogic task (B), which followed the substantial input phase, asked learners to revise the structure of the Globe Theatre. It was an open class discussion, with teachers and learners taking notes on key vocabulary and ideas. For the following pedagogic task (C), learners were asked to watch a video on the Globe Theatre individually and then focus on comprehension questions provided by the teacher. After the first listening, they worked in pairs to discuss and agree on answers and identify possible comprehension questions the teacher could ask. During the collaborative tasks, learners from the iPad group shared their devices, often watching the video together on one device and then taking notes on another. Notes from the video were then recorded using TinyPDF or Evernote (D). Learners in the pen-and-paper group made notes in their notebooks and discussed them with peers after the teacher had played the video on the main screen. At this stage, the teacher circulated and provided personalized feedback either online,

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Table 1. Tech-mediated task-based language teaching (TBLT) classroom cycle for Task 2 – Speaking: "The Globe Theatre"

TBLT classroom cycle	Type of task Pedagogic technology task and pedagogic language task	iPad group procedure	Pen-and-paper group procedure	Time on task
Substantial input	Tech task – podcast listening	On YouTube (individual pace)		10 minutes
	Language task – revise questions on theatre	TinyPDF Evernote	Class listening (recording played twice) Handout and notebook	10 minutes
Pedagogic task	Tech task – watch a video on YouTube	YouTube (individual pace)		6/8 minutes
	Language task – answer comprehension questions, focus on key vocabulary	TinyPDF Evernote	Video played twice on the class Interactive White Board (IWB) Handout and notebook	15 minutes
Target task performance	Tech task – create an interactive eBook, add voice-over, visuals, and internal/external link	Individual and collaborative work on eBook creator + use of search engines and Evernote		45 minutes
	Language task – you are a tourist guide: produce a text on the Globe Theatre	Use of voice recorder for rehearsal Use of presentation software	Planning notes written in students' notebooks and silent performance rehearsal in class	45 minutes

correcting language structures (focus on form) directly on Evernote in real time (for the iPad group), or talking to students FTF (for the pen-and-paper group). During the target task performance phase (E), the iPad group students were required to create a voice-over presentation using the Bookcreator app. This involved including pictures, planning the text, using their notes to contribute to the performance, rehearsing, recording their voice, and adding other elements to personalize their output. The pen-and-paper group students prepared a standard oral presentation. Table 1 shows a summary of this technology-mediated TBLT classroom cycle. Task 4 (Speaking), *After-school activities*, followed a very similar procedure.

6.1.2 Writing

One of the text types required for the Cambridge B2 First qualification is an argumentative essay. Therefore, the teachers planned various lessons around this text type to give students an overview of the genre and authentic examples to use as a model for writing. For the writing tasks, Task 3 (post-test) and Task 5 (delayed post-test), students were required to read an argumentative essay on a similar topic, infer meanings and features, and then produce their own essay following the structure provided.

To activate previous knowledge and expose students to authentic language input, the teachers carefully selected recent essays on sport (Task 3) and language learning (Task 5) from the BBC website. To be suitable, essays had to respect the standard genre structure as presented in the latest Cambridge B2 First handbook and contain mainly (minimum 65%) vocabulary at B2 level. Each text was scanned using the Text Inspector on English Vocabulary Profile. The iPad group could access the website, see the context of the text (e.g. pictures, similar titles, etc.), and save it on their note-taking app. The teacher distributed a printed version to the students in the pen-and-paper group. For the focus on form technology-mediated task, learners had to look at the text collaboratively and select meaningful sections within it that illustrated features of the genre. They

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Table 2. Tech-mediated task-based language teaching (TBLT) classroom cycle for Task 3 Writing: "Essay on sports"

TBLT classroom cycle	Type of task Pedagogic technology task and pedagogic language task	iPad group tools	Pen-and-paper group tools	Time on task
Substantial input	Tech task – download and read an essay from the BBC website	Safari TinyPDF Evernote	Text provided on handout Notebook	10 minutes
	Language task – revise the general structure of the genre			10 minutes
Pedagogic task	Tech task – read, select, colour code meaningful parts of the text	TinyPDF Camera Word Evernote	Highlighters and pencils on the handout	15 minutes
	Language task – answer comprehension questions, focus on key textual features		Students' notebooks	15 minutes
Target task performance	Tech task – download the instructions on Showbie, write the text using the app	Showbie Search engines Evernote		45 minutes
	Language task – compose an argumentative essay on sport		Essay writing on paper	45 minutes

then discussed these with the teacher. Both groups had 45 minutes (time on task) to complete the writing task. No time management issues were reported. Table 2 shows the TBLT classroom cycle for the two groups and the tools used to perform the tasks. The iPad group typed the text on Showbie, while the pen-and-paper group used their notebooks.

6.2 Assessment of tasks

In evaluating individual participants' speaking and writing performances, the assessment scales employed in the Cambridge B2 First examination were utilized as a standardized measure. The assessment scale for speaking encompassed four key areas: grammar and vocabulary, discourse management, pronunciation, and interactive communication. This standardized approach provided a comprehensive framework for assessing and analysing the participants' speaking abilities based on well-defined criteria and established language proficiency benchmarks. Each criterion was scored on a scale of 1 to 5. Subsequently, each student was assigned a global mark for overall achievement based on the global achievement scale.

For each learner, a total of 33 scores were generated (11 per test, comprising 5 for speaking, 4 for writing, and 2 for global achievement for each task). Each task was assessed by two teachers who had undergone specific training in grading Cambridge B2 papers, ensuring a high level of interrater reliability (Pearson's $r = 0.587$). Where the two teachers did not reach a consensus, the average between the assigned marks was calculated to maintain consistency and reliability.

7. Data collection

Quantitative data were collected during the pre-test, post-test, and delayed post-test. The pre-test (Task 1) took place at the beginning of the school year. A month later, participants performed the post-test (Task 2 – Speaking and Task 3 – Writing) in class. Speaking and writing tasks were planned for two different days. Students were allowed 45 minutes to perform the task. In the iPad group, the writing assignments were shared via Showbie, while the speaking presentations were shared through Evernote. This digital sharing allowed for convenient and efficient submission and feedback processes.

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On the other hand, in the pen-and-paper group, speaking presentations were delivered in the classroom setting, without any recordings. The presentations were directly performed and observed by the teacher and the class. The delayed post-tests (Tasks 4 and 5) were administered two months later, following the same procedures as previously. All tasks were assessed and scored by two teachers. In addition to quantitative data, qualitative data were gathered through learner and teacher interviews. Additional datasets for triangulation were obtained from notes taken during teacher meetings and six lesson observations. These tasks focused on collaborative work, noticing, and personalized feedback, providing insights into the L2 learning process.

8. Analysis

To address the first research question, which explored the impact of a technology-mediated TBLT design on students' proficiency, the analysis phase involved a comparison of speaking and writing scores using the scores from the pre-test, post-test, and delayed post-test. Specifically, the assessment focused on various aspects, such as grammar and vocabulary, discourse management, pronunciation, and interactive communication in speaking tasks (Tasks 1, 2, and 4). Statistical analysis was performed using JASP 0.11.1 to determine any significant differences or improvements in these areas. Similarly, the writing scores were analysed with regard to content, communicative achievement, organization, and language proficiency in writing tasks (Tasks 1, 3, and 5).

For the second research question, which explored students' learning experiences and conditions in technology-mediated TBLT, data were collected from multiple sources: classroom observations ($N = 6$), student interviews ($N = 16$), and interviews with teachers ($N = 4$). The data analysis involved a qualitative content analysis approach based on emergent themes, following the frameworks established by Elo and Kyngäs (2008) and Silverman (2004). The analysis process included open coding of the interviews, lesson plans, and classroom observation notes. Each section and activity within the lesson plans was scrutinized using the frameworks proposed by Chapelle (2001) and González-Lloret and Ortega (2014). To facilitate the analysis, the qualitative data were managed and organized using the qualitative analysis software NVivo (Version 10.8). This comprehensive analysis provided valuable insights into students' learning conditions and experiences, thus complementing the statistical analysis.

By combining quantitative and qualitative methods, this research aimed to gain a deeper understanding of the impact of a technology-mediated TBLT design on students' proficiency and explore their learning experiences within this context. The integration of statistical analysis and qualitative content analysis facilitated a comprehensive examination of the research questions, allowing for a more comprehensive interpretation and discussion of the findings (see also Morgana, 2023).

9. Results

9.1 The impact of technology-mediated tasks on speaking

The Shapiro–Wilk test showed that the data were normally distributed, so *t*-tests were conducted to measure between-group differences. The *t*-test on global achievement scores revealed no significant group difference in the pre-test speaking tasks ($t = -1{,}284$, $p = 0.214$), indicating an overall balanced level between the two classes. As stated earlier, all students performed the pre-test using pen and paper. The overall achievement score was 3.3 (Cambridge B2 First Band 3), showing that all the participants were at an intermediate level of English. However, data from the post-test (Task 2) showed a significant difference in the distribution of rates between the two groups, $t = -1.784$, $p = 0.090$. The difference between the groups on speaking scores increased considerably in the delayed post-test (Task 4), $t = -2.914$, $p = 0.004$. Table 3 shows descriptive statistics for each group's pre-, post-, and delayed post-test speaking scores.

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Table 3. Descriptive statistics for Speaking

	iPad group			Pen-and-paper group		
	Pre-test	Post-test	Delayed post-test	Pre-test	Post-test	Delayed post-test
M	3.429	3.667	4.190	3.238	3.333	3.571
SD	0.676	0.796	0.702	0.639	0.730	0.870

Note. *M* = average score based on Cambridge B2 First bands (1 to 5); *SD* = standard deviation (difference from the mean value of the group).

Table 4. Descriptive statistics for Speaking Subskills – Pronunciation

	iPad group Pronunciation scores			Pen-and-paper group Pronunciation scores		
	Pre-test	Post-test	Delayed post-test	Pre-test	Post-test	Delayed post-test
M	3.095	3.810	4.429	2.905	2.905	3.238
SD	0.678	0.814	0.708	0.700	0.720	0.625

Note. *M* = average score based on Cambridge B2 First bands (1 to 5); *SD* = standard deviation (difference from the mean value of the group).

Table 5. Descriptive statistics for Speaking Subskills – Grammar

	iPad group Grammar scores			Pen-and-paper group Grammar scores		
	Pre-test	Post-test	Delayed post-test	Pre-test	Post-test	Delayed post-test
M	2.857	3.095	3.476	2.524	2.429	2.762
SD	0.793	0.768	0.602	0.814	0.676	0.768

Note. *M* = average score based on Cambridge B2 First bands (1 to 5); *SD* = standard deviation (difference from the mean value of the group).

Additionally, an inter-group analysis was conducted on each macro area of the assessment scale (grammar and vocabulary, discourse management, pronunciation, and interactive communication). In the pre-test (Task 1), no significant difference was found between the two groups. Generally, students were less proficient in the areas of grammar and pronunciation, whilst they performed better against the criteria for interactive communication. Although students in the iPad group achieved slightly higher scores in the post-test, data showed no significant difference between the two groups regarding discourse management, interactive communication, and lexical resources. With regard to the grammar, however, the *t*-test revealed a significant difference at the post-test ($t = -3.005$, $p = 0.007$), and again at the delayed post-test ($t = -3.250$, $p = 0.004$) (Table 5). The most important difference between the two groups was revealed by the scores on pronunciation (post-test, $t = -4.663$, $p = 0.001$; delayed post-test, $t = -8.027$, $p = 0.001$) (Table 4), particularly on stress and intonation, as reported by students and teachers. Comparing the post-test and delayed post-test scores relating to grammatical resources and pronunciation, it becomes evident that the iPad group outperformed the pen-and-paper group against both criteria. The iPad learners constantly improved their scores regardless of their performance in the pre-test, proving to be more accurate and fluent.

9.2 The impact of technology-mediated tasks on writing

The same procedure was followed to assess the differences between the groups in terms of writing scores. Table 6 shows the descriptive statistics scores from the pre-, post-, and delayed post-test on

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Table 6. Descriptive statistics for Writing

	iPad group			Pen-and-paper group		
	Pre-test	Post-test	Delayed post-test	Pre-test	Post-test	Delayed post-test
M	3.143	3.381	4.143	3.028	3.238	3.667
SD	0.504	0.596	0.602	0.590	0.530	0.670

Note. *M* = average score based on Cambridge B2 First bands (1 to 5); *SD* = standard deviation (difference from the mean value of the group).

Table 7. Descriptive statistics Writing Subskills – Organization

	iPad group Organization			Pen-and-paper group Organization		
	Pre-test	Post-test	Delayed post-test	Pre-test	Post-test	Delayed post-test
M	3.143	3.714	4.286	3.000	3.143	3.762
SD	0.675	0.717	0.784	0.632	0.678	0.700

Note. *M* = average score based on Cambridge B2 First bands (1 to 5); *SD* = standard deviation (difference from the mean value of the group).

Table 8. Descriptive statistics Writing Subskills – Content

	iPad group Content			Pen-and-paper group Content		
	Pre-test	Post-test	Delayed post-test	Pre-test	Post-test	Delayed post-test
M	3.571	3.762	4.762	3.238	3.524	4.048
SD	0.598	0.625	0.436	0.436	0.680	0.669

Note. *M* = average score based on Cambridge B2 First bands (1 to 5); *SD* = standard deviation (difference from the mean value of the group).

writing for both groups. The evidence indicates that students started at similar proficiency levels, with no significant differences in their pre-test levels ($t = -1.071$, $p = 0.297$). Both groups registered the lowest scores on the language criterion, including grammar and vocabulary.

As stated above, based on the pre-test results, participants performed Task 3 and Task 5 (the post-test and delayed post-test) in two separate groups (iPad or pen and paper). Table 6 shows the significant difference registered in the delayed post-test written production scores ($t = -2.848$, $p = 0.010$), confirming a continuing increase in scores among the iPad group compared to the pen-and-paper group. As with the speaking tasks, writing performance scores differed significantly in terms of language ($t = -2.010$, $p = 0.035$). However, the most substantial differences were registered against the criteria of content and organisation, with the iPad group achieving significantly higher scores at the delayed post-test ($t = -4.176$, $p = < 0.001$) (Tables 7 and 8). It is interesting to note that one of the teachers' first concerns about using mobile devices in language writing tasks relates to the easy access to self-correctors and online dictionaries as, for instance, they could potentially prevent students from learning to spell words. This matter will be discussed further in Section 9.

9.3 Learners' behaviours and perceptions

Learners' behaviours and perceptions data were collected through interviews with teachers and students ($N = 18$), comprising eight participants in the iPad group, eight in the pen-and-paper group, and two teachers. Classroom observation notes were also obtained during lesson planning

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and delivery ($N = 6$). The interview sessions consisted of nine open-ended questions designed to explore participants' perceptions and behaviours, with a specific focus on self-reported improvements in language competence, particularly in speaking and writing skills. The collected data underwent content analysis, identifying various themes such as "challenges", "task types", "personalization", "pronunciation", "collaboration", "motivation", and "language proficiency". These themes provide valuable insights into the experiences and perspectives of the participants, shedding light on the dynamics and outcomes of implementing the technology-mediated TBLT design.

Regarding the theme of "challenges", students in the pen-and-paper group showed a positive response. However, they also expressed concerns about their teachers' technological proficiency, fearing that their teachers might not be familiar with the devices used in the technology-mediated tasks.

Three subthemes were identified within the "task types" theme: "motivation", "collaboration", and "personalization". Both groups regarded the tasks as well designed and highly motivating, albeit for different reasons. Regarding personalization, it was primarily associated with feedback rather than the tasks themselves. The iPad group students expressed their motivation through personalization and collaboration, emphasizing the advantages of receiving personalized feedback, the ability to replay recordings for pronunciation practice, and the convenience of easily organizing the text layout. Notably, the iPad group students and teachers frequently mentioned the term "record". On the other hand, the pen-and-paper group found the tasks engaging because they perceived them as relevant to real-life situations.

Regarding "language proficiency", the study observed notable differences in the responses of students from both groups. Students in the iPad group perceived an improvement in their English language proficiency, attributing it to the technology-mediated tasks that facilitated identifying spelling mistakes through spell checkers, expanding their vocabulary range, enhancing paragraph organization, and promoting efficient work and learning. Conversely, the pen-and-paper group expressed the need for more time dedicated to tasks to enhance their language proficiency. They also expressed a desire for unrestricted access to audio and video files for pronunciation practice. However, it is interesting to note that students in the pen-and-paper group demonstrated a stronger focus on the tasks compared to the iPad group, despite the recorded data indicating high engagement from both groups across task types and devices. Notably, during the interviews, none of the students mentioned the technology itself; instead, their attention was primarily directed toward the tasks and their personal interactions with them.

10. Discussion

The primary objective of this study was to highlight the impact of technology-mediated tasks on the accuracy, pronunciation, and content organization of speaking and writing skills within an EFL secondary school setting. To evaluate this impact, the study employed pre-test, post-test, and delayed post-test assessments, considering various factors that may have influenced the results, including learner motivation and feedback types. These assessments provided insights into specific aspects of language acquisition in which learners from the iPad group demonstrated improved performance compared to those from the pen-and-paper group.

Furthermore, it is crucial to note that the study maintained consistent conditions, such as time on task and task type, for both groups. This deliberate approach highlights the significance of task design and conditions in fostering language improvement, as emphasized by previous research (Ellis *et al*., 2019; Morgana, 2023). By focusing on the outcomes of technology-mediated tasks, this study contributes to the growing body of research examining the effectiveness of integrating technology into language learning processes. The findings provide valuable insights into the potential benefits and implications of employing technology in TBLT, particularly in terms of enhancing language accuracy, pronunciation, and content organization.

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Regarding speaking tasks, learners in the iPad group demonstrated notable improvements in accuracy and pronunciation, particularly in suprasegmental features such as stress and intonation. This could be attributed to the mobile technology, which allowed students to record their tasks multiple times, compare their recordings to the original version, and engage in focused practice. These findings align with the importance of pre-task planning, specifically rehearsal, in enhancing fluency and speaking performance, as discussed in Ellis (2003, 2009). Furthermore, students in the iPad group exhibited a different pace of work, enabling them to identify their weaknesses more efficiently by focusing on specific parts that required improvement. In terms of language accuracy, learners autonomously sought alternatives and explanations by accessing web resources and digital books when errors were identified. Hence, technology-mediated tasks facilitated the noticing of specific language features or aspects of learners' interlanguage, as demonstrated in Pellettieri (2000) and Smith (2004). Although a direct link between the higher performances of the iPad group and the task or medium cannot be established due to the absence of a control for time on task and motivation, the study underscores the evident change in learners' experiences and attitudes, prompting further discussions on the role of task conditions in technology-mediated TBLT. Qualitative data revealed that all iPad group students attributed their language proficiency improvement to the technology-mediated tasks. These findings confirm the encouraging results in Morgana (2023) but contradict the findings of Tang (2019) to some extent, as students engaging in technology-mediated tasks outperformed the other group in speaking performances. The disparity may be attributed to the different task types employed in the two studies, with Tang (2019) emphasizing interaction, whereas the tasks in this study leaned slightly more towards presentation skills. Nonetheless, this study supports the findings of Winke (2014) in terms of the benefits of self-assessment and self-regulated learning in language development and self-correction strategies. Additionally, technology aided personalized feedback on speaking performances and provided learners with multimodal inputs, including videos, audio, and grammar animations, which assisted students in producing high-quality outputs.

The second significant finding of this study relates to writing skills. It became evident that the iPad, as a writing tool, aided learners in organizing their texts, ideas, and layout. This finding is supported by both statistical analysis and qualitative data. Interviews with students and teachers revealed that the tool played a mediating role in reflecting their ideas, possibly due to learners utilizing the cut-and-paste function to rearrange text and ideas easily. This observation is consistent with previous research emphasizing the role of visual features in fostering students' reflection on their own work (Pellettieri, 2000; Yamada, 2009). The mediation provided by the iPad also facilitated peer collaboration and knowledge sharing, for example, through vocabulary prompts or guidance on specific grammatical features (e.g. the use of personal pronouns). Consequently, learners in the iPad group demonstrated meaningful improvements in their content scores.

The inclusion of mobile devices in this study enabled students in the iPad group to actively engage in their learning process. In contrast, students in the pen-and-paper group had restricted access to multimedia resources and primarily relied on interactions within the classroom setting. The sociocultural notion of placing the learner at the centre of tasks facilitated interactions between teachers, peers, and the technological tool, thereby serving as a scaffolding technique.

11. Conclusion

This research paper examines the influence of technology-based language tasks on EFL learners' proficiency in pronunciation, accuracy, and text organization in a secondary school setting. The study follows the design principles proposed by González-Lloret and Ortega (2014) and specifically investigates the impact of mobile devices. While the study focuses on a specific set of outcomes measured through learners' scores, it emphasizes the importance of the interaction

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between teachers, learners, and technology-mediated tasks within the classroom. The study reveals two significant findings that have implications for classroom practices and future research in this field.

The use of mobile devices for language learning elicited positive responses from both teachers and learners. However, the data presented mixed results, emphasizing the importance of tailoring technology-mediated frameworks to specific educational needs and focusing on selected linguistic features. Notably, the areas of pronunciation, text organization, and language (grammar and vocabulary) were identified as particularly influenced by technology. Although teachers anticipated that the iPad group would exhibit greater accuracy in written assignments due to easy access to online grammar references, the actual results did not align with this expectation. Instead, learners in the iPad group demonstrated more accurate oral performances. These findings highlight the significance of teachers carefully considering the impact of technology on different language skills and aligning instructional approaches accordingly.

In summary, the study highlights the positive reception of mobile devices in language learning, but also emphasizes the importance of adapting technology-mediated frameworks to specific educational needs. The findings shed light on the influence of technology on pronunciation, text organization, and language skills, urging teachers to consider these factors when designing instructional approaches for language learning.

Furthermore, this study makes two additional contributions. First, it identifies key principles that should be considered when examining the influence of mobile technologies on language tasks and how tasks can shape the use of such technologies. This insight provides guidance for future research in this area. Second, the study underscores the importance of conducting further investigations that explore the implementation of a technology-mediated TBLT framework over an extended period, with a specific emphasis on enhancing productive skills. By undertaking more comprehensive studies of this nature, educators can gain a deeper understanding of the overall impact of integrating technology into the syllabus, moving beyond the evaluation of individual tasks. This broader perspective is essential for informed decision-making and instructional planning.

In conclusion, this research highlights the importance of considering teachers' professional development in technology-mediated TBLT principles and classroom practices. It also suggests the need for future studies to investigate the implementation of technology-mediated TBLT frameworks over an extended duration to gain a more comprehensive understanding of their impact on productive language skills.

Ethical statement and competing interests. This research involving participants under 18 strictly adheres to ethical guidelines. Informed consent, detailing the study's purpose and modality, was obtained from parents or legal guardians. Confidentiality was maintained, and data were treated with utmost sensitivity. The author declares no competing interests.

References

Abdous, M., Camarena, M. M. & Facer, B. R. (2009) MALL technology: Use of academic podcasting in the foreign language classroom. *ReCALL*, 21(1): 76–95. https://doi.org/10.1017/S0958344009000020

Abrams, Z. I. (2016) Possibilities and challenges of learning German in a multimodal environment: A case study. *ReCALL*, 28(3): 343–363. https://doi.org/10.1017/S0958344016000082

Adams, R., Alwi, N. A. N. M. & Newton, J. (2015) Task complexity effects on the complexity and accuracy of writing via text chat. *Journal of Second Language Writing*, 29: 64–81. https://doi.org/10.1016/j.jslw.2015.06.002

Chapelle, C. A. (2001) *Computer applications in second language acquisition: Foundations for teaching, testing and research*. Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9781139524681

Chapelle, C. A. (2014) Technology-mediated TBLT and the evolving role of the innovator. In González-Lloret, M. & Ortega, L. (eds.), *Technology-mediated TBLT: Researching technology and tasks*. Amsterdam: John Benjamins, 323–334. https://doi.org/10.1075/tblt.6.12cha

Chen, J. C. C. (2012) Designing a computer-mediated, task-based syllabus: A case study in a Taiwanese EFL tertiary class. *The Asian EFL Journal Quarterly*, 14(3): 62–97.

Ellis, R. (2003) *Task-based language learning and teaching*. Oxford: Oxford University Press.
Ellis, R. (2009) The differential effects of three types of task planning on the fluency, complexity, and accuracy in L2 oral production. *Applied Linguistics*, 30(4): 474–509. https://doi.org/10.1093/applin/amp042
Ellis, R. (2018) *Reflections on task-based language teaching*. Bristol: Multilingual Matters. https://doi.org/10.21832/ELLIS0131
Ellis, R., Skehan, P., Li, S., Shintani, N. & Lambert, C. (2019) *Task-based language teaching: Theory and practice*. Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/9781108643689
Elo, S. & Kyngäs, H. (2008) The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1): 107–115. https://doi.org/10.1111/j.1365-2648.2007.04569.x
González-Lloret, M. (2014) The need for needs analysis in technology-mediated TBLT. In González-Lloret, M. & Ortega, L. (eds.), *Technology-mediated TBLT: Researching technology and tasks*. Amsterdam: John Benjamins, 23–50. https://doi.org/10.1075/tblt.6.02gon
González-Lloret, M. & Ortega, L. (2014) Towards technology-mediated TBLT. In González-Lloret, M. & Ortega, L. (eds.), *Technology-mediated TBLT: Researching technology and tasks*. Amsterdam: John Benjamins, 1–22. https://doi.org/10.1075/tblt.6.01gon
Hymes, D. (1972) On communicative competence. In Pride, J. & Holmes, J. (eds.), *Socio-linguistics*. Harmondsworth: Penguin, 269–293.
Kern, R. (2014) Technology as *Pharmakon*: The promise and perils of the internet for foreign language education. *The Modern Language Journal*, 98(1): 340–357. https://doi.org/10.1111/j.1540-4781.2014.12065.x
Lai, C. & Li, G. (2011) Technology and task-based language teaching: A critical review. *CALICO Journal*, 28(2): 498–521. https://doi.org/10.11139/cj.28.2.498-521
Lantolf, J. P., Poehner, M. E. & Swain, M. (eds.) (2018) *The Routledge handbook of sociocultural theory and second language development*. Abingdon: Routledge. https://doi.org/10.4324/9781315624747
Lantolf, J. P., Thorne, S. L. & Poehner, M. E. (2014) Sociocultural theory and second language development. In VanPatten, B. & Williams, J. (eds.), *Theories in second language acquisition*. London: Routledge, 221–240.
Lee, L. (2010) Fostering reflective writing and interactive exchange through blogging in an advanced language course. *ReCALL*, 22(2): 212–227. https://doi.org/10.1017/S095834401000008X
Levy, M. (2006) Effective use of CALL technologies: Finding the right balance. In Donaldson, R. P. & Haggstrom, M. A. (eds.), *Changing language education through CALL*. Abingdon: Routledge, 1–18.
Lomicka, L. & Lord, G. (2012) A tale of tweets: Analysing microblogging among language learners. *System*, 40(1): 48–63. https://doi.org/10.1016/j.system.2011.11.001
Long, M. H. (2015) *Second language acquisition and task-based language teaching*. West Sussex: John Wiley & Sons.
Mak, B. & Coniam, D. (2008) Using wikis to enhance and develop writing skills among secondary school students in Hong Kong. *System*, 36(3): 437–455. https://doi.org/10.1016/j.system.2008.02.004
Morgana, V. (2023) *Task-based English language teaching in the digital age: Perspectives from secondary education*. London: Bloomsbury Academic. https://doi.org/10.5040/9781350288041
Nielson, K. B. (2014) Evaluation of an online, task-based Chinese course. In González-Lloret, M. & Ortega, L. (eds.), *Technology-mediated TBLT: Researching technology and tasks*. Amsterdam: John Benjamins, 295–322. https://doi.org/10.1075/tblt.6.11nie
Oskoz, A. & Elola, I. (2014) Promoting foreign language collaborative writing through the use of Web 2.0 tools and tasks. In González-Lloret, M. & Ortega, L. (eds.), *Technology-mediated TBLT: Researching technology and tasks*. Amsterdam: John Benjamins, 115–148. https://doi.org/10.1075/tblt.6.05osk
Park, M. (2012) Implementing computer-assisted task-based language teaching in the Korean secondary EFL context. In Shehadeh, A. & Coombe, C. A. (eds.), *Task-based language teaching in foreign language contexts: Research and implementation*. Amsterdam: John Benjamins, 215–240. https://doi.org/10.1075/tblt.4.14par
Pellerin, M. (2014) Language tasks using touch screen and mobile technologies: Reconceptualising task-based CALL for young language learners. *Canadian Journal of Learning and Technology*, 40(1): 1–23. https://doi.org/10.21432/T2K01N
Pellettieri, J. (2000) Negotiation in cyberspace: The role of chatting in the development of grammatical competence. In Warschauer, M. & Kern, R. (eds.), *Network-based language teaching: Concepts and practice*. Cambridge, UK: Cambridge University Press, 59–86. https://doi.org/10.1017/CBO9781139524735.006
Sauro, S. (2009) Computer-mediated corrective feedback and the development of L2 grammar. *Language Learning & Technology*, 13(1): 96–120. https://doi.org/10125/44170
Sauro, S. (2012) L2 performance in text-chat and spoken discourse. *System*, 40(3): 335–348. https://doi.org/10.1016/j.system.2012.08.001
Silverman, D. (2004) *Qualitative research: Theory, method and practice* (2nd ed.). Thousand Oaks: Sage Publications.
Smith, B. (2004) Computer-mediated negotiated interaction and lexical acquisition. *Studies in Second Language Acquisition*, 26(3): 365–398. https://doi.org/10.1017/S027226310426301X
Solares, M. (2014) Textbooks, tasks, and technology: An action research study in a textbook-bound EFL context. In González-Lloret, M. & Ortega, L. (eds.), *Technology-mediated TBLT: Researching technology and tasks*. Amsterdam: John Benjamins, 79–114. https://doi.org/10.1075/tblt.6.04sol

Stockwell, G. (2010) Effects of multimodality in computer-mediated communication tasks. In Thomas, M. & Reinders, H. (eds.), *Task-based language learning and teaching with technology*. London: Continuum, 83–104.
Swain, M., Kinnear, P. & Steinman, L. (2015) *Sociocultural theory in second language education: An introduction through narratives* (2nd ed.). Bristol: Multilingual Matters. https://doi.org/10.21832/9781783093182
Sykes, J. M. (2005) Synchronous CMC and pragmatic development: Effects of oral and written chat. *CALICO Journal*, 22(3): 399–431. https://doi.org/10.1558/cj.v22i3.399-431
Tang, X. (2019) The effects of task modality on L2 Chinese learners' pragmatic development: Computer-mediated written chat vs. face-to-face oral chat. *System*, 80: 48–59. https://doi.org/10.1016/j.system.2018.10.011
Thomas, M. & Reinders, H. (eds.) (2010) *Task-based language learning and teaching with technology*. London: Continuum.
Tsai, S.-C. (2011) Courseware integration into task-based learning: A case study of multimedia courseware-supported oral presentations for non-English major students. *ReCALL*, 23(2): 117–134. https://doi.org/10.1017/S0958344011000048
Vygotsky, L. S. (1978) Socio-cultural theory. *Mind in Society*, 6: 52–58.
Winke, P. M. (2014) Formative, task-based oral assessments in an advanced Chinese-language class. In González-Lloret, M. & Ortega, L. (eds.), *Technology-mediated TBLT: Researching technology and tasks*. Amsterdam: John Benjamins, 263–294. https://doi.org/10.1075/tblt.6.10win
Yamada, M. (2009) The role of social presence in learner-centered communicative language learning using synchronous computer-mediated communication: An experimental study. *Computers & Education*, 52(4): 820–833. https://doi.org/10.1016/j.compedu.2008.12.007
Zuengler, J. & Miller, E. R. (2006) Cognitive and sociocultural perspectives: Two parallel SLA worlds? *TESOL Quarterly*, 40(1): 35–58. https://doi.org/10.2307/40264510

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