Digital Collaborative Learning: Promoting Reading Comprehension and Vocabulary among Saudi University English Majors

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Abstract

This study considered how digital collaboration can improve English majors' Reading Comprehension (RC) and Vocabulary Learning (VL). It employed tests and semi-structured interviews to investigate whether differences exist between Collaborative Digital Learning (CDL) and Individual Digital Learning (IDL) regarding participants’ reading comprehension and vocabulary learning and to explore EFL learners’ perceptions of CDL. Sixty EFL majors enrolled in two sections of the same course- RC and VL- were randomly assigned to a treatment group and a control group. Both groups were pre-tested before performing the assigned digital activities through the learning management platform and Quizlet website. At the end of the course, both groups were post-tested. The treatment group was only individually interviewed about CDL's impact and perceptions. The results revealed that CDL had improved students' RC and VL. The treatment group outperformed the control group in the post-test scores in the test dimensions, RC and VL, and in the overall scores of the test. The analyses, including paired-sample t-tests, independent-sample t-tests, Cohen'd statistics, and qualitative content analysis, indicated more significant benefits of CDL over IDL in improving RC and VL. It emphasized the importance of integrating collaboration activities in reading and VL classes. The data obtained from the interviews showed the learners' preference for CDL as a valuable interactional setting for English as a foreign language. This study highlights the need for collaboration and more digital tools to be integrated into EFL education in Saudi Arabia. Based on these findings, conclusions, limitations, and recommendations were provided.

Keywords: collaborative learning, digital learning, English majors, promoting reading, reading comprehension, vocabulary learning

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Introduction

During the last two decades, much has been written about the remarkable transformation primarily attributed to using digital technologies in teaching language skills. Based on experience and investigations, researchers believe that digital learning benefits language skills as it enables teachers to facilitate learners' engagement with practice in language skills (Phillips, 2016; Tanrikulu, 2020; Sharma, et al., 2024). Compared to IDL, which has been widely implemented and proven effective in the last decades, CDL is a relatively nascent model popularized over the previous two decades. The related literature has revealed insufficient definite and concise definitions of CDL (Austin, et al., 2010). Harasim (2012) defined it as:

a model of learning in which students are encouraged and supported to work together to create knowledge: to invent, to explore ways to innovate, and, by so doing, to seek the conceptual knowledge needed to solve problems rather than to recite what they think is the right answer' (p. 90).

CDL refers to a method of teaching and learning in which students are grouped to explore a significant question or create a meaningful project when technology is integrated meaningfully (Austin, et al., 2010).

The existing literature suggests that CDL is successful in teaching different subject matters. English as a foreign language is no exception since literature has quite significant evidence of digital learning efficacy in English language acquisition (Avci & Adiguzel, 2017; Chen, et al., 2020; Chen, et al., 2014; Kim, 2018; Lahpai, 2019; Su & Zou, 2020; Alruwaili, 2024; Rintaningrum, 2024). Given that digital learning and face-to-face learning, two different modes of language learning, differ in many aspects, such as text-based/oral discussion, asynchronous/synchronous interaction, threaded/guided responses, and intensive/extensive language practice, these different characteristics might likely affect RC and VL. Most studies were more interested in surveying teachers' and students' perceptions or attitudes toward digital tools integrated into language classes. Some limited studies were conducted within the Saudi context that targeted writing (Al Khateeb, 2013), storytelling (Al Khateeb, 2019), vocabulary retention (Al-Ahdal & Alharbi, 2021), and composition (Alqurashi, 2005). So, this study contributes to filling this gap in the literature in the Saudi context.

Additionally, some researchers argue that VL is seen as a crucial factor in academic achievement for foreign language learners (Alqahtani, 2015), and others claim that it is closely linked to successful foreign language use and formation of complete language production and comprehension (Susanto & Fazlinda, 2016). Reading academic texts is one of the essential skills that university EFL and ESL learners should acquire (Levine, et al., 2000) as it has attracted much research in RC processes, skills, and teaching models. Little research has studied the effect of collaboration in a digital environment on RC and VL. Thus, it is necessary to fill these gaps and investigate the affordances offered by digital collaboration as a new model of learning RC and vocabulary.

Literature Review

Theoretical Account for the Contributing CDL to EFL

CL is identified in the literature by various titles like cooperative learning, team learning, or learning communities. It is a goal-oriented activity of a group of students committed to achieving a common goal and interactively creating new knowledge in learning environments (Zheng, et al., 2014). The benefits of collaboration have been investigated from different cognitive and
psychological perspectives (Cantwell & Andrews, 2002). Some results revealed that CL helps learners demonstrate more self and social regulatory behaviors (Su, et al., 2018). Recently, research has expanded to examine CL in the digital environment, reflecting a growing interest in its benefits (Hiltz & Turoff, 2002; Nistor, et al., 2015). According to Kılıckaya (2020), the use of digital technology in the classroom "has provided teachers with the opportunity to employ new and creative activities in which learners are more active while trying to improve their skills such as writing" (p. 58).

Despite its prevalence in the related literature, little research has examined the effect of digital collaboration on RC and VL in the Saudi context. Additionally, because collaboration is considered supportive and central to language learning (Austin et al., 2010), it is essential to investigate how integrating collaboration into a digital learning environment (Web sites/learning platforms) affects the occurrence and development of EFL.

RC is an active meaning-construction process in which the reader builds a cognitive map of the text; good readers move more fluently through the text. The analysis of the existing literature related to RC and vocabulary suggested some clear thoughts as a focus of the current study. First, RC and VL dominate nearly all foreign and second language classes. Krashen (2013, p.102) explained the interrelation between reading and vocabulary, claiming that the target vocabulary is the 'rule of the day' in language classes, which are also included in 'brief readings' packed with the targeted items. According to Nation (2013), second language vocabulary knowledge is the foundation of learning English as a second or a foreign language since it has a pronounced effect on language skills such as reading and writing. It was also empirically supported that vocabulary knowledge promotes reading fluency, enhances RC, and improves academic success (Bromley, 2004). The second thought was considering how collaborative reading may interrelate with RC and vocabulary. Reading Collaboratively, distinguished from collaborative strategic reading, facilitates RC among learners with reading problems (Klingner, et al., 2002; Riani, 2013). Finally, the literature assumed that RC and vocabulary acquisition might occur when they are digitally and collaboratively practiced in different settings, sometimes guided by the instructors and themselves. It also assumed that collaboration scaffolds and enriches learning.

**Digital Collaboration: A Few Gaps to Fill**

This study considers how CDL can contribute to improving English majors' RC and VL. It was very clear from the beginning that digital tools themselves can't entail collaboration unless they are effectively integrated into the instructional procedures. Generally, previous results indicate that while the streams of digital learning and collaborative learning tools have traveled different routes, ease of access and ease of use of communication in technology-based learning tools have widened the gate for collaborative learning (Abdullateef, 2021; Bradford, et al., 2007; Akpinar, 2014; Lin, et al., 2017). Some studies have evidenced the preference for Blackboard (Bb) as a famous online learning platform that has many collaborative features (Khafaga, 2021; Aguilar & Pérez, 2021; Alokluk, 2018). Several tools of e-collaborative learning within the blackboard are varied, including wikis (Labib, 2007), panel discussions, and virtual classrooms (Alzahrani & Aljraiwi, 2017), and vocabulary (Alamer, 2020). However, little research has experimentally documented how effective Bb is for collaborative learning. None of the studies documented its relation to reading and VL. Accordingly, the current study fills this gap and provides solid evidence of the potential of Bb in developing RC and VL in the same Saudi context.
Additionally, Quizlet is a website that offers various digital learning tools, including explanations, flashcards, diagrams, collaborative and competitive games, and online quizzes and exams for different subjects. Many studies have called attention to the potential of using Quizlet for vocabulary development (Sanosi, 2018; Alhadiah, 2020; Al-Malki, 2020; Baptist, 2018; Bueno-Alastuey & Nemeth, 2020; Chaikovska & Zbaravska, 2020; Crandell, 2017; Dizon, 2017). Adopting a vocabulary test, the Cambridge RC KET test, and a survey, Ledesma Acosta’s (2019) results revealed that both knowledge of vocabulary and RC were increased when using Quizlet. Nonetheless, some studies haven't reported any significant differences in vocabulary improvement due to the use of Quizlet or any alternative intervention (Davie & Hilber, 2015; Dizon & Tang, 2017; Kalecky, 2016). Therefore, the great interest of this study is to extend previous research and provide more solid evidence on the effectiveness of using digital collaboration via Quizlet and Bb on students' RC and VL.

This study investigated if EFL majors' RC and VL would be improved through CDL and explored their perceptions of CDL. It addressed the following two questions:
1. Does CDL lead to EFL majors’ better RC and VL than IDL?
2. How do EFL majors perceive using CDL for RC and VL?

**Methodology**

**Participants**
The study included 60 female English majors at Majmaah University, Kingdom of Saudi Arabia. They are registered in two sections of the reading and vocabulary building course, which guarantees their continual participation. Randomly, one section was designated as a treatment group (n=30) that studied the course through CDL, and the other one was designated as a control group (n=30) that studied the same course through IDL. All the participants were from an Arabic language background, with a mean age of 19.1 (SD= 0.624). They all were in level 4, passing an intensive English course as a requisite to English language entrance. Their participation in the study was ethically considered and approved by the Ethics Committee at the university.

**Procedure and Instructional Design**
In the 1st semester of the academic year 2023, the participants studying the Reading and Vocabulary Building course were selected to participate in an experimental study where the researcher was the instructor of both groups. In the first week, both groups were briefed about the study's design, purpose, and procedures. They received an orientation session and pre-tested using the Bb testing tool. For the following ten weeks, both groups studied five units from the assigned book, covering a unit every two weeks. Every week, the two groups were asked to come to class having read the passage and provided answers to some questions for each passage. During classes, the two groups were asked to do quick reading, fill charts, use Venn diagrams, design graphic organizers, cluster, write summaries, and complete live games and online quizzes on Quizlet. The control group studied the course using IDL, completed all the activities and tasks individually on Bb and Quizlet, and received feedback and assessment individually from the teacher online and in class. Concurrently, the treatment participants studied the same course through Bb and Quizlet. They completed the same tasks and activities collaboratively. They were divided into six subgroups, each including five participants. At the end of the experiment, both groups had the RC and vocabulary test using the Bb testing tool. Only the participants in the treatment group have been interviewed to get their perceptions of CDL (Figure 1). After reading passages, both groups had to
perform specific tasks on Bb, including filling charts, using Venn diagrams, designing graphic organizers, clustering, writing summaries, and completing online quizzes. Then, they used both oral and written online and in-class discussions to share knowledge and input. The goal here was to supplement the students with enriching context and collaborative time through tools of discussion and digital materials. Feedback and assessment were implemented through reciprocal discussions for the treatment sub-groups. They read the passages before the class every week, discussed the questions and tasks on the course forum on the learning platform, read each group's work, and provided feedback. The control group performed the same tasks as well as provided feedback individually.

At the end of each unit, all students were tasked to work on different vocabulary blocks to answer questions, fill in graphic organizers, and complete the quizzes on Quizlet. They were also invited to share their work to confirm the necessity of finishing the tasks on time and exchange ideas and techniques for the following tasks. An engaging feature of Quizlet is ‘live’, which was used to provide engaging opportunities for students to compete in learning the vocabulary. Treatment sub-groups had to work in teams, collaborate, and communicate effectively to win the games by choosing the correct answer to move forward. As for the control group, they played the games in the individual mode.

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Topic</th>
<th>Details</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Orientation and setting</td>
<td>Reading comprehension and vocabulary learning task (Form A) on Bbboard</td>
<td>Understanding the meaning of words from context</td>
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<td></td>
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<td>Grouping words with similar meanings for recalling information</td>
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<td>Identifying common words in reading passages</td>
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<td>Interpreting and analyzing points of view</td>
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<td>Using tables to organize information</td>
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<td>Week 2</td>
<td>New challenges</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
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<td>Grouping words with similar meanings for recalling information</td>
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<td>Identifying common words in reading passages</td>
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<td>Understanding the meaning of words from context</td>
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<tr>
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<td>Checking reading comprehension</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
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<td>for correct facts from a reading</td>
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<td>Grouping words with similar meanings for recalling information</td>
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<td>Identifying common words in reading passages</td>
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<td>Understanding the meaning of words from context</td>
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<tr>
<td>Week 4</td>
<td>Team and competition</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
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<td>Grouping words with similar meanings for recalling information</td>
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<td>Identifying common words in reading passages</td>
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<td>Understanding the meaning of words from context</td>
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<td>Week 5</td>
<td>Selecting the main idea of a</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
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<td></td>
<td>article</td>
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<td>Grouping words with similar meanings for recalling information</td>
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<td></td>
<td>Identifying common words in reading passages</td>
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<td></td>
<td>Understanding the meaning of words from context</td>
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<tr>
<td>Week 6</td>
<td>Relationships</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
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<td>Grouping words with similar meanings for recalling information</td>
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<td></td>
<td>Identifying common words in reading passages</td>
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<td></td>
<td>Understanding the meaning of words from context</td>
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<tr>
<td>Week 7</td>
<td>Health and leisure</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
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<td></td>
<td>Grouping words with similar meanings for recalling information</td>
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<td></td>
<td></td>
<td>Identifying common words in reading passages</td>
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<td></td>
<td></td>
<td></td>
<td>Understanding the meaning of words from context</td>
</tr>
<tr>
<td>Week 8</td>
<td>High tech, Low tech</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
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<td></td>
<td></td>
<td></td>
<td>Grouping words with similar meanings for recalling information</td>
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<td></td>
<td>Identifying common words in reading passages</td>
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<td></td>
<td>Understanding the meaning of words from context</td>
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<tr>
<td>Week 9</td>
<td>Post-testing</td>
<td>Reading before examining every word</td>
<td>Before reading and learning</td>
</tr>
<tr>
<td></td>
<td>Collecting participants'</td>
<td></td>
<td>Grouping words with similar meanings for recalling information</td>
</tr>
<tr>
<td></td>
<td>opinions</td>
<td></td>
<td>Identifying common words in reading passages</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Understanding the meaning of words from context</td>
</tr>
</tbody>
</table>

*The reading articles and vocabulary were assigned from Mosiac 1 Reading, New York, McGraw Hill, 2014.*

**Figure 1.** Timeline and framework of CDL model featured in the study.

Source: Author’s work

**Data Collection**

The study collected two varied types of data for analysis, including participants' scores in an RC and vocabulary test and their responses to semi-structured interviews.

**The RC and vocabulary test.**

The test contained fifty questions divided into two sections: RC and vocabulary. The RC section included twenty filling-the-blank items (40%) and five true or false items (10%). The
vocabulary section included twenty multiple-choice items (40%) and five true or false items (10%) with a total score of 100. Two equivalent forms (A & B) of the RC and vocabulary test were designed to get data about all participants' performance in RC and VL. Both treatment and control groups were pre-tested online using the RC and vocabulary test (form A) in the first week and post-tested using the same test (form B) at the end of the experiment (Table 1). Before the actual experimentation, the test was piloted by the researcher and other students who did not attend the main experiment. Reliability analyses were conducted, and the Cronbach alpha coefficient of the two test forms (A & B) was 0.91 and 0.90, respectively, signifying a high level of reliability. Five experts of TEFL judged and ensured the tests' suitability and face validity.

The semi-structured interviews.
Toward the end of the semester, the participants in the treatment group were interviewed to give their perceptions of CDL's efficacy. They answered four structured evaluative questions: (1) What did you like or dislike about your collaborative digital class in RC and vocabulary courses? (2) In what ways can digital tools and collaborative learning facilitate and improve learning? (3) Where do you see potential problems? and (4) Do you want to study more English courses using the same collaborative digital model?

Since the interviews were semi-structured and the questions were predetermined, the researcher asked some impromptu questions to comment on the participants' responses and get a deep insight into their perceptions. Each participant was interviewed individually for 10 minutes. The data collected were analyzed using content analyses depending on selecting specific meaning units, coding the units into keywords close to the participants' expressions, clustering the keywords into categories and sub-categories, and judging and finalizing a list of the coded categories.

Data Analysis
Data were analyzed quantitatively and qualitatively in two main steps. First, paired-sample t-tests for the mean scores of the two groups were conducted to identify the differences in both groups' performance in pre and post-tests of RC and VL. The difference in RC and VL between the two groups was examined using an independent samples t-test. The effect size was computed using Cohen’s d statistic to quantify the magnitude of the treatment effect. Second, content analysis was employed to determine the treatment group's perceptions of CDL. Their responses were coded into main categories: study dynamics, accessibility and technical capacities, communication and interactivity, collaborative mode, and different preferences. Then, these main categories were divided into sub-categories to help represent the responses statistically in a meaningful way. They displayed the number of observations within a given interval.

Results
The results are organized into three sections considering the three study questions. First, the quantitative results about the effect of CDL on the treatment group's RC and VL are presented. Second, quantitative results of treatment and control groups in RC and VL are then presented and compared across the two conditions. Scores of the pre-and post-test of RC and vocabulary provided data about all participants' performance before and after the experiment. They are disaggregated into two dimensions as the test included two sections, namely RC and VL (Table 1). The last section presents the qualitative results about students' perceptions of CDL.
Table 1. Descriptive statistics for measures in pre-test and post-test

<table>
<thead>
<tr>
<th>Measure</th>
<th>Treatment group (n=30)</th>
<th>Control group (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td>RC</td>
<td>Mean</td>
<td>27.9</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>5.300293</td>
</tr>
<tr>
<td>VL</td>
<td>Mean</td>
<td>25.5667</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>4.680726</td>
</tr>
<tr>
<td>Overall performance</td>
<td>Mean</td>
<td>53.433</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>7.846</td>
</tr>
</tbody>
</table>

Effect of CDL on RC and VL

Variance analysis was conducted to ensure homogeneity between the treatment group's pre- and post-test scores. The analysis yielded homogeneity of scores, F(0.52) = 0.943, P = 0.432. Thus, a paired-sample t-test was conducted to determine the effect of CDL on the RC and VL of treatment students (Table 2). The analysis indicated that post-test scores of the overall students' performance (M=80.7, SD=8.061) were significantly higher than pre-test scores (M=53.4, SD=7.8), t(30) = -15.724, p = 0.000, d=3.248, indicating a large effect size (d=3.248), according to Plonsky and Oswald (2014). As for the results of the two dimensions of the test, post-test scores for RC (M=40.6, SD=5.4) were higher than those of pre-test (M=27.9, SD=5.3), t(30) = -10.48, p = 0.000, d=3.011. The post-test scores of VL (M=40.1, SD=4.29) were also significantly higher than those of the pre-test (M=25.6, SD=4.7), t(30) = -14.28, p = 0.001, d=2.53.

Table 2. Paired two-sample t-tests for the treatment group.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Mean</th>
<th>SD</th>
<th>T</th>
<th>df</th>
<th>*Sig. (2-tailed)</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC</td>
<td>Pre-test</td>
<td>27.9</td>
<td>5.300293</td>
<td>-10.4772</td>
<td>29</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>40.6</td>
<td>5.379399</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>VL</td>
<td>Pre-test</td>
<td>25.5667</td>
<td>4.680726</td>
<td>-14.2774</td>
<td>29</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>40.1</td>
<td>4.285903</td>
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<td></td>
<td></td>
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<tr>
<td>Overall assessment</td>
<td>Pre-test</td>
<td>53.433</td>
<td>7.846</td>
<td>-15.724</td>
<td>29</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>80.7</td>
<td>8.061</td>
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</table>

*p < .05

The Comparison of The Two Groups' RC and VL

Concerning the second question, a preliminary analysis was carried out to confirm the non-existence of differences in the level of RC, VL, and overall performance between the control and treatment groups. Thus, independent-sample t-tests were conducted, confirming no significant differences in the pre-test scores of RC, t(30) = 1.132, p = 0.216, VL, t(30) = -1.512, p = 0.166, and overall all performance of RC and vocabulary pre-test in the two groups, t(30) = -0.128, p = 0.890, as indicated in Table 3.

Table 3. Independent t-test for pre-testing in both groups

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Mean</th>
<th>SD</th>
<th>T</th>
<th>df</th>
<th>*Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC</td>
<td>treatment</td>
<td>27.9</td>
<td>5.300293</td>
<td>1.132</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>25.46</td>
<td>4.256</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VL</td>
<td>treatment</td>
<td>25.5667</td>
<td>4.680726</td>
<td>1.512</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>26.25</td>
<td>4.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>treatment</td>
<td>53.433</td>
<td>7.846</td>
<td>-0.128</td>
<td>29</td>
</tr>
</tbody>
</table>
Another paired-sample t-test was conducted to compare the score means of the control group of the pretest to those of the post-test. The results showed a significant increase in students' scores in the test dimensions (RC, \( t(30)= -12.813, p = 0.014 \), and VL, \( t(30)= -10.943, p = 0.001 \)) and overall all performance of RC and VL (\( t(30)= -16.204, p = 0.000 \)) as indicated in Table 4. Then, an independent-sample t-tests was conducted to compare the score means of the experimental and control groups of the post-test. The results showed that the treatment students performed significantly better than those in the control group in the post-test in RC, \( t(30) = 2.561, p = 0.013 \), d= 0.633, VL, \( t(30) = 3.220, p = 0.003 \), d = 0.810, and the overall performance, \( t(30) = 3.22, p = 0.013 \), d= 0.884, as indicated in Table 5.

Table 4. Paired Two-Sample T-tests for the Control Group.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC</td>
<td>26.36667</td>
<td>37.46667</td>
</tr>
<tr>
<td>VL</td>
<td>27.26667</td>
<td>36.8</td>
</tr>
<tr>
<td>Overall assessment</td>
<td>53.633</td>
<td>74.267</td>
</tr>
</tbody>
</table>

*\( p < .05 \)

Table 5. Independent-sample t-test for both groups

- **RC**
  - Treatment: 40.6, SD: 5.379399
  - Control: 36.8, SD: 3.933937
- **VL**
  - Treatment: 40.1, SD: 4.285903
  - Control: 37.46667, SD: 3.9977
- **Overall assessment**
  - Treatment: 80.7, SD: 8.061
  - Control: 74.267, SD: 6.405

*\( p < .05 \)

**Students’ Perceptions of CDL**

Concerning the third question of the study, the treatment participants' perceptions of CDL were collected through semi-structured interviews at the end of the course. Building on the students’ responses to the questions of the interviews, eight themes were identified: 1) VL, 2) RC, 3) collaborative learning, 4) digital tools (Blackboard & Quizlet), 5) accessibility, 6) self-regulation, 7) preference, and 8) motivation. The participants' responses were analyzed into coded categories as they recurred prominently in the responses (Table 6). In this section, some of these responses were presented verbatim to contextualize their experience meaningfully (Figure 2).
**Digital Collaborative Learning: Promoting Reading Comprehension**

**Abdelshaheed**

**RC**
- Clear comprehension: 27 (90%)
- Benefited from discussions and ideas: 23 (77%)
- Checking correctness of comprehension: 29 (97%)

**Q2: In what ways can digital tools and collaborative learning facilitate and improve learning?**

**Collaborative learning**
- The better mode of learning: 29 (97%)
- Great support from peers: 19 (63%)
- Funny and amusing: 22 (73%)
- Collaboration requires time: 17 (57%)
- Interaction is encouraging: 21 (70%)

**Digital tools** (Blackboard & Quizlet)
- Guarantee differentiation: 12 (40%)
- More active and dynamic: 19 (63%)
- Easy to use: 23 (77%)

**Q3: Where do you see potential problems?**

**Accessibility**
- Poor connection: 25 (83%)
- Lacking some digital skills: 10 (33%)

**Self-regulation**
- Not used to work in groups at first: 19 (63%)
- Challenging to manage digital content at first: 16 (53%)
- Competitive manners among groups: 19 (63%)

**Q4: Do you want to study more English courses using the same collaborative digital model?**

**Preference**
- Like the class: 30 (100%)

**Motivation**
- Willingness to study more digital courses: 25 (83%)

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*the frequency of responses, **the percentage of the observation to the total number of participants (n=30)*

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**Figure 2.** Samples of participants' responses

Source: Author’s work

As indicated in Table 6, students’ responses to the first question showed that they benefited from the varied activities (70%), and intensive practice of vocabulary and reading (73%) that promoted their VL (93%). Most participants' positive views (90%) were reinforced when their RC was improved due to using a flipped class that helped them ensure the correctness of their practice
and answers in the class (97%). Many participants benefited from a discussion with a classmate (77%).

For the second question, students reported that integrating collaboration with digital learning offered them a better mode of learning (97%), and great support from classmates (63%). Some participants reported that they enjoyed using digital tools (73%), and the encouraging interaction (70%) because it highlighted their mistakes and helped them avoid later mistakes. Some participants perceived the value of digital activities as they helped them be dynamic and active (63%). As for differentiation, some students (40%) reported that they learned asynchronously according to their own pace.

For the third question, 575 of the students raised concerns about accessibility and time consumed in collaboration. It was frustrating at first, but they coped with that in the following sessions. Some students reported some challenges at the beginning of the course of Bb's activities (53%), poor connection (83%), and lack of self-regulation skills (63%). Their motivation was disrupted by some competitive manners within the groups. Still, many students reported the ease of use of Quizlet (77%). For the last question, students expressed their motivation to study more collaborative digital courses (83%), and showed their appreciation of the experiment (100%).

Discussion

The current study has examined the effect of using CDL on EL majors' RC and VL. It also reported the participants' perceptions of the treatment. Both qualitative and quantitative collected data provided answers to the study questions and revealed that CDL helped treatment participants benefit from every channel of learning such as online and face-to-face discussions, the flipped classes, the Quizlet website, and virtual classes on Blackboard.

As quantitative data indicated, the significant difference between the two groups is consistent with the empirical results reported by various studies (Bueno-Alastuey & Nemeth, 2020; Chang & Windeatt, 2016; Tsai & Talley, 2014; Tseng & Yeh, 2018; Rintaningrum, 2024; Sharma, et al., 2024). As for VL, current results indicate that CDL has contributed to the development of VL. Although the control group students showed an improvement in VL, the treatment group outperformed it in the post-test of vocabulary. This result may reflect that the students gained longer-term vocabulary retention since the post-test was another form. This result is consistent with the results of Avci and Adiguzel (2017), Kim (2018), Abdulrahman and Basalama (2019), Hung (2015), Lai, et al. (2016), and Lahpai (2019).

The qualitative data based on the treatment participants' responses to the interview questions showed that most students have positive perceptions of CDL since they helped them improve RC and VL compared to other traditional activities. This finding is significantly related to Lin et al. (2017) and Anwas et al. (2020). Students' preference and predilections of CDL is an indicates of its effectiveness in enhancing learning and improving comprehension. The treatment sub-groups had to reflect on their own and other groups' performance, offer scaffolding and support, and evaluate the completed tasks. Taken together, the results revealed the advantageous impact of CDL over conventional learning on both developing RC and VL and offering a learning process that generates more positive attitudes. Additionally, regarding previous studies on the effect of either collaboration or digital tools on RC and VL (Lück, 2013; Tsai & Talley, 2014), this study has extended its results by examining the effect of integrating collaboration with digital tools on the same variables.
Some words of caution are due here. Although the current results revealed the advantageous impact of CDL over conventional in class RC and VL, it did not mean the former's superiority or the latter's inferiority. Both groups developed their RC and VL. However, the treatment group not only showed higher learning outcomes but also reflected more positive perceptions toward the treatment. The educational implication here is focused on the possibility and the suitability of CDL to be an alternative to traditional in class learning in English language classes.

In addition, there were some observations based on the aforementioned key results serve to validate them. Firstly, collaboration decreased the cognitive load on students, and helped free up more time for the groups to focus on processing their memories and learn vocabulary. Secondly, the user-friendly and intuitive design of Bb and Quizlet helped the students download, upload, discuss, and take quizzes and exams smoothly. It was imperative to select direct digital tools to decrease the time consumed in training students in new complex digital skills. Third, it was preferred to have the pre-post control group design. It helped validating the efficacy of standardized comparisons of CDL against traditional in-class activities that did not incorporate any deliberate digital or collaborative practice. Fourth, although it consumed much time and effort to conduct interviews and analyze participants' responses, it was preferred to use semi-structured interviews to collect qualitative data instead of surveys or questionnaires. The interviews provided in-depth analysis (Stringer, 2008; Taylor, et al., 2006) and reflections on the participants' feelings and opinions. Besides, they allowed comparisons between the participants' opinions before and after the course, which means that results were drawn from reliable and comparable qualitative data. These results can be applied to many similar situations, and potentially anticipate comparable levels of achievement.

**Conclusion**

The results approved the effectiveness of using CDL in RC and VL among university English majors and revealed their preference for it. Although this study was small-scale, situated in a specific setting, and targeted RC as an English language skill and VL as an important factor in learning all language skills, its results were directly related to many variables separately investigated and examined before. The point is that the findings were based not only on the participants' perceptions of CDL but also on data obtained from a concise experiment. The study's critical results urge the researcher to conclude that CDL can be an up-to-the-minute alternative to traditional face-to-face competitive language classes. As Rapchak (2017) indicated, online versus face-to-face learners' performance was not similar, especially concerning social metacognition. The results of this study show evidence that technology plays a crucial role in optimizing collaborative learning at the university level. It can be concluded accordingly that adaptions to technologies within collaborative contexts can create varied learning opportunities and expand students' experiences, skills, and knowledge.

**Limitations and Recommendations**

While digital learning in the collaborative model is well-regarded as an effective means of grappling with face-to-face learning, some previous findings identified some situations where the success of digital collaboration may be restricted. Certain out-of-control factors, such as unreliable internet connection, access issues, and inadequate technical skills, could potentially impact students’ achievement. Fortunately, these problems were minimal since the classes were held in the college language lab. The connection was lost twice. Fortunately, the participants each time...
were able to switch to their mobile networks for a duration of 15 minutes. However, it was exhausting for the teacher to manage the teaching methods, guide the learners, and supervise the forums. Despite all the pedagogical principles of collaborative learning, some complications might arise initially. Here, some kind of superficial collaboration in the first class and some competitive manners were noticed among the groupmates. Matters were improved in the second class since all the participants realized that their goal was common, and they had to share the work at the end.

Drawing upon these results and discussion, recommendations and suggestions for further investigations would be proposed. Further research can focus on investigating digital collaboration challenges among learners with varying styles of learning. A comparative study is also recommended to identify whether individual digital learning is more suitable for learners with different learning styles than digital collaboration in diverse groups. As this study was conducted among female English majors, further investigations may be needed to identify gender differences concerning learners' performance, preferences, and perceptions of CDL. The change into digitalism in education is justified by the principle of life-long learning, which is growing within technology-based educational contexts. It requires adapting the educational systems derived from different learning theories in ways that allow designing and generating new techno-cognitive learning models.

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