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Denitza Anguelova Charkova, Department of Methodology of Mathematics and Informatics Education, University of Plovdiv "Paisii Hilendarski", Plovdiv, Bulgaria, email: dcharkova@gmail.com

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Evaluation of the Effectiveness of a Cloud-based EFL Writing Course against a 90% Mastery Threshold

Denitza Anguelova Charkova [1]

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ABSTRACT

The present article is based on a cloud-based EFL writing course in an academic context. The course effectiveness was evaluated through two studies, on two units of the syllabus, involving 189 students, 98 in study 1 and 91 in study 2. The learning gains were assessed in two methodological conditions, interactive and individual work. The results of the pre-test were compared to those of immediate and delayed post-tests in reference to a 90% mastery threshold. Paired-samples and independent-samples t-tests were performed with Bonferroni corrections. Both groups achieved significant learning gains in reference to the 90% mastery threshold; however, the students in the interactive group demonstrated better performance on the immediate and delayed post-tests in both studies ($p > 0.05$ for all tests). The conclusion is that cloud-based technology is an effective tool for teaching EFL writing and for fostering mastery of the target skills. Interactive learning led to better mastery and was favored by the majority of the students.

Cloud computing refers to a variety of web-hosted resources, networks, and services that can be easily and conveniently accessed by institutional and individual users (El-Attar, El-Ela, & Awad, 2019). With its wide variety of resources and flexibility, cloud computing promotes the construction of dynamic learning environments (Al Arood, Aljallad, & Baioumy, 2020; Salam, Iskandar, Ibrahim, Muhammad, & Farooq, 2019). Such environments are very suitable for language learning and teaching because they offer numerous

[1] Department of Methodology of Mathematics and Informatics Education, University of Plovdiv "Paisii Hilendarski", Plovdiv, Bulgaria, email: dcharkova@gmail.com , Phone: +359888664121

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opportunities for developing learners' speaking, listening, writing, and reading skills. Cloud-based language teaching is the recent offspring of computer-assisted language learning (CALL).

The growing sophistication of technology is both an advantage and a challenge. An appropriate integration of web-based tools with teaching methods and learning goals is crucial for the success of technology-based education (El-Attar, El-Ela & Awad, 2019). The need for appropriate models of technology-based language teaching was brought to attention in the works of well-known CALL specialists (e.g. Chapelle, 20014; Colpaert, 2006; Hinkelman, 2018; Netto-Shek, 2017; Richards, 2015; Zhou & Wei, 2018). Currently, Task-based Language Teaching (TBLT) is the main framework for technology-based language learning courses and curricula. The appropriateness of TBLT for technology-based teaching is discussed extensively in González-Lloret (2015). The author affirms TBLT as the principal approach in computer-based teaching and learning and offers a practical guide to its implementation in course design.

Cloud-based language courses are suitable for both interactive (a.k.a. collaborative) and individual work. The benefits of interactive language learning have been discussed (Long, 1996) and documented in second language theory and research (e.g. Gass, Mackey, & Ross-Feldman, 2005; Gass & Varonis, 2008; Kessler, 2013; Ortega, 2009; Smith, 2003, 2004). However, studies comparing the effectiveness of interactive vs. individual language learning in technology-based educational contexts are still few (Granena, 2016).

Since technology is amicable towards both approaches, the choice of interactive versus individual work should be based on empirical evidence about their appropriateness for specific goals and situations. The present work derives its rationale from the above issues. It describes the methodological design of a cloud-based course for teaching EFL writing to Bulgarian college students, developed in view of the recommendations in González-Lloret's (2015) guide for integrating technology with TBLT. It also reports the results of two experimental studies about the effectiveness of the cloud-based EFL writing course in two methodological conditions, interactive vs. individual work.

2. Literature Review

2.1. Interactive Language Teaching and Learning

Language is a means of communication, so it is not surprising that one of the most effective ways to learn a language is through interaction with other speakers. A scientific elucidation of the role of interaction in language learning is first provided by Long (1981) in the Interaction Hypothesis, which postulates that language learning is facilitated through learners' increased attention to language forms and meaning. Research has shown that noticing facilitates learning and retention (Gass, Behney, & Uzum, 2013; Mousavi, Ghafoori, & Saeidi, 2020; Schmitt, 2000).

Modern technology provides ample opportunities for developing learners' language skills through interactive tasks. As shown by several studies (Gang & Takatsuka, 2009; González-Lloret, 2008; Kawaguchi & Ma, 2012; Yilmaz & Granena, 2010), noticing happens when asking for clarification and/or providing corrective peer feedback. Gang and Takatsuka (2009) and Yilmaz and Granena (2010) reported that certain language features were brought to the learners' attention through interaction. Moreover, González-Lloret (2008) observed that when working together on a task, learners noticed and modeled correct forms for each other, thus facilitating their acquisition.

Learner interaction in technology-based language teaching is associated with positive outcomes in various aspects, including collaborative L2 writing tasks (Brodahl, Hadjerrouit & Hansen, 2011; Kessler, Bikowski, & Boggs, 2012; Yim & Warschauer, 2017), online chat (Payne & Whitney, 2002; Tare, Golonka, Vatz, Bonilla, Crooks, & Strong, 2014), voice-based computer-mediated communication (Granena, 2016) and others. Significant gains in receptive and productive vocabulary were observed in the research of de la Fuente (2003) and Smith (2004). Payne and Whitney (2002) found improved accuracy in word usage and

grammatical forms. Granena observed significant gains in language forms, including modals, past tense, and connectors.

Since technology creates suitable conditions for both interactive and individual language learning tasks, it will be unreasonable to assume that interactive tasks are more effective than individual ones without empirical evidence. As noted by Granena (2016), there is a substantial body of research about the benefits of interactive language learning, but research comparing the two approaches is still insufficient. The next section outlines studies that have examined the effectiveness of interactive versus individual work in technology-based language teaching contexts.

2.2. Interactive vs. Individual Technology-based L2 Writing

The studies that are most relevant to the present one involve quantitative comparisons of the effectiveness of interactive vs. individual work in technology-based L2 writing courses. Overall, the results show that interactive work enhances L2 writers' sense of audience and prompts them to work on improving the content, grammar, clarity, and organization of their writing (Bikowski & Vithanage, 2016; Kuteeva, 2011; Wichadee, 2013). In Kuteeva's study, the use of wikis in an academic writing course resulted in an enhanced awareness of the importance of structural coherence and correct grammar for the clarity of one's writing. Strobl (2014) found a positive association between interactive work in the planning phase and the quality of the content and organization of collaboratively written outputs. Arslan and Şahin-Kizil (2010) observed a significant priority of interactive work regarding the organization and content of the writing, but no difference in vocabulary and grammar usage. On the other hand, in Tare et al. (2014), the advantage of interactive work was observed in relation to vocabulary gains, whereas the accuracy and sophistication of the writing itself were not affected by the condition.

In a study about the effects of collaborative versus individual web-based writing, Bikowski and Vithanage (2016) observed positive outcomes for both collaborative and individual web-based learners, but with significantly higher gains for the collaborative group. However, the results are ambivalent considering the lower pre-test scores of the collaborative writing group in comparison with the individual writing group. Irrespective of the experimental condition, most of the participants expressed a preference for collaborative learning.

Elola and Oskoz (2010) evaluated collaborative and individual L2 writing through the use of social media tools like wikis and chats. Although there were no statistically significant differences in the fluency, accuracy, and complexity of the writing, some patterns emerged, differentiating the two groups in relation to how they approached the writing and regarding the focus of their work. The students working individually were focused on the formulation of ideas and content building, whereas the group engaged in collaborative writing, directed their attention to making revisions, and improving the quality of the draft. Overall, it was observed that the use of social web-based media in L2 writing can facilitate interaction between the learners; however, the authors do not advocate replacing individual work with collaborative. In fact, they propose combining both approaches depending on the specific goals and situations.

In summary, the findings of the existing comparative studies between interactive and individual work in technology-based L2 writing courses suggest that some aspects of the target language are more effectively acquired through interactive vs. individual tasks. Benefits were observed in the content and organization of the writing, revisions and improvements of subsequent drafts, noticing vocabulary and grammatical forms. These results indicate that the choice between interactive and individual work should not be based on assumptions, but on empirical evidence about which specific language forms, structures, and skills benefit the most from interactive work and vice versa. In order to build a solid empirical base for course designers and teachers, we need to carry out further research on this issue.

3. Methodological Design of the Cloud-Based EFL Writing Course

The cloud-based EFL writing course was developed to address the specific needs of the students in the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski", Bulgaria. The target student group represented a technologically savvy sample for which technology-based writing skills were essential for further professional development. The focus was on developing writing skills related to creating different types of web content and technical reports.

The course was built on Google cloud (https://edu.google.com/products/google-cloud/) due to the wide variety of collaboration tools that are easily available and accessible. It does not require web design skills and every teacher with basic computer competencies can easily build and maintain a web-based course on the Google cloud. Google applications were widely used in the Bulgarian school education, and researching their efficacy as an instructional medium was important for the teaching practice.
The following collaboration tools, provided on Google workplace (https://workspace.google.com/features/) were incorporated in the construction of the course: Gmail, Meet, Chat, Drive, Docs, Sheets, Slides, Forms, and Sites. The YouTube channel (http://youtube.com), a subsidiary of Google, was also used for sharing instructional videos.

The course was designed on the methodological principles of Task-Based Learning and Teaching (TBLT), which in recent years has been widely accepted as the main framework in technology-based language education (González-Lloret, 2015; Hinkelman, 2018; Lai & Li, 2011; Roessingh, 2014). TBLT advocates the use of real-life tasks in order to stimulate learners' interest and motivate them to get engaged in the learning process (Nunan, 2004). Completing the tasks in the cloud-based EFL writing course involved using specific Google applications. Fig. 1 summarizes the main tasks and respective Google applications for Unit 5, titled *Creating web content.* Principles of cooperative and interactive learning (Brown, 2015; Vacca & Vacca, 2017) were also incorporated into the design of the tasks to stimulate peer interaction and involvement. Drawing on data-driven language learning (e.g., Laufer & Waldman, 2011; Lui & Lei, 2017), a special effort was made to focus on lexical and grammatical collocations versus single words and grammatical forms. The assessment of students' performance was based on pre-determined criteria and rubrics, following the criterion-referenced approach (Brown, 2018; Schrock & Coscarelli, 2007). Considering the importance of English writing skills for future IT specialists, the threshold for mastery of the target writing skills was established at 90%.

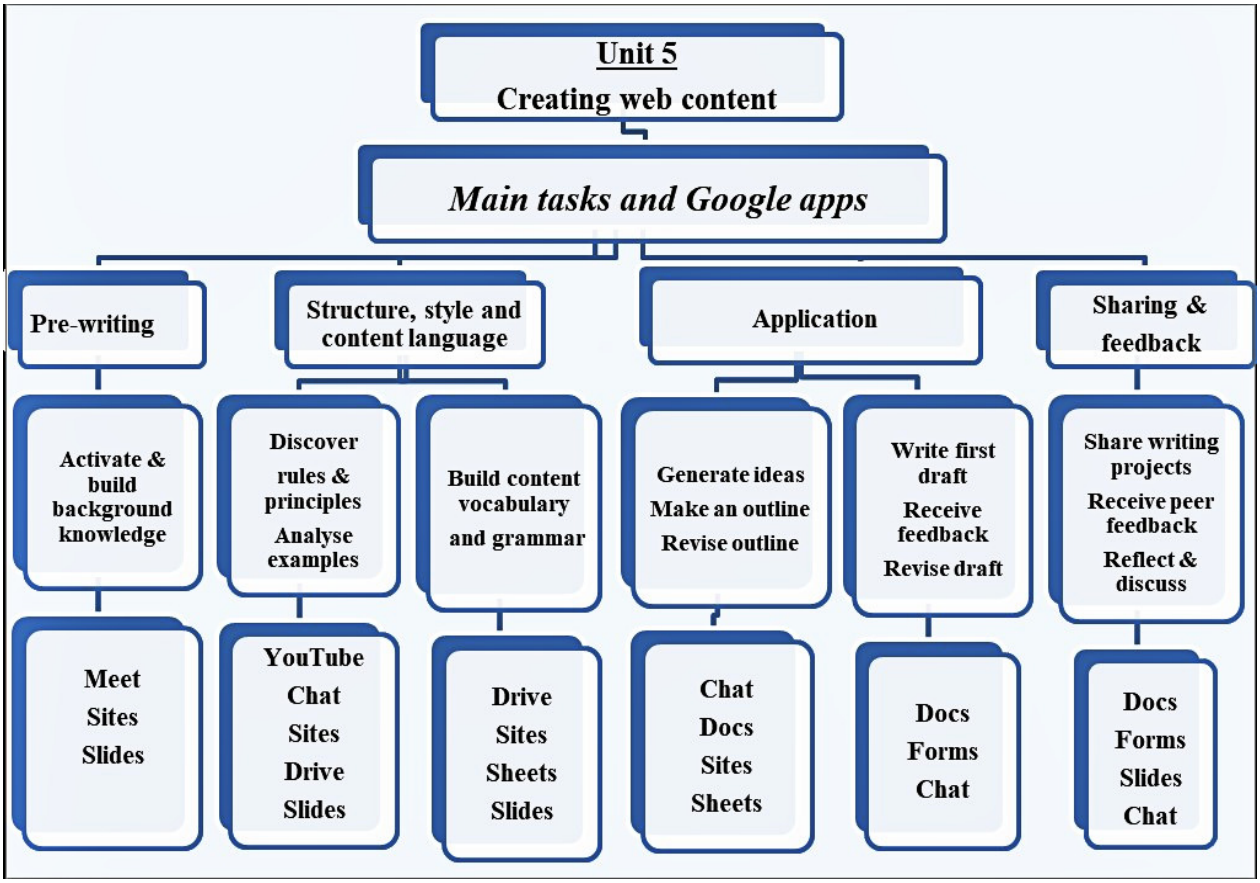


Figure 1: Main tasks and Google applications included in Unit 5 *Creating web content*

4. Empirical Evaluation of the Effectiveness of the EFL Cloud-Based Writing Course

4.1. Purpose

A To evaluate the effectiveness of the cloud-based EFL writing course, two experimental studies were carried out on two different units: 1) *Summary of technical information/reports* and 2) *Creating web content*. The studies aimed to provide empirical data about the level of learning gain against a 90% mastery threshold (Schrock & Coscarelli, 2007), as well as to compare the effectiveness of interactive vs. individual work.

4.2. Methodology

Both studies followed a pretest → immediate post-test → delayed posttest design with two experimental groups. Control over confounding variables was established in adherence to the principles of experimental research (Phakiti, 2015). In both studies, the tests were conducted in weeks 4, 6, and 10 during two consecutive fall semesters. The conditions under which the tests were administered were identical. Each of the experiments included seven interconnected stages: 1) English language proficiency test; 2) Formation of the two experimental groups; 3) Pre-test; 4) Teaching the target writing skill; 5) Immediate post-test; 6) Delayed post-test; 7) Survey of student opinions. The tasks were designed in two versions - for interactive

work in small groups of 3-4 students, and for individual work. Both experiments were guided by the research questions given in the next section.

4.2.1 Research Questions

The purpose of teaching is to lead to learning gains (Lee & Benati, 2009); however, our goal was to go beyond the usual practice of finding mean differences between the pre-test and post-test and establish the learning gains against a 90% mastery threshold. The research questions were stated as follows:
Research Question 1: a) Will the cloud-based model of teaching EFL writing skills lead to a significant development of the target writing skills in both conditions, interactive and individual work? b) What is the learning gain against a 90% mastery threshold?

Research question 2: Is there a significant difference in learning gains (mean scores and compared to the 90% mastery threshold) between interactive and individual work in cloud-based EFL writing instruction?

Research question 3: Which one of the two approaches, interactive vs. individual work, would the participants choose if given the opportunity and why?

4.2.2 Participants, Treatment, and Testing in Study 1

Study 1 included 98 students, 49 of whom were randomly assigned to the interactive condition and 49 to the individual one. The mean age in both groups was 19 years, with an age range between 18 to 30 years. The English language test, administered before the treatment, showed that the students in the interactive and individual groups were of similar language competence, with no statistically significant difference in language proficiency, t (96) = 1.834, p = 0.07.

In the first study, students were taught how to write summaries of technical information, following a similar instructional plan as the one shown in Fig. 1. The unit was covered in four class periods of 45 minutes each, not counting the homework assignments. In the interactive condition, all the tasks were performed in collaboration with peers, using the respective Google apps. In the individual condition, the same tasks were completed individually via the same Google apps; however, the chat option was used only to communicate with the instructor. Peer evaluations and homework assignments were also done collaboratively or individually, depending on the experimental condition. The instructor followed, monitored, and directed student work in both conditions. Regular feedback was provided to facilitate the learning outcomes in both conditions. The students' ability to summarize technical information was tested before the instruction, immediately after the instruction, and four weeks after the instruction. All three tests were completed individually by the students in both experimental conditions via computers in a controlled classroom setting.

The pre, immediate and delayed post-tests in Study 1 involved reading and summarizing short texts about computer viruses and malicious software programs. Readability statistics, produced by the spelling and grammar check of Word, were used to match the difficulty level of the texts to the B2 level of proficiency. All texts had a similar number of words (≈ 260) and sentences (≈ 21), and similar sentence length. Passive voice sentences constituted 10% to 19% of the texts. The text difficulty according to the Flesch Reading Ease formula (Flesch, 1979) ranged between 49.9 to 52.2. Students were instructed to read the texts and write a summary of the main points and facts, not exceeding 150 words for each test.

The total number of summaries amounted to 294. Each summary was evaluated by two independent raters, who went through preliminary training. The scoring was done following an analytic rubric, including five criteria: content, organization, lexical resource, grammatical appropriateness and accuracy, and mechanics (spelling, punctuation, capitalization). The assigned scores followed the Bulgarian

grading scale, where 6 = excellent and 2 = poor/fail. The raters' scores were correlated through the Pearson-r test. The inter-rater agreement ranged between 95% and 98%. The raters' scores were averaged and weighted as follows: content 40%, organization 10%, lexical resource 30%, grammar 10%, mechanics 10%. Content and lexical resource were weighted higher because they constitute the most essential aspects of summary writing. Grammar, organization, and mechanics were given less weight because they should follow the original text in summary writing.

4.2.3 Participants, treatment, and testing in Study 2

Study 2 included 91 students, of whom 45 were randomly assigned to interactive work and 46 to individual work. The mean age in both groups was 19 years; the age range was 19-25 years. The English language proficiency test did not show a statistical difference between the two groups, t (89) = 0.13, p = 0.89. Overall, the students were at the B2 proficiency level (CEFR, 2009).

The topic in Study 2 was *Creating web content* and the instruction involved the tasks shown in Fig. 1. The topic was covered in 4 class periods of 45 minutes plus the extra time spent in completing homework assignments. The organizational structure for the interactive and individual work was the same as in Study 1.

The students' mastery of the target skill was established through their performance on a pre, immediate and delayed post-test. For each test students in both conditions worked independently. They were required to write a web article between 170-190 words following similarly structured tasks. To ensure the reliability of the tests, all three tasks had similar topics, organization, and identical instructions. The scoring of students' writing was guided by an analytic rubric with the same five criteria as in Study 1, but weighted differently according to their importance: 30% content, 20% organization, 20% lexical resource, 20% grammatical range and accuracy, and 10% mechanics. The test data included a total of 273 articles, which were scored by two independent raters with an inter-rater agreement between 94% and 98%.

4.2.4 Survey of student preferences in Studies 1 and 2

After the delayed post-test, the participants were asked to complete a short online survey about whether they would opt to work in a team or individually if they were given the option to choose. The students were also asked to explain why they would prefer one approach over the other. The questions were obligatory, yielding a response rate of 100% in both experiments.

4.2.5. Data analysis in Studies 1 and 2

To address research question 1, paired-samples t-tests were used to compare the participants' tests scores within each condition of the two experiments as follows: 1) pre-test scores ↔ immediate post-test scores; 2) pre-test scores ↔ delayed post-test scores; and 3) immediate post-test scores ↔ delayed post-test scores. Bonferroni correction was applied to control for Type I error. Results were considered significant if *p-values* were ≤ 0.017. Effect size (d) for each paired t-test was calculated according to Cohen's (1988) formula for paired comparisons. In research question 2, independent-samples t-tests were used after the data was examined for normality. The Kolmogorov-Smirnov test showed that all distributions were normally distributed (p > 0.05). In each study, 3 independent-samples t-tests were performed to compare the test scores of the students in the interactive conditions with those in the individual condition on the pre-test, immediate and delayed post-test. Type I error was controlled through Bonferroni correction. Results were considered significant if *p-values* were ≤ 0.017. Effect size (d) was calculated following Cohen's (1988) formula for independent t-test comparisons. The quantitative data from the survey was analyzed through

contingency tables of frequencies and percentages, the Chi-square test and simple correspondence analysis with rows = condition and columns = preference for interactive or individual work.

5. Results

5.1. Effectiveness of the Cloud-Based EFL Writing Instruction

5.1.1. Study 1

The first research question examined the effectiveness of the cloud-based writing course within each of the two conditions (interactive and individual work). In Study 1, the students in the interactive condition achieved a statistically significant improvement of their summary writing skill between the pre-test and the immediate post-test, t (48) = -8.272, $p < 0.001$, $d = 1.13$. The learning gain between the pre-test and delayed post-test was also statistically significant, t(48) = -10,223, $p < .001$, $d = 1.40$. A further significant development was observed between the immediate and delayed post-tests, t (48) = -2.293, $p = 0.013$, $d = 0.31$.

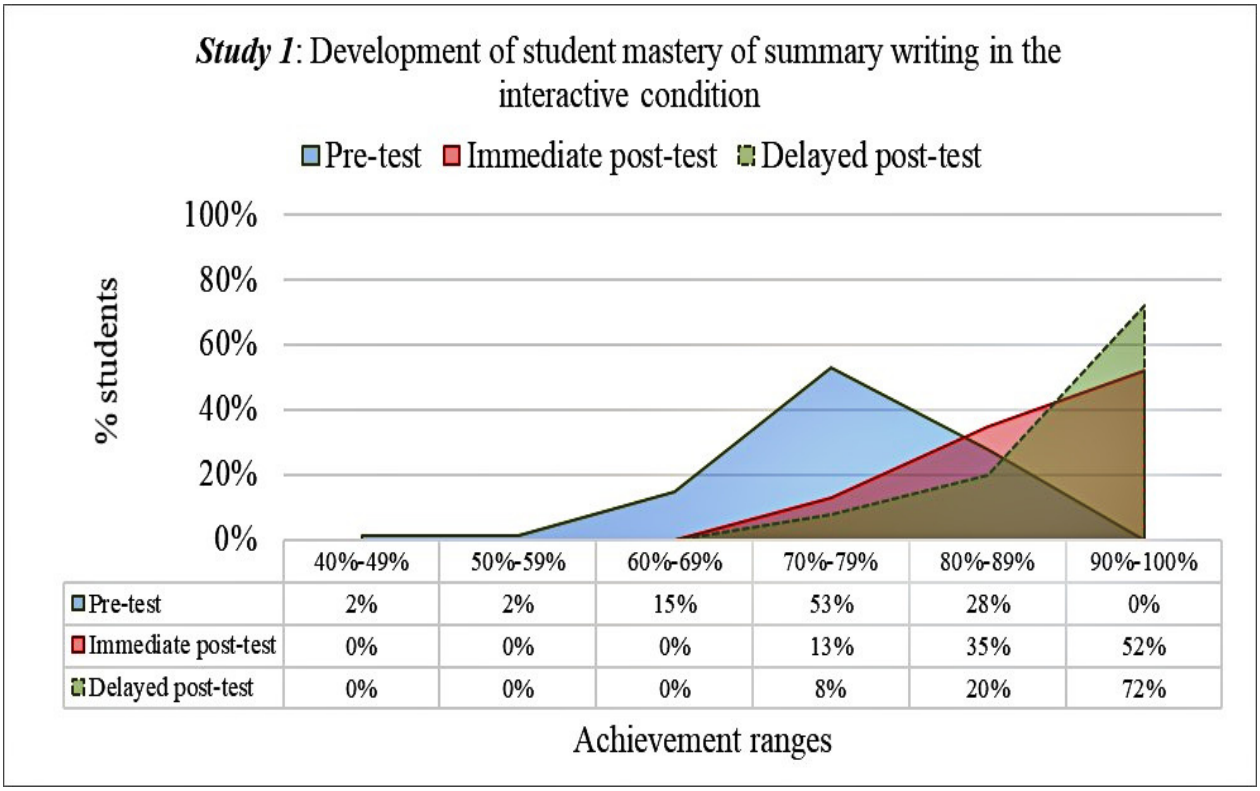
A similar trend was established in the individual condition. A significant learning gain was found between the pre-test and the immediate post-test: t (48) = 4.978, $p <.001$, $d = 0.76$; and between the pre-test and delayed post-test: t (48) = 7.53, $p < .001$, $d =1.14$. A significant development was also observed between the immediate and delayed post-tests, t (48) =2.57, $p = 0.008$; $d = 0.31$. The descriptive statistics for Study 1 are summarized in Table 1.

Table 1
Descriptive Statistics in Study 1

Test	Interactive work				Individual Work			
	N	M	SD	95% CI	N	M	SD	95% CI
Pre-test	48	4.59	0.59	4.43 - 4.74	48	4.64	0.59	4.47 - 4.81
Immediate PT	48	5.34	0.44	5.21 - 5.45	48	5.15	0.36	5.04 - 5.26
Delayed PT	48	5.49	0.30	5.39 - 5.58	48	5.34	0.29	5.23 - 5.44

To compare the learning gains against the 90% mastery level, each student's individual score on the pre-test, immediate post-test, and delayed post-test was converted to % achievement (individual score/maximum score of 6 multiplied by 100). Achievement ranges were created (40%-49%; 50%-59 %; 60%-69 %; 70%-79 %; 80%-89%; 90-100%) in order to illustrate the dynamics in the students' mastery of summary writing from the pre-test to the delayed post-test.

On the pre-test, the majority of the students (72%) in the interactive condition performed below 80%; 28% scored in the range 80%-89%, and none scored at the 90%-100% mastery level. On the immediate post-test, there was a shift towards the higher percentile ranks: 52% achieved mastery; the percentage scoring in the 80%-89% range increased from 28% to 35%; nobody performed below 70%. A further shift upwards was observed on the delayed post-test as the percentage of students at the mastery level increased to 72% (Fig. 2).



	40%-49%	50%-59%	60%-69%	70%-79%	80%-89%	90%-100%
Pre-test	2%	2%	15%	53%	28%	0%
Immediate post-test	0%	0%	0%	13%	35%	52%
Delayed post-test	0%	0%	0%	8%	20%	72%

Figure 2. Development of student mastery of summary writing in *the interactive condition*. An increase from 0% to 52% to 72% mastery was observed.

In the individual condition, the developmental trend was similar. On the pre-test, 70% of the students scored below 80%; 30% fell in the 80-89% range; 0% reached the mastery level. On the immediate post-test, 42% of the students reached the mastery level; the percentage scoring between 80%-89% increased from 30% to 45%; none of the students scored below 70%. A further upward shift occurred on the delayed post-test as 63% of the students qualified for mastery (**Fig. 3)**.

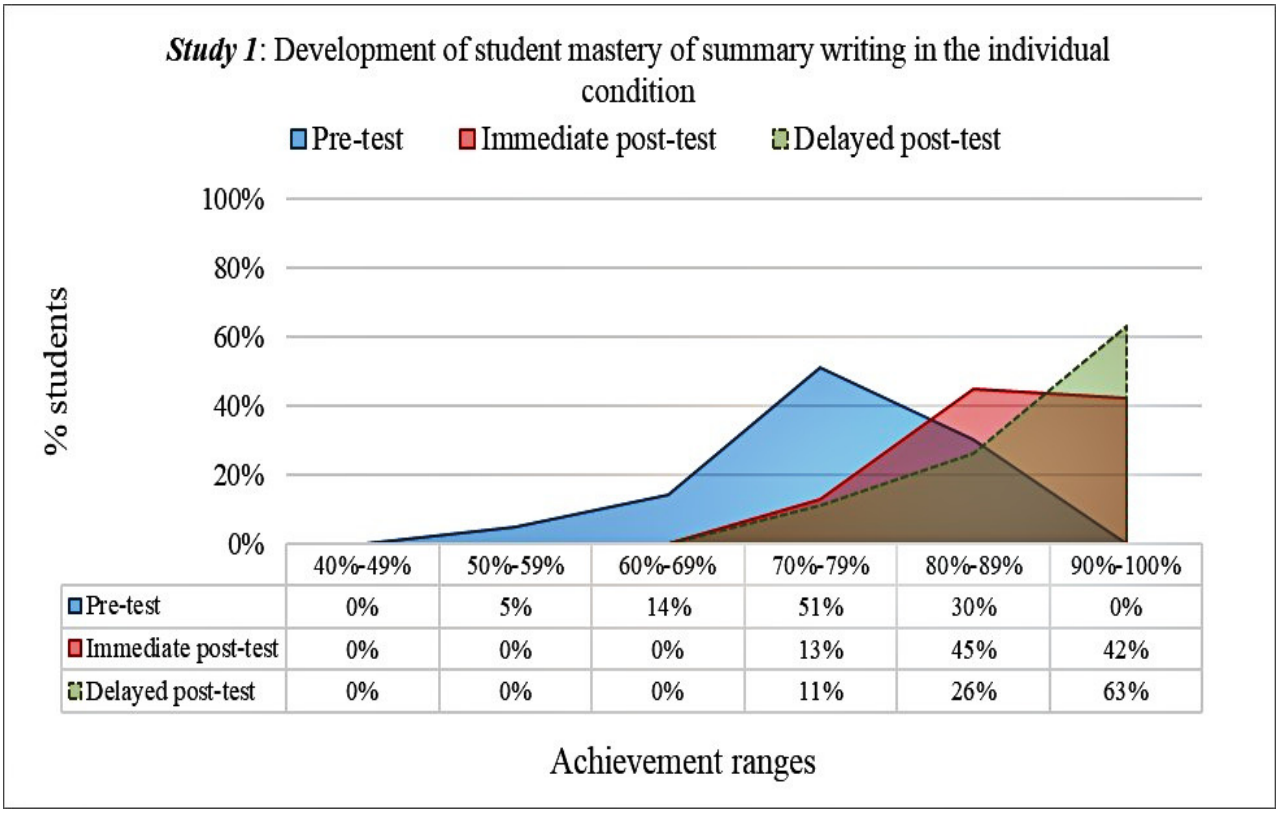


Figure 3. Development of student mastery of summary writing in *the individual condition*. An increase from 0% to 42% to 63% mastery was observed.

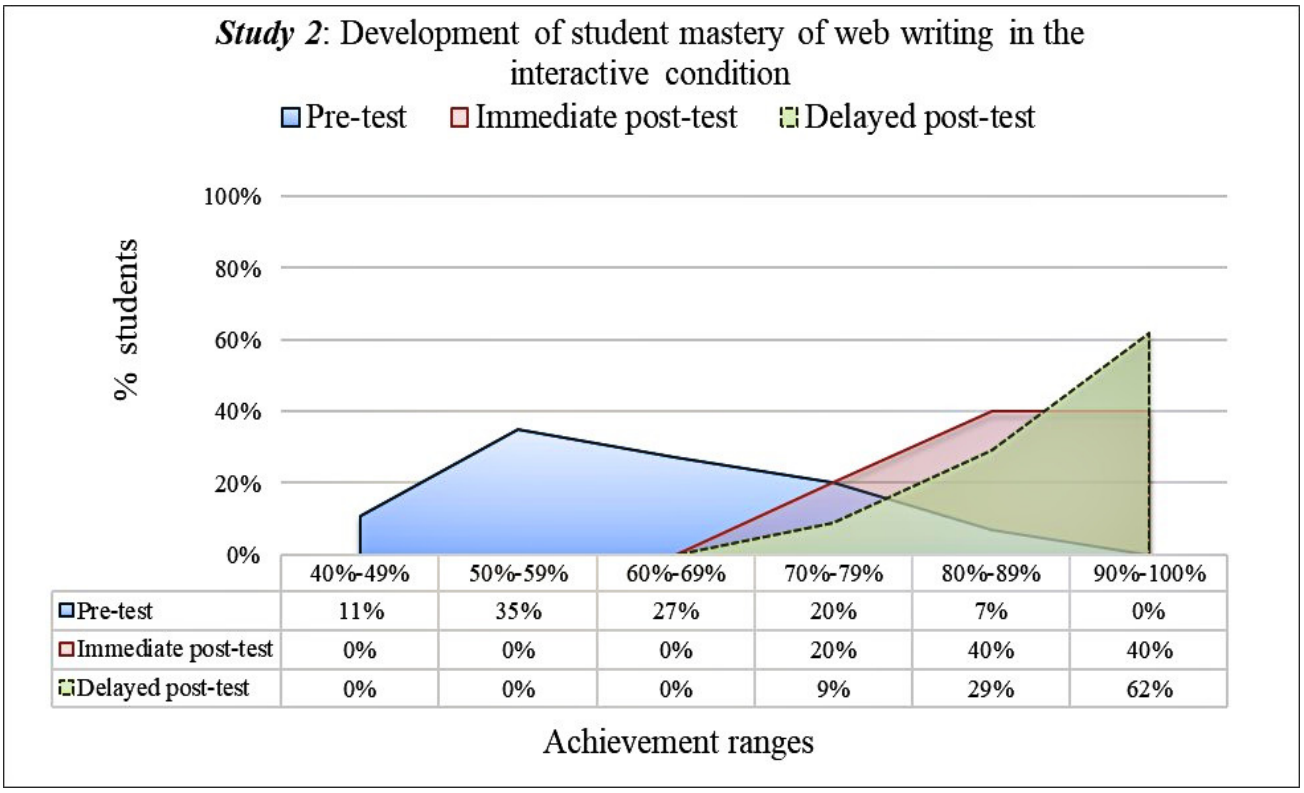
5.1.2. Study 2

The results from Study 2 collaborated the trends observed in Study 1 (**Table 2**). The participants in the interactive condition achieved a statistically significant improvement of their ability to write web content between the pre-test and the immediate post-test: $t(44) = -13.009$, $p < 0.001$, $d = 1.9$; and between the pre-test and delayed post-test, $t(44) = -16.745$, $p < 0.001$, $d = 2.48$. A significant improvement was also found between the immediate and delayed post-tests: $t(44) = -16.745$, $p = 0.011$, $d = 0.35$. The students in the individual condition showed a significant improvement in their web-writing skills between the pre-test and the immediate post-test: $t(45) = -.717$, $p < 0.001$, $d = 1.30$; and between the pre-test and the delayed post-test: $t(45) = -1.128$, $p < 0.001$, $d = 1.74$. The learning gains between the immediate and delayed post-test was also significant: $t\ (45) = 0.022$, $p = 0.007$, $d = 0.34$.

Table 2
Descriptive statistics in Study 2

Tests	Interactive work				Individual work			
	N	M	SD	95% CI	N	M	SD	95% CI
Pre-test	45	3.76	0.66	3.56 - 3.96	46	3.91	0.63	3.72 - 4.10
Immediate PT	45	5.10	0.34	4.99 - 5.20	46	4.84	0.52	4.68 - 4.99
Delayed PT	45	5.28	0.43	5.14 - 5.40	46	5.04	0.41	4.92 - 5.16

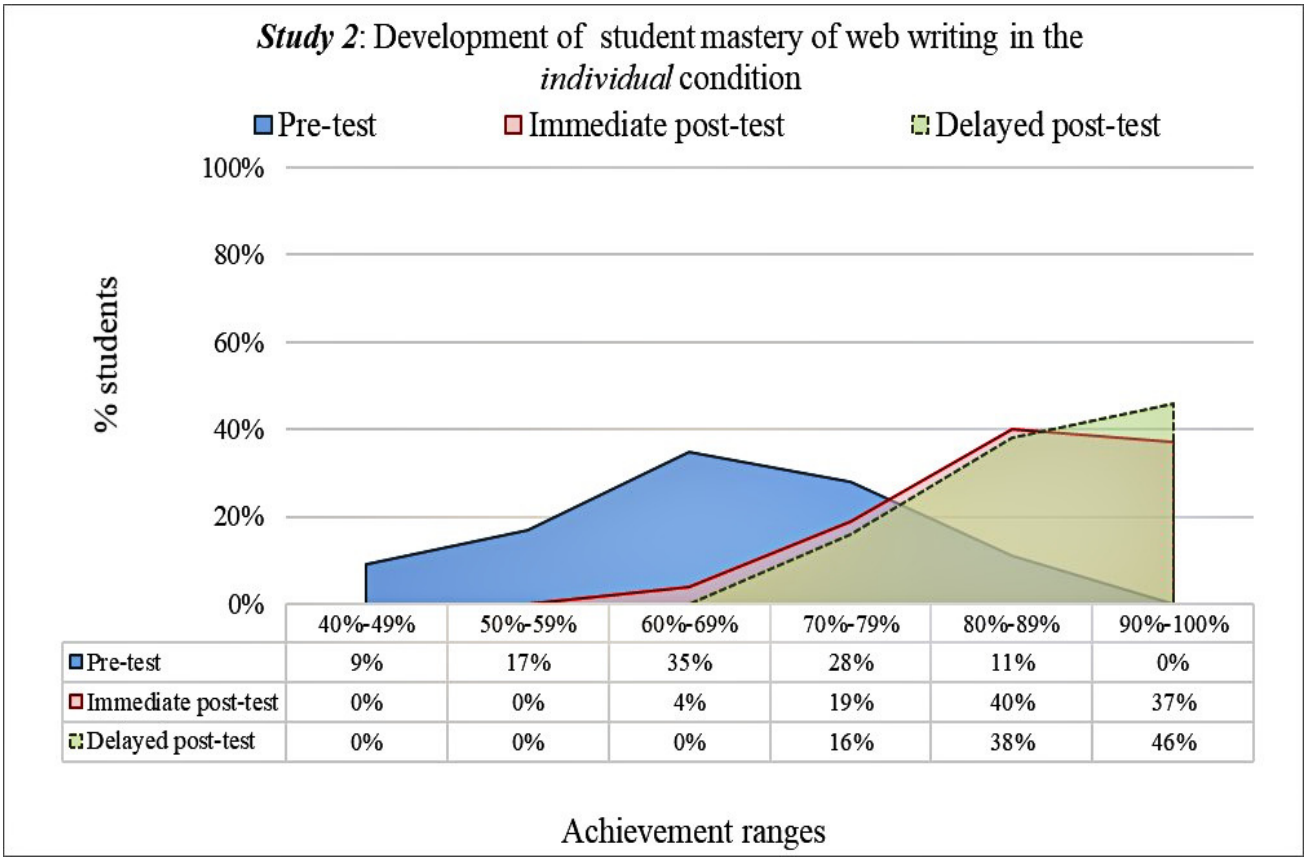
The % achievement in Study 2 was calculated and presented in ranges like in Study 1. On the pre-test, 93% of the interactive group scored below 80% and 7% scored in the 80%-90% range. Whereas nobody performed in the 90%-100% range on the pre-test, on the immediate post-test 40% scored in this range (90%-100%). Those in the 80%-89% range increased from 7% to 40% and none scored below 70%. There was a further shift upwards on the delayed post-test as more than half of the students (62%/N = 28) achieved mastery (Fig.4).



	40%-49%	50%-59%	60%-69%	70%-79%	80%-89%	90%-100%
Pre-test	11%	35%	27%	20%	7%	0%
Immediate post-test	0%	0%	0%	20%	40%	40%
Delayed post-test	0%	0%	0%	9%	29%	62%

Figure 4. Development of student mastery of web writing *in the interactive condition*. An increase from 0% to 40% to 62% mastery was observed.

The students in the individual condition followed a similar path of development. On the pre-test, 89% scored below 80% and 11% scored in the 80%-89% range, with none at the mastery level. On the immediate post-test, the students scoring in the range of 90%-100% increased from 0% to 37%; those in the 80-89% range increased from 11% to 40%, and only 4% scored in the 60-69%. A further development was observed on the delayed post-test when 46% of the students reached mastery, and none scored below 70% (Fig. 5).



	40%-49%	50%-59%	60%-69%	70%-79%	80%-89%	90%-100%
Pre-test	9%	17%	35%	28%	11%	0%
Immediate post-test	0%	0%	4%	19%	40%	37%
Delayed post-test	0%	0%	0%	16%	38%	46%

Figure 5. Development of student mastery of web writing *in the individual condition*. An increase from 0% to 37% to 46% mastery was observed.

5.2. Effectiveness of Interactive vs. Individual Work

The second research question examined the effectiveness of interactive vs. individual work in the context of the EFL cloud-based writing course. The learning gains in the two approaches were compared through t-tests for independent samples. The results revealed a significant priority of interactive work over individual work in both studies.

In Study 1, the students in the interactive and individual condition did not differ significantly in their summary writing scores on the pre-test, t (96) = 1.282, p = 0.203, d = 0.08. The students in the interactive condition achieved a statistically higher learning gain on the immediate post-test than their counterparts in the individual condition, t (96) = 2.241, p = 0.013, d = 0.48. The better performance of the students in the interactive condition was sustained on the delayed post-test, t (96) = 1.991, p = 0.016; d = 0.41.

Likewise, the results from Study 2 showed no significant difference between the interactive and individual condition on the pre-test, t (89) = -1.129, p = 0.262; d = 0.23, and a significantly better learning outcome for interactive work on the immediate post-test, t (89) = 2.743, p = .007; d = 0.59. The interactive group maintained the significantly better performance on the delayed post-test, t (89) = 2.649, p = .008; d = 0.57.

The mean percentage of mastery in the interactive and individual conditions in both experiments is illustrated in Fig. 6. In study 1, the mean mastery level in the interactive condition was 87% on the immediate post-test and 90% on the delayed post-test versus the individual group which attained mean mastery of 83% and 87%. In Study 2, the students in the interactive condition demonstrated 85% mean mastery on the

immediate post-test and 88% on the delayed post-test, whereas those in the individual condition achieved respectively 81% and 84% mastery on the average.

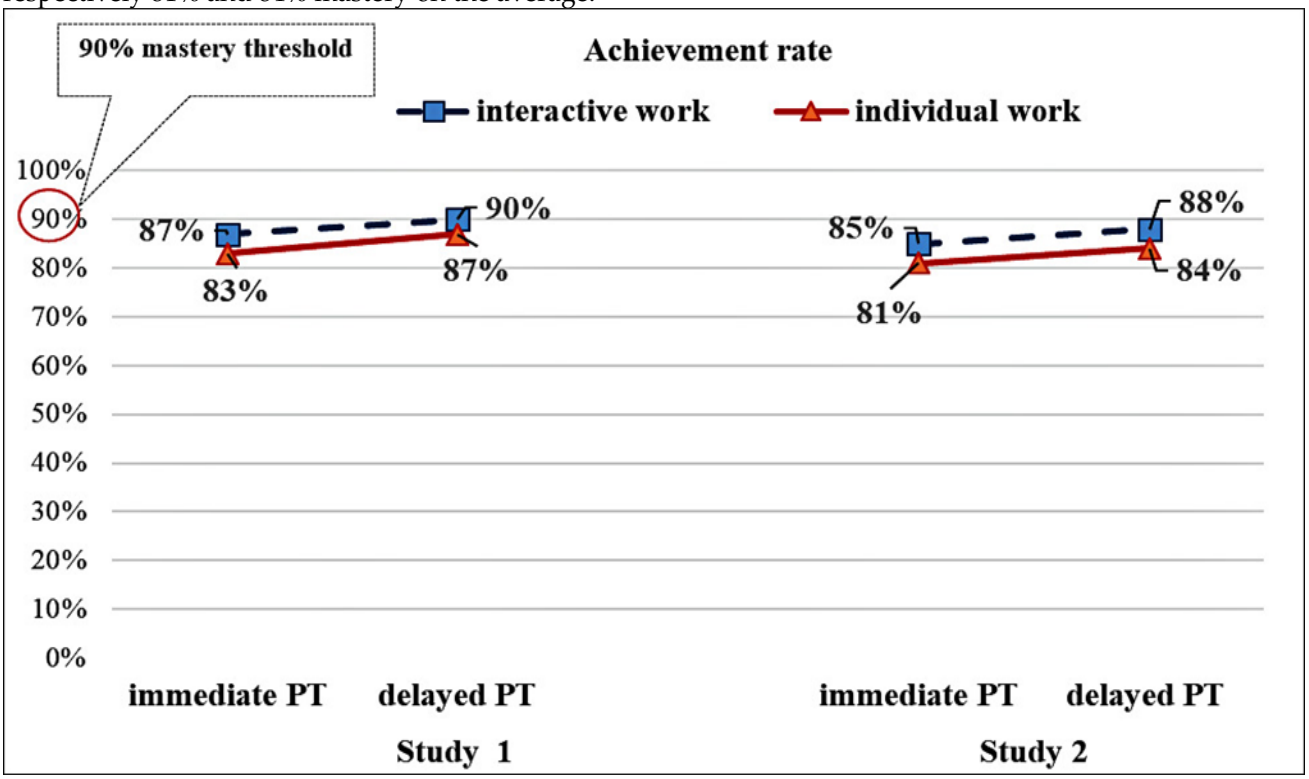


Figure 6. Mean % of mastery against the 90% threshold in the interactive and individual condition in Study 1 and Study 2

5.3. Students' preferences for interactive or individual work

In a survey given after the delayed post-test, the students were asked to indicate their preference for interactive or individual work. Since the question was obligatory, the response rate was 100% in both studies. Overall, a significantly higher percentage of students expressed a preference for interactive work. In Study 1, 72% of the students in the interactive condition chose interactive work versus 28% who preferred individual work, $\chi 2$ (1) = 20.715, $p < 0.001$. In the individual condition, 66% of the participants preferred interactive work, while 34% were for individual work, $\chi 2$ (1) = 8.909, $p = 0.002$. In total, 69 % of the students in Study 1 showed preference for interactive work vs. 31% who chose individual work, $\chi 2$ (1) = 28.158, $p < 0.001$.

The correspondence analysis plot illustrates a stronger preference for interactive work regardless of the condition in Study 1 (Fig.7). The points corresponding to the individual and interactive condition are located closer to the option *"for interactive work"*, whereas the option *"for individual work"* is located further away from both conditions.

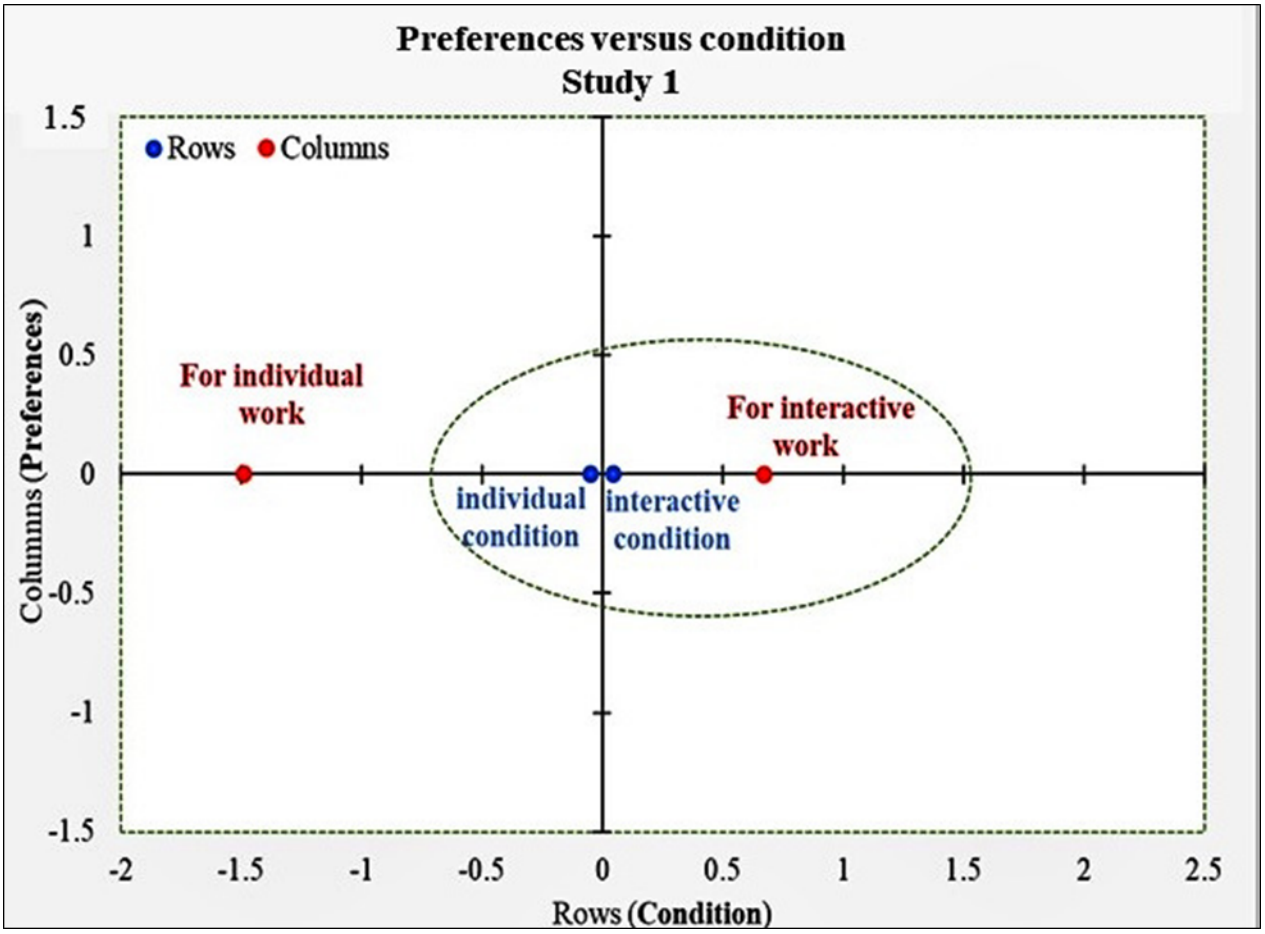


Figure 7. Stronger preference for interactive work in Study 1 by the students in both conditions

A similar trend was observed in Study 2. In the interactive condition, 71% of the participants expressed a preference for interactive work against 29% for individual work, χ 2 (1) = 8.812, p = 0.003. In the individual condition, 67% of the participants preferred interactive work versus 33% for individual work, χ 2 (1) = 10.28, p = 0.001. Overall, 69% indicated preference for interactive work and 31% for individual work 28, χ 2 (1) = 26.136, p <0.001. On the correspondence analysis plot (Fig. 8) the points associated with the individual and interactive condition are located closer to the option "*for interactive work"* as compared to the option *"for individual work* ".

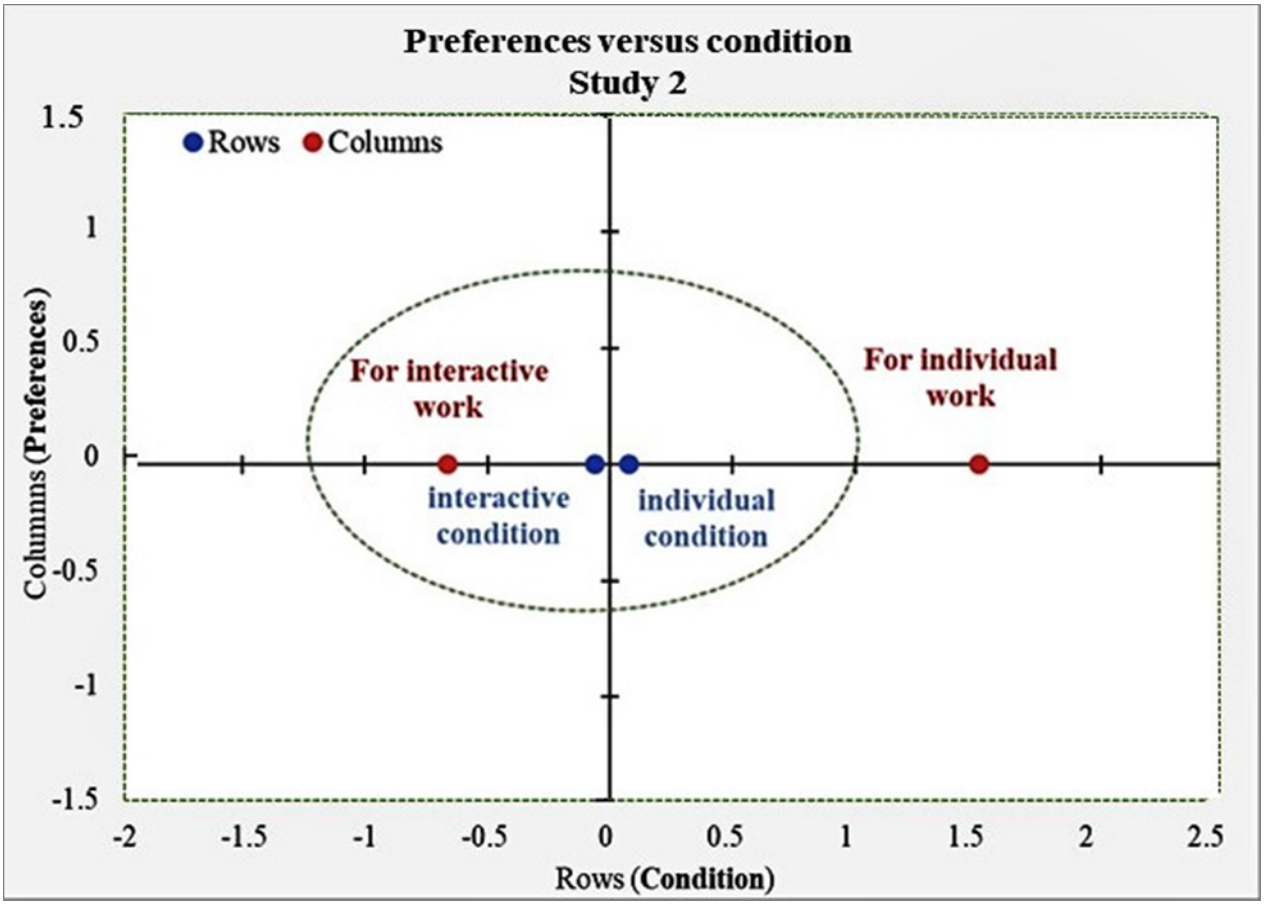


Figure 8. Stronger preference for interactive work in Study 2 by the students in both conditions

The dominant reasons for choosing interactive versus individual work that were given by the students were: "*the opportunity to share and discuss ideas*", "*the challenge to think critically in searching for creative solutions*"; "*the opportunity to develop communication skills*"; "*the relevance to real-life situations where teamwork is becoming the norm*"; "*heightened motivation and emotional engagement*". The students who indicated a preference for individual work expressed a propensity for self-reliance and full control over their work. These participants were skeptical about the commitment of team members to the overall goal.

6. Discussion

The cloud-based EFL writing course was designed as a medium integrating current trends in second language theory and research with the affordances of the Google cloud. It aimed to provide a learning platform rich in authentic learner-centered tasks with a focus on performance-based practice and assessment. The steady development of the students' writing skills can be attributed to their active engagement in the learning process through appropriate tasks delivered on the platform of Google cloud. The results collaborate Lee and Benati's (2009) claim that learner-centered teaching models lead to long-term learning gains and benefits. The observed learning gains fall within the range of the results reported in related studies on technology-based EFL/ESL writing (e.g. Bikowski & Vithanage, 2016; Elola & Oskoz, 2010; Kuteeva, 2011; Wichadee, 2013).

However, in all previous research on the efficacy of technology-based ESL/EFL writing courses, the learning gains were established through the statistical comparison of students' mean scores before and after

the treatment. In technology-assisted task-based teaching, which aims at promoting the mastery of real-life skills, it is important to evaluate achievement against a threshold mastery level. In the present study, mastery was defined as achievement at or beyond the 90% threshold level. The learning progress was estimated by tracking the percentage of students who achieved mastery at and beyond this level. On the pre-tests, most of the students scored in the low ranges between 50% and 79%. On the immediate post-test, the majority moved to the top achievement ranges of 80%-89% and 90%-100%. The trend was extended to the delayed post-test when more than 50% of the students were ranked at the mastery level. **Figure 9** summarizes the percentages of students who demonstrated mastery (90%-100%) on the delayed post-test. In the interactive condition, the mastery rate was 72% in Study 1 and 63% in Study 2, amounting to an average of 67.5%. In the individual condition, the mastery rate was 62% in Study 1 and 46% in Study 2, with an average of 54%.

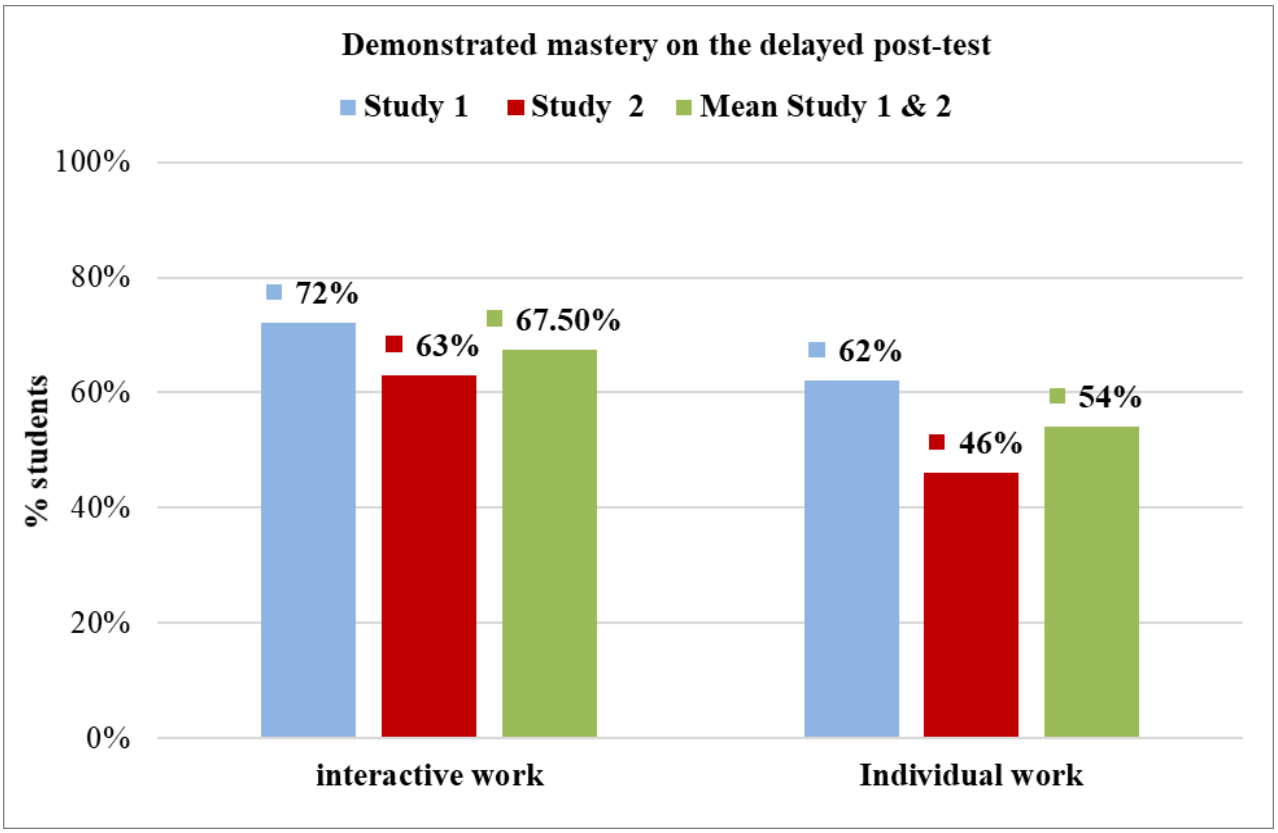


Figure 9. Summary of the % of students who demonstrated mastery on the delayed post-tests in Studies 1 and 2.

However, it is not possible to draw comparisons between the present study's achievement rate at the 90-100% level and other studies due to the fact that no other studies have evaluated course effectiveness against a mastery threshold level (at least to the author's knowledge). Extrapolating from the present experience, it is highly recommended that future studies evaluate learning gains against a pre-determined mastery level. This approach is not only more relevant for assessing the effectiveness of technology-assisted task-based teaching, but also provides a more reliable basis for drawing comparisons across related studies. The effectiveness of the cloud-based L2 writing course was also investigated in view of two different work conditions, interactive vs. individual. Even though significant learning gains were observed in both conditions of both experiments, the mean scores on the immediate and post-test were significantly higher

in the interactive condition than those in the individual condition. The average achievement rate was also persistently higher in the interactive condition as compared to the individual condition (72% vs. 63% on summary writing; 62% vs. 46% on web-article writing).

As mentioned in the introduction, the effectiveness of interactive/collaborative work has been established in the related research literature; however, only a few studies have compared it to individual work. The better outcomes of interactive learning in the present study provide supporting evidence to Arslan and Şahin-Kizil's study (2010) which has reported a significantly higher development in the organization and content of writing in the interactive condition. However, the same study found no difference in vocabulary and grammar usage. A positive connection between the quality of the content and organization of collaborative writing and the peer interactions during the planning phase was also reported in Strobl (2014). Although in the present study, students' summary and web-article writing skills were not compared in terms of different writing components, the rubrics used to assess them included 5 criteria, among which content, organization, lexical resource, grammatical appropriateness and accuracy, and mechanics (spelling, punctuation, capitalization). In scoring students' summaries, the largest weight was given to content and lexical resource and in scoring web-articles, content and organization received the most weight. Extrapolating from the way the criteria were weighted, it can be deduced that the greatest benefit of interactive work in the present study was observed in relation to the content and organization of writing, and also in the students' ability to convey the main ideas of the original text with appropriate synonyms and paraphrases. One reason for this, as already noted by other authors (Kuteeva, 2011; Wichadee, 2013), is that interactive work raises writers' sense of audience and alerts their attention to the importance of structural clarity and organization.

On the other hand, micro-level skills (grammatical range and lexical resource) do not always experience a greater benefit from interactive work vs. individual. This may be explained by the fact that the learning of vocabulary and grammar requires continuous practice and multiple retrievals over a longer period of time (Schmitt, 2000). So, the effect of any teaching approach on such language aspects will be hard to capture by a pre-test → one treatment → post-test experiment.

The empirical evidence affirming the interactive approach as more effective than the individual is supplemented by the overwhelming preference for interactive work by the students in both conditions. Many participants shared the opinion that the ability to work with others is a skill that transcends educational settings and finds application in contemporary workplaces. They appreciated the opportunity to discuss and offer alternative perspectives on a topic, deepen their critical thinking and reach consensus. The results collaborate the observations made in a fairly old, but still very relevant article by Johnson and Johnson (1986) that, contrary to some expectations, many students hold positive attitudes towards interactive work and prefer to collaborate rather than to compete with each other.

Finally, we should mention that the findings are subject to certain limitations. They are specific to the cloud-based writing course described in this article and may not be as relevant to technology-based courses with different content and methodology. They may also not hold true in other cultural environments. The effectiveness of the cloud-based course for developing students' English writing skills was established on the basis of two writing tasks, whereas the course employed a variety of assessment methods, the results of which were not included.

7. Conclusion

The cloud-based EFL writing course was designed on task-based, learner-centered, cognitive, and data-driven language learning principles. The content and tasks were delivered on the Google cloud with its different applications. To test the effectiveness of the course, two experimental studies were carried out with reassuring results. However, it should be borne in mind that the integration of cloud technologies into

language teaching poses many challenges to course designers and teachers. It is necessary to choose the right forms and methodological principles that are tailored towards the specifics of the learning context, learners' profiles, and pedagogical goals (El-Attar, El-Ela, & Awad, 2019).The process of creating a cloud-based language teaching course involves researching and evaluating the options; selecting the most appropriate ones; putting them together in a coherent methodological structure; delivering the course; testing and evaluating its effectiveness; making subsequent changes, improvements, and updates.

The present experimental investigation and previous related studies (e.g. Brodahl, Hadjerrouit & Hansen, 2011; Granena, 2016; Kessler, Bikowski, & Boggs, 2012; Payne & Whitney, 2002; Tare, Golonka, Vatz, Bonilla, Crooks, & Strong, 2014; Yim & Warschauer, 2017) have provided evidence supporting the better learning outcomes of interactive work vs. individual. In the current study, it was also the preferred mode of the majority of the students, regardless of the condition they were randomly assigned to. However, it should not be assumed that the interactive approach is more effective in all circumstances. Depending on the context and learning objectives, some tasks may be more suitable for interactive work and others for individual work. Further research should focus on identifying the language aspects and skills that benefit more from interactive, as well as those that improve more when students work independently.

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