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## The Impact of Mediational Artifact Types on EFL Learners' Writing Complexity: Collaboration vs. Asynchronous Artifacts

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Nasibeh Bagherpour<sup>1</sup>, Mojgan Rashtchi<sup>2\*</sup>, Parviz Birjandi

<sup>1</sup> Department of Foreign Languages, Science and Research Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup> Department of Foreign Languages, North Tehran Branch, Islamic Azad University, Tehran, Iran

<sup>3</sup> Department of Foreign Languages, Science and Research Branch, Islamic Azad University, Tehran, Iran

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Received: 11 June, 2017

Accepted: 01 November, 2017

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### Abstract

The present study was an attempt to investigate the significance of environmental changes on the development of writing in English as a Foreign Language (EFL) context with respect to the individual. This study also compared the impacts of collaboration and asynchronous computer mediation (ACM) on the writing complexity of EFL learners. To this end, three intact writing classes were designated as Collaborative face-to-face group (N = 21), Asynchronous Computer Mediation group (N = 20) and Control group (N = 16). The two experimental groups received scaffolding instructions on narrative essays. The collaborative face-to-face group (CFFG) went through the working in pairs, and working asynchronously through a researcher-designed website (ACMG). The data were analyzed employing ANOVA. The results showed that CFFG improved in terms of complexity and positive impact of Collaborative approach and superb performance of CFFG over the ACMG. The findings brought to light the benefits of pair work and showed that learners working in pairs used structures that were more complex in their writing than ACM class.

**Keywords:** Asynchronous computer mediation, Collaboration, Complexity, Mediating artifact, Scaffolding instruction, Writing performance

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### INTRODUCTION

The emergence of modern theories has had a significant role in the use of more successful ways of language teaching. Learners are not autonomous creatures, and learning does not entirely occur inside the heads of the learners, but in the world where they live. One area that has proliferated much in recent years is the use of small group and pair work in the classrooms,

specifically in English as second language (ESL) classrooms. Using pair work depends on strong theoretical and pedagogical foundations (Donato, 1994; Ohta, 2001; Schmidt, 1990; Storch, 2002; Swain & Lapkin, 1998). From a theoretical standpoint, the use of pair's accords with a social constructivist view of learning that originates from Vygotsky's (1978) social constructivism. Learners, according to the social constructivist viewpoint, should be promoted to contribute to

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\*Corresponding Author's Email:  
m\_rashtchi@iau-tnb.ac.ir



wards activities, which raise interaction and co-construction of knowledge.

From a pedagogical standpoint, the communicative approach to second language (L2) instruction supports the use of small group and pair work that emphasize on providing learners with circumstances to use the L2. In other words, collaborative work could develop individuals' skills. Johnson (2009), Kramsch (2000), Lantolf (2000), Lave (1991), Rogoff (1990), and Walqui (2006) emphasized the role of the social nature of communication and mentioned that studying human cognitive development and learning out of social context is meaningless as language use precedes cognitive and psychological development.

In addition to the theoretical shifts, technology has opened a new venue in the field of second language education over the last decade and an extensive use of computer technologies has come into writing instruction. Second language teachers have also realized the value of computer technologies in teaching and learning. Additionally, foreign/second language teachers unceasingly examine new ways to assist English language learners. One area that has provided much excitement in recent years is the use of advanced technology that supports both synchronous and asynchronous communication. In the past few decades, writing and technology have mainly focused on different computer applications as well as a variety of tools, such as word processors, e-mails, to online chats, bulletin board discussions, and Web page projects. Using technology in learning has brought major benefits to English as Foreign/second language (EFL/ESL) learners. Nowadays, distance learning takes a number of forms including synchronous/asynchronous online courses, hybrid or blended courses that contain some face-to-face contact time in combination with online delivery, and technology-enhanced courses that employ face-to-face interactions along with technological incorporation (Warschauer, 1996, 1999, 2004, 2005). Second language practitioners have implemented computer-mediated technologies in their classrooms more and more (Campbell, 2003, 2005; Johnson, 2004). Some teachers have been

more conservative concerning the application of computer-mediated tools in their classes as a danger to the human interactions. On the other hand, some teachers have accepted these progresses; they have seen the addition of new technology-based pedagogies as a path through which students' writing developed and as a means of reviving instruction. The research findings highlight applying technology into the classroom and curriculum design and on technology-enhanced language learning activities that are meaningful to students and well matched with pedagogical goals. Concerning the application of technology, MacKinlay (1999) maintained that 'how the technology is integrated into the curriculum and the course work' (online) determines the success of asynchronous technology in education reasoning that 'if there is no learning framework in place then learner uncertainty may affect participation and motivation levels' (online). Other researchers including Harasim (1993) and Aviv (2000) likewise recommend that such technology should integrate carefully with other learning activities. Creative teachers are continuously devising the rapid development of technologies into their instructional designs. Before pointing our discussion on the role of mediation in improving students' writing ability, it seems necessary to contemplate on the role of mediation and artifacts in the sociocultural theory. Mediation is a central issue in Vygotsky's work that assists the achievement of a profound understanding of mental processes and is a fundamental concept for learning. Mediation is defined as "the process through which humans deploy culturally constructed artifacts, concepts, and activities to regulate (i.e., gain voluntary control over and transform) the material world and their own and each other's social and mental activity" (Lantolf & Thorne, 2006, p. 79). Lantolf and Thorne also mentioned the concept of 'tools'. According to Lantolf (2000) and Lantolf and Thorne (2006) culturally constructed tools mediated the mental and social activities of the human. They emphasized that the relation between human beings and the world can be of two types of direct (e.g. re-

flex, spontaneous attention, and memory) and indirect/mediated (i.e. control of mental functioning). Mediation can take various manifestations in classroom setting: One is in the form of tangible mediation such as books, computers, and interlocutors. A related point to consider is that individuals who created tools got involved in the activities (i.e., cognitive, physical) that the tools created. The studies on individuals' cognitive development, language learning specifically in our case, needs to take into account the effects of mediating tools on individuals' activities.

Although the number of research on the application of computer mediated communication (CMC) and collaboration is not scarce, only few research projects have focused on the comparison of these two mediating artifacts and their impacts on students' writing performance. Research findings on the efficacy of asynchronous computer mediation (ACM) in writing classrooms are mixed. On the other hand, due to the nature of ACM, which is text-based without time pressure, it may encourage learners to monitor their production (Kelm, 1992). Moreover, the absence of non-verbal cues may foster self-correction and more negotiation (Blake, 2000). In addition, other researchers such as Kitade (2000) reiterated the facilitative role of CMC in comprehension, interaction, raising awareness, and collaboration. However, the postulation in these investigations emphasized that CMC facilitates collaboration, and therefore leads to better learning of the subject matter, without considering more precisely the type of relationship individuals formed when functioning through CMC. The findings of the aforementioned studies indicated that pair work and CMC have a positive effect on the second/foreign language development. However, no empirical evidence has been suggested to determine the best model of mediation in language instruction. Therefore, the paucity of research on the comparative effect of different mediational artifacts on writing performance interested the researchers to conduct the present study. The aim of this study was to compare the effects of three mediational artifacts on enhancing Iranian EFL

learners' writing performance. We investigated the impact of scaffolding on the participants' narrative writing in two experimental groups (i.e. CFFG and ACMG) and a control group (CG) that received no mediation. The researchers selected the Task-Based Scaffolding Instruction as the framework to explain the role of mediating artifact in writing classes. Consequently, to achieve the purpose of this study, the following research question was formulated:

1. Do Asynchronous Computer Mediation (ACMG), Collaborative Face-to-Face Group (CFFG), and no mediation (CG) differ in terms of their effects on the complexity of EFL learners' writing performance?

## METHODS

### Participants

The participants enrolled in a course required for the first year students in the field of Teaching English as Foreign Language (TEFL) and English Translation titled 'Advanced Writing'. Students usually take this course in their third semester after they have completed eight credits in relation to grammar and writing. Fifty-seven undergraduate students in the field of English Translation from the department of the Islamic Azad University at South Tehran Branch participated in this study. The three classes were randomly assigned to the experimental and control groups. The age range of the participants was between 18 and 25. There were 20 participants in ACMG, 21 in CFFG, and 16 in the CG. Two of the three classes constituted the experimental groups and one formed a control group that received lecture-discussion instruction. One of the experimental groups received Asynchronous Computer Mediation via the class website, and the participants' personal profile, the other one received face-to-face Collaborative instruction in the classroom context through pair-work. The participants of this study were randomly assigned to the Collaborative face-to-face group (CFFG) and the control group (CG). However, the participants of the Asynchronous Computer-Mediated

group (ACMG) enrolled voluntarily.

### **Production Measures**

The current study adopted production measures of complexity. Skehan (1996) introduced complexity as one of the goals for L2 instruction: complexity was the elaboration of an IL system. To undertake this analysis, all written work coded in the first instance for T-units and clauses. A T-unit is defined by Hunt (1966) as “one main clause plus whatever subordinate clauses happen to be attached to or embedded within it” (p. 735). Additionally, as Foster, Tonkyn, and Wigglesworth (2000) asserted, T-unit, despite its limitations, was originally designed for the analysis of written scripts but has been widely used for the analysis of both written and oral discourse. However, to accomplish the purpose of this research, we considered an appropriate analytic tool for the analysis of the written data. Complexity revealed the writer’s willingness to involve in a range of syntactic structures, moving beyond coordination to complex structures that include subordination and embedding. One measure of complexity is the proportion of clauses to T-units. Based on research by Foster and Skehan (1996), this reliable measure correlates well with other measures of complexity. Another measure of complexity is the proportion of subordinate clauses to clauses, according to Wolfe-Quintero, Inagaki, and Kim (1998) this could examine the degree of embedding in a text.

### **Instructional material**

The researchers tried to help the learners so that they could write an English composition without assistance. As stated in Ohta (2001) the researchers gave the students input and instructed them to support and challenge them, and increase their competence as they moved toward more independence and self-regulated performance. The researchers also used Hyland’s categorization for choosing the tasks. Hyland (2003b) categorized scaffolding tasks into four main groups; that is, language familiarization, model analysis, controlled composition, and guided composition.

According to Hyland (2003b), the tasks involved in each category are:

- Language familiarization tasks: comparison, gap fill, and feature identification
- Model analysis and manipulation: re-ordering, transforming, or combining feature
- Controlled composition based on models: text completion and parallel writing
- Guided composition: data transfer, information transfer, and medium transfer

The researchers designed the tasks to enhance the learners’ independence gradually and to control moving from the basic noticing activities toward using tasks with various degrees of guidance. Throughout this process, the teacher was the assistant, scaffolding the participants to the point where the support was no longer needed. In other words, the assistance was temporary and diminished if not required. Therefore, scaffolding works as a “fuel of autonomy” (Van Lier 2004, p. 148). There exist in the literature various steps and recommendations suitable for different settings, including language lessons. Clay and Cazden (1992) used the notion of instructional scaffolding, which was used in the present study. Clay and Cazden (1992) listed some essential characteristics in scaffolding i.e. “setting the topic, increasing accessibility, maintaining interactive ease, prompting the child to engage in constructive activity, working with new knowledge, accepting partially correct responses” (p. 212).

The very first step was setting the topic that was employed to take the participants’ areas of interest into consideration and motivate them throughout their learning process. The next step was increasing accessibility. Increasing accessibility, as stated by Van Lier (2004) and Clay and Cazden (1992) could mean simplifying the tasks. Additionally, in line with Robinson (2003), the level of complexity in tasks could be decreased. With task complexity, Robinson (2005a) referred

to cognitive task features that could function to increase or lessen the cognitive demands of a task. Concerning the cognitive variables, a distinction has to be made between the resource-directing and resource-dispersing variables (Robinson, 2005a). Resource-directing variables were integral parts of tasks, such as the number of elements and relationships to be distinguished and defined [+/-few elements], the temporal and spatial references of the task [+/-Here-and-Now], and the necessity to give reasons to support statements made [+/-no reasoning demands]. According to different studies done in this area (Robinson, 2001, 2005a), decreasing cognitive task complexity on these developmental dimensions is achieved if they are [+few elements], [+Here-and-Now], [+no reasoning demands]. Task complexity could also decrease along resource-dispersing dimensions, which are not related to any particular linguistic features. Examples of resource-dispersing variables are the amount of planning time allowed [+/- planning], the decrease of the number of tasks that have to be performed simultaneously [+/-single task], and the existing linguistic and extra-linguistic knowledge of the learners [+/-prior knowledge]. According to Robinson (2005b), tasks that are cognitively less complex on these resource-dispersing dimensions are the ones with [+ planning], [+single task], [+prior knowledge]. We tried to control task complexity in order to assist the participants to move from being more dependent to more independent.

Robinson's (2001) framework concerning the storytelling tasks was used to support the learners. The possible ways of grading narrative tasks are increasing the demands on the narrator as language ability develops. Rewriting a very short story based on a familiar text, with preparation time, may be suitable for low-level learners, while spontaneously writing a personal story to a group of people would be suited to more advanced ones. The problem was how to move from one to the other. Progression between these two tasks might move in the direction of increasing difficulty on a number of overlapping dimen-

sions. Robinson (2001) suggested that these dimensions should include the following:

**Model narrative structure:**

*simple language > complex language  
(lexically and grammatically)  
simple story > complex story (many  
characters, episodes)  
familiar story > unfamiliar story*

**Model narrative mode:**

*written > pictures > video > given  
theme  
(closed task > open task)*

**Telling conditions:**

*extensive preparation time > no plan-  
ning time  
reference materials (pictures, notes) >  
no reference materials  
no time limit > time pressure*

The aim of the third and the fourth steps was enhancing interaction maintenance and encouraging learners to take part in constructive activities. Owing to the above-mentioned steps, along with the low general English proficiency level of the participants, we chose narrative genre of writing, which made the tasks manageable for them, so that they did not frustrate to cooperate in the process of task completion. The next step focused on working with new knowledge; therefore, we brought some pictures based on Hyland's (2003) work as visual input and helped the learners to activate their schemata and their background knowledge about the task that was under their production. The last step mentioned by Clay and Cazden (1992) was accepting partially correct responses. This step was necessary because the teacher should have mediated in the process of learning and interested the students to take part in task completion sequence. By accepting partially correct responses, the teacher also helped the participants to reduce their anxiety, so that they felt free to take part in the process of task completion and accepted the assistance of their teacher in this process.

### **Instrumentation**

For conducting the present research, four different data gathering tools were employed. A Quick placement test, Pre writing test, a post-writing test, moodle platform (Inquiry Learning Forum), instructional material.

#### ***Oxford Quick Placement Test (QPT)***

The Oxford Quick Placement Test (QPT) is a placement test for learners of English, developed by Oxford University in collaboration with the University of Cambridge ESOL Examinations (formerly UCLES). The test takes approximately 15-20 minutes to complete, during which the student answers 20-25 multiple-choice questions. The test draws on a bank of hundreds of multiple-choice questions and tests grammar, vocabulary, reading and listening comprehension skills. In the current study, the reliability estimate for the test computed through Cronbach's alpha was 0.80.

#### ***Pre- and Post-Writing Tests***

A pre and a post-writing test helped us examine the participants' writings before and after the treatment. The groups wrote about a personal story or event that had extremely affected them both as the pre and post writing tests (i.e. your first day at school, your first job, the first time you drove a car, the birth of your first child).

#### ***Moodle***

A part of the experiment was conducted on a computer-mediated context; therefore, we created a web site for the asynchronous writing course before the semester began, using Moodle platform. There were some reasons that persuaded us to choose this Inquiry Learning Forum. Firstly, the content that Moodle hosts is only educational in the sense that advertisements have no place in the platform. Secondly, Moodle is user-friendly in a way that adding and updating it is as simple as sending an email. Additionally, Moodle provides an interactive platform and can facilitate communication among the users.

### **Procedure**

Students in the three intact classes took part in 16 teaching sessions and each session was held once a week. However, the data were collected in eight consecutive sessions while the participants were attending their classes during the semester. Each class took for one and a half hour during which the teacher timed the participants' performance. Before the treatment, the participants took an English proficiency test. During the pre-test session, the students wrote a five-paragraph narrative essay. There was no time restriction for doing the pre-test. While it might seem obvious, the participants took all of the tests (QPT, Pre-test, Post-test) in their classrooms.

The teacher gave instructions to complete the tasks in written form and read aloud to the participants. In addition, the teacher gave extra time for questions regarding task procedures as necessary. There was no time restriction, and the participants completed the tasks in a 90-minute class period. To justify the procedure of the present study, it is worth referring to the research done by Skehan (1998) and Skehan and Foster (2001) who found that one of the three axes to describe task difficulty is 'communicative stress', which refers to the performance conditions of a task like time limits, which we tried to control.

Since, the indispensable role of instructional material was to provide the basis for participants' understandings of the writing skill, the materials for scaffolding focused on practice and served as reference works for knowledge. According to Hyland (2003b), this category involved grammars, dictionaries, rhetoric, reference manuals, and style guides; however, their role was to support the learners' understandings of the writing skill through examples, explanations, and guidance. All students in the on-line classes had their personal computer at home or any other place to sign in the website and to post their writing and update their profile, at least two times a week. The teacher had informed the participants that she signed in every other day (three times a week) to check their profile and help them solve their problems and answer their questions while

completing the writing tasks. Prior to the instruction, the teacher explained the purpose of the online course, introduced the Moodle platform, how to post something to the website, and construct personal profiles.

To motivate the students to participate in the study and in collaborative writing tasks, the teacher introduced the benefits of using collaboration. She encouraged the participants to agree on a solution to each problem. The face-to-face group interacted collaboratively during all of the stages of the process writing, namely, generating ideas, clarifying the topic, outlining, structuring, and drafting. In addition, the group interacted at paragraph revising stage. In this case, the researchers could ascertain that the possible complexity improvement was because of the interactions that the face-to-face group had. It should be mentioned that during the experiment, the control group did not receive any scaffolding instruction on the writing tasks. The teacher administered a post-test of writing to all participants to evaluate their narrative writing performance in terms of complexity.

## DATA ANALYSIS AND RESULTS

Quantitative data analysis was used, in this study, to measure the complexity level of the participants' writings. Complexity measure was based on the count of T-units and clause analysis, as described in the production measures section. Considering Polio's (1997) recommendation, we formulated the guiding principles that clarified what constituted T-units, clauses, and errors. Since one of the main causes of disagreement between raters is a coding mistake, we gave Polio's guideline to the raters. Then, a second rater coded a random sample of 20 writings forming approximately 15% of the entire data. By using two raters, the researchers averaged the results. Inter-rater reliability index for the number of T-units, error-free T-units, number of clauses, and number of words identification was .77, .88, .82, and .81 respectively; discussion between raters settled all divergences and led to decontaminating of the protocols used for the identification of error-free clauses.

A one-way between group analysis of variance (ANOVA) was run to determine the effectiveness of mediational artifacts on the complexity level of the learners' writings. The independent variable was the type of mediational artefacts (ACM & CFF) and the dependent variable was complexity. In a bid to answer the research questions, both descriptive and inferential statistics were used to give a clear picture of the data and to answer the research question.

To decide on an appropriate statistical analysis, the researchers ensured that the four main assumptions for using a parametric one-way ANOVA were met. The first two assumptions (data should be independent and the dependent variable should be an interval-level measurement) were met. The other two assumptions behind ANOVA (distributional normality and homogeneity of variances) were examined. As for the normality of the distribution of the scores, the ratios of skewness and kurtosis over their standard errors were lower than  $\pm 1.96$  (Bae & Bachman, 1998). The assumption of homogeneity of variances was met, too. For the pretest and the posttest, in terms of the measure of complexity, the levels of significance for the observed F values were larger than .05 ( $p > .05$ ) which shows that the variances were homogeneous. Moreover, the results revealed that the pre-test for complexity was [F (3, 79) = 2.30,  $p = .08$ ] and post-test for complexity was [F (3, 79) = .51,  $p = .67$ ]. Prior to running the ANOVA, the two treatment groups were compared in terms of the complexity factor in their post writing tests, in order to check the homogeneity of the participants.

Table 1 below shows the descriptive statistics of the three groups' pretest and posttest complexity scores. As shown, the highest mean of the pretest belongs to the CFFG. The statistical significance of the observed differences was checked through ANOVA. The highest mean of the posttest belongs to the CFFG ( $M_{\text{postcom}} = .68$ ). The CFFG was followed by (a) ACMG ( $M_{\text{postcom}} = .54$ ), and CG ( $M_{\text{postcom}} = .51$ ) in descending order of mean score magnitude. The statistical significance of the observed differences was examined through a One-Way ANOVA.

**Table 1**  
*Descriptive Statistics of the Pretest and the Posttest by Groups*

Group		N	Mean	SD	SEM	95% Confidence Interval for Mean	
						Lower Bond	Upper Bond
CG	Pretest	6	.4825	.11863	.02966	.4193	.5457
	Posttest	6	.5144	.13211	.03303	.4440	.5848
ACMG	Pretest	20	.5135	.09516	.02128	.4690	.5580
	Posttest	20	.5450	.13276	.02969	.4829	.6071
CFFG	Pretest	21	.5390	.08843	.01930	.4988	.5793
	Posttest	21	.6814	.11783	.02571	.6278	.7351

As shown in Table 2 below, the results of the ANOVA indicated that the three groups were not significantly different in their total pretest scores as the observed F value was not significant

[F (2, 54) = 1.45, p = .24]. However, as the results revealed, the groups were significantly different in their total posttest scores as the observed F value was significant [F (2, 54) = 9.47, p = .00].

**Table 2**  
*One-Way ANOVA on the Pretests of Complexity by Groups*

		Sum of Squares	Df	Mean Square	F	Sig.
Pretest	Between Groups	.029	2	.015	1.454	.243
	Within Groups	.540	54	.010		
	Total	.569	56			
Post	Between Groups	.307	2	.153	9.478	.000
	Within Groups	.874	54	.016		
	Total	1.181	56			

Subsequently, post hoc scheffe test was run to find out where the differences lay. The results are shown in Table 3 below. The following results were obtained for the complexity post-test scores:

1. The CFFG ( $M_{\text{postcom}} = .68$ ) significantly outperformed the ACMG ( $M_{\text{postcom}} = .54$ ) (MD = .13, p = .03).

2.

3. There is no statistically difference between the ACMG ( $M_{\text{postcom}} = .54$ ) and the CG ( $M_{\text{postcom}} = .51$ ) on post-test of complexity (MD=.03, p = 1.00).

4. The CFFG ( $M_{\text{postcom}} = .68$ ) significantly outperformed the CG ( $M_{\text{postcom}} = .54$ ) on their post-tests (MD<sub>postcom</sub> = .16, p = .01).



**Table 3**  
*Post-Hoc Scheffe's Test; Posttest of Complexity by Groups*

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		
						Lower Bound	Upper Bound	
Pretest	ACMG	CFFG	-.02555	.03123	1.000	-.1027	.0516	
		CG	.03100	.03353	1.000	-.0518	.1138	
	CFFG	ACMG	.02555	.03123	1.000	-.0516	.1027	
		CG	.05655	.03317	.282	-.0254	.1385	
	CG	ACMG	-.03100	.03353	1.000	-.1138	.0518	
		CFFG	-.05655	.03317	.282	-.1385	.0254	
	Post	ACMG	CFFG	-.13643*	.03976	.003	-.2347	-.0382
			CG	.03063	.04268	1.000	-.0748	.1361
CFFG		ACMG	.13643*	.03976	.003	.0382	.2347	
		CG	.16705*	.04223	.001	.0627	.2714	
CG		ACMG	-.03063	.04268	1.000	-.1361	.0748	
		CFFG	-.16705*	.04223	.001	-.2714	-.0627	

\*. The mean difference is significant at the 0.05 level.

## DISCUSSION AND LIMITATIONS

The collaborative instructional approach led to the outperformance of CFFG over ACMG approach. As shown in the result section, the students of collaborative group produced texts that were more complex than those who worked individually via ACM context and those who did not receive any kind of mediation. Therefore, the CFFG benefited more from the mediational artifact. The results of the statistical analysis revealed that CFFG outperformed the CG. Moreover, ACMG did not differ significantly from the CG, although the ACMG showed some progress but the difference between these two groups was not significant. The findings of the present study can be discussed in the light of the state of the art theory and practice. Many theories in second language acquisition supported the importance of group work on learners' achievement (Donato, 1994; Ellis, 1994; Long, 1983; Schmidt, 1990; Storch, 2002; Swain & Lapkin, 1998; Wigglesworth & Storch, 2009). Concerning the impact of collaboration on the students' improvement, the findings of this investigation were in line with the results of some previously conducted studies (e.g., Donato, 1994; Ohta, 2001; Storch, 2002; Swain, 2000). The result of all these studies showed that pair work provided the opportunity

for learners to engage in interaction and co-construction of knowledge and had a positive effect on language development. The students working in pairs or small groups use L2 more in comparison to teacher-fronted classes (Long & Porter, 1985). In the analysis of pair, dialogues Wigglesworth and Storch (2009) found that when learners produced their scripts in pairs, the process of writing afforded them to interact on the different features of the writing skill. They also added that in the process of generating ideas, learners promoted to collaborate about the content of their essays. Moreover, the probability of problem solution in collaborative dialoguing seemed to be higher, owing to the availability of peer feedback as well as the possibility of dyadic knowledge pooling (Swain, 2000, 2006). Moreover, giving and receiving immediate feedback on language was the opportunity that the students afforded in writing collaboratively, an opportunity that was missing when students wrote individually.

This study also supports the findings of earlier studies in relation to the mediatory role of pair work in language learning and specifically in writing improvement in terms of complexity. The findings of this study revealed that students produce texts that are more complex when they did

the writing tasks collaboratively in the classroom context rather than the time they produced the texts individually in asynchronous computer mediation context. In a similar vein, Storch (2005) compared the texts generated by nine pairs with text produced by five individual students in terms of complexity. The participants were asked to produce texts based on a graphic prompt with no time restriction. The findings demonstrated that the texts produced by pairs were more complex, but the texts were shorter in terms of total number of words. In addition, in a study Pae (2011) compared 24 EFL Korean college students' essays produced by pairs with essays generated by individuals and found that when students produced essays collaboratively the complexity of their scripts increased. The findings of the current research were also in line with Glendinning and Howard (2002) who found that texts produced collaboratively were more complex than the texts produced individually. Wigglesworth and Storch (2009), however, in their study found that collaboration did not affect the complexity factor in argumentative essays.

When asynchronous computer mediation was the focus of consideration, the results of this study indicated that, ACMG did not show progress after instruction. The ACMG produced more complex texts in comparison to no mediation group, but the difference was not significant. This study lends support to the findings by Chen (2005) who investigated the influence of traditional class instruction with or without computer assisted learning. This study is also in line with the study conducted by Young and Duncan (2014) who asked their participants to rate instructions in 172 online and 470 face-to-face courses. The results of their study revealed that face-to-face classes were rated significantly higher than the online courses when considering "communication, faculty/student interaction, grading, course outcomes, and overall evaluation" (p. 70).

In asynchronous mode of CMC, the delay of the interaction changes its nature, making this interaction more like the dynamics of the face-to-

face classroom interaction settings. As Warschauer (1996) stated, asynchronous interactions result in more syntactically complex language output through the use of subordinate clauses and longer sentences that are an indicator of active cognitive processes involved in text construction. Although the participants of ACMG had more time to construct the texts and were familiar with both audience expectations and the nature of performed tasks, the results signified that CFFG significantly outperformed ACMG in terms of complexity. Asking the students to do the tasks collaboratively might encourage them to think critically and focus on both meaning and form than during asynchronous computer-mediated communication interaction.

Asynchronous computer mediation (ACM) enables language learners to engage in interactions with a wider range of interlocutors actively (Beauvois, 1994, 1997; Kern, 1995) because the interactions are both place-independent and time-independent. However, the results of the present study ran against this. Shang (2007) investigated the effect of implementing email exchanges on learners' writing performances in terms of syntactic complexity, grammatical accuracy, and lexical density. The results indicated that exchanging email messages of the participants with their peers improved the writing performance of students' syntactic complexity. Furthermore, Passig and Schwartz (2007) compared the quality of graduated students' writing assignment in two different contexts (collaboratively produced synchronous vs. collaboratively produced face-to-face) and found that the students' assignments had a higher quality when produced on an online synchronized context.

There are some limitations influenced the generalizations made by this study. One of the problems was the restricted sample of written texts that the researchers obtained. The sample was limited to students from four EFL writing groups in the field of Teaching English as Foreign Language (TEFL) and English Translation. The next limitation referred to the measures of language ability. In this regard, the researchers

were concerned with the indirectness of complexity as the measurement tool of the present study. This study could have rendered more generalizable outcomes if the number of participants and the number of writing samples had increased. Moreover, several uncontrolled variables including motivation, attitude, and stress might have affected the results of this study. In addition, the idiosyncratic nature of writing activity might have jeopardized the results of the study. Last but not the least, this study could be expanded to include more variables, such as learning styles and level of learners' willingness to communicate, which were ignored due to the scope of this work.

## CONCLUSIONS

The present study compared the impacts of two different mediating artifacts ACMG and CFFG on the complexity of the participants' writings. As the findings of this study showed, when students worked in pairs on collaborative writing tasks in face-to-face contexts, they produced more complex texts than those who worked individually on asynchronous computer-mediated contexts. In this regard, collaboration in the classroom context assisted learners in the co-construction of knowledge by the help of their peers. In addition, it could enable the teacher to recognize the developmental patterns of writing scripts processed by the learners while performing the writing tasks. Thus, as Vygotsky (1978) argued, collaboration played the role of mediating artifact. Vygotsky's model of mediated learning consisted of a subject (in our case, the learners who worked in pairs) and the object (in our case, the writing tasks of a learner in L2) stood on the top and helped the students to regulate themselves in the process of completing the writing tasks, then, the appropriate development occurred. On the contrary, when the appropriate development did not occur (i.e. ACM instructional approach- as in the current study) the subject could not mediate the action on the object, then the learner needed to resort to an artifact in order to provide assistance; however, the results

showed that they did not benefit from this artifact. As a result, the participants of ACM instructional approach did not show any advantage compared to no mediation (CG).

We need to investigate the concept of mediation more. The findings of this study hold apparent implications for the teaching English in general and writing in particular. This study shed light on the notion of mediating artifact and the way it associates with the development of L2 writing ability. In fact, the implementation of 'interaction' in teaching L2 writing could be an appropriate response to the problems of the current English writing classes in Iran. The findings provided more insights into the progressive processes, which are associated with the development of L2 writing ability within Zone of Proximal Development (ZPD) through receiving peer feedback. Perhaps the organization of the mediating artifacts applied in this study could be beneficial to the Dynamic Assessment (DA) researchers who seek for understanding how to offer mediations in an EFL writing classroom. More specifically, the results attained from this study offered a development in SCT-based research on the notion of group learning.

This study was simply an opening through which many innovative studies in the field of Collaboration and CMC could be developed. One of the promising lines of research would be a consideration of discourse analysis on peer-peer interaction and student-teacher interaction. These interactions could be examined when the students work in different mediating contexts. Moreover, discourse used by pairs of male group could be compared with pairs of female and or male-female groups. Finally, an important area worthy of investigation would be to scrutinize the form of mediation each pair gets from the peer in a joint activity. Moreover, interaction sessions could be transcribed by the future interested researchers to detect the mediations gave by peers in each pair, discriminate teacher mediation from peer mediation, and then examine them in terms of typology of peer meditational moves/strategies.

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### **Biodata**

**Nasibeh Bagherpour** is a PhD candidate in the field of Teaching English as Foreign Language (TEFL) at the Science and Research Branch, Islamic Azad University, Tehran, Iran. She is a full-time faculty member at the South Tehran Branch of Islamic Azad University. She has taught the units in relation to language testing, research methodology, linguistics, and general English university courses since 2007. Her research interests include scaffolding instruction, issues in sociocultural theories, computer assisted language learning, second language writing instruction, collaborative and cooperative learning, and dynamic assessment.

Email: ns.bagherpour@gmail.com

**Dr Mojgan Rashtchi** is associate professor of Applied Linguistics and head of the department of Teaching English as Foreign Language (TEFL) at the Faculty of Foreign Languages at the Islamic Azad University, North Tehran Branch. She has worked in the field of foreign language education for 25 years. She has published many articles and books on different topics related to the field. In addition, she has participated in several national and international conferences. Her areas of interest include second language teaching research, P4C, first language acquisition, and second language learning.

Email: m\_rashtchi@iau-tnb.ac.ir

**Dr Parviz Birjandi** is a professor of English education from the University of Colorado. He is a faculty member at the Faculty of the English Language and Literature at the Science and Research Branch, Islamic Azad University, Tehran. He has published many articles in the field of Teaching English as Foreign Language (TEFL) and Teacher Education. He has also authored many English textbooks for high school and university levels.

E-mail: pbirjand@srbiau.ac.ir