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Brainstorming Revisited: Does Technology Facilitate Argumentative Essay Writing?

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Abstract

Brainstorming, as a pre-writing activity, facilitates the process of generating ideas and helps organize learners' thoughts to get involved in writing activities. The present convergent mixed methods study investigated whether the integration of technology and brainstorming could affect the argumentative writing of EFL learners. Initially, 68 university students in three intact classes (n=26, n=23, n=20) were exposed to mobile-assisted brainstorming (n=26), wordle-assisted brainstorming (n=23), and cooperative brainstorming (n=20) in the quantitative phase. For qualitative data collection, each session, some paper strips with three questions on them were distributed among the groups to help the researchers discover the participants' learning processes and perceptions during the instruction. Sixty-five participants who had attended all treatment sessions took one immediate post-test on a seen and one delayed post-test on an unseen topic. Two one-way analysis of variance tests (ANOVA) examined whether there were statistically significant differences between the means of the groups. The results revealed that the wordle-assisted brainstorming group outperformed the two other groups in both post-tests. The findings supported the use of word clouds as a cognitive activity in promoting the argumentative essay writing of Iranian EFL learners. The study has implications for teachers, practitioners, and educators.

Keywords: *Brainstorming, Essay Writing, Mobile Learning, Pre-writing Activities, Wordle, Word Clouds*

Introduction

The enormous number of studies on different aspects of writing has contributed to understanding how learners can perform successfullyin L2 writing classes. Some studies have focused on writing strategies(e.g., Karim, Maasum, & Latif, 2018; Mastan, Maarof, Embi, 2017; Machili, Papadopoulou, Kantaridou, 2019; Rashtchi & Karami, 2015), while others have dedicated their attention to classroom practices (e.g., Elola, & Oskoz, 2017; Everson, 2011; Gerde, Bingham, &

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Wasik, 2012; Keck, 2014; Rashtchi, Porkar, & Ghazi Mir Saeed, 2019). However, the objective of all studies has been improving ESL/EFL learners' writing skills. Despite the extensive research on finding the most appropriate way of instruction, the topic remains challenging for teachers as well as educators, forging ahead studies on different aspects of the skill. One reason for such a quest is the role writing plays in gaining mastery over English language learning as well as its potential for stimulating thinking skills (Rashtchi, 2019; Sheikhy Behdani & Rashtchi, 2016, 2019). The complexity of the writing process necessitates the employment of a variety of strategies, techniques, and activities in the classrooms.

One source of complexity comes from the multiplicity of tasks learners should employ while engaged in writing besides cognitive involvement and mental concentration. Student writers not only should get involved in generating ideas but also, they need to analyze, organize, and revise while writing. Teachers who usually confront students' complaints regarding the lack of ideas in writing classes use brainstorming, which, due to research findings, can provoke thoughts and encourage learners to get started (e.g., Helen, Paul, & Hellen, 2020; Rahmawati, 2019; Nugraha & Indihadi, 2019; Rashtchi & Beiki, 2015).

However, nowadays, in a world invaded by technology, conventional classroom practices seem not to be attractive for learners, particularly when they need time, focus, and tolerance. The advent of Web 2.0 technologies such as blogs, Facebook, Telegram, and YouTube also magnifies the distance between typical classes and the modern world the learners encounter outside the classrooms.Thus, the use of technology to create an alternative way of implementing techniques and strategies can fascinate learners and instigate more engagement in classroom practices. The researchers' questfor creating variety inwriting classes and facilitating the skill for EFL learners encouraged them to design the present study. They believed that focusing onthe problem of lack of sufficient knowledge regarding the subject under scrutiny could promise successful writing and, meanwhile, foster an active classroom environment. Their intention was intensified by research findings on the efficacy of technology in the process of ESL/EFL learning (e.g., Abdul Razak, Ameruddin, &Ithnin**,** 2018; Rashtchi & Aghili, 2014; Rashtchi & Khoshnevisan, 2008; Rashtchi & Tollabi Mazraehno, 2019; Nejati, Jahangiri, & Salehi, 2018). Such findings urged the researchers to examine whether incorporating technology in pre-writing activities could have positive impacts on the writing ability of EFL learners. They assumed that the integration of technology and brainstorming could be fascinating and might boost learners' involvement inwriting skills. The use of technology also could revitalize the lost attractionof writing classes. Therefore, this study compared mobile-assisted brainstorming and wordle-assisted brainstorming with typical cooperative brainstorming and followed two purposes. First, it sought to investigate which of the techniques could be more constructive in enhancing EFL learners' writing skills. Second, it explored how the participants perceived the use of alternative ways of brainstorming in writing classes.

Literature Review

Writing classes are usually challenging for students since they need to use several linguistic and cognitive skills before, while, and after composing their writings (Selvaraj & Abdul Aziz, 2019). L2 writers are bound to focus simultaneously on both higher-level skills (i.e., planning and organizing) and lower-level skills (i.e., word choice, punctuation, and spelling). However, one problem before getting started is finding worthwhile ideas for writing, which underscores the importance of brainstorming as a pre-writing activity. For developing a broader range of concepts, it is necessary to view an issue from different perspectives. By employing brainstorming, teachers encourage students' reflection on a topic and help them access a plethora of ideas. Several researchers have allocated different roles to brainstorming, such as activating prior knowledge (Owo, Idode, & Ikwut, 2016; Nugraha & Indihadi, 2019), creating ideas (Rahmawati, 2019), increasing motivation (Mohammad & Hussein, 2013), and stimulating thinking abilities (AlMutairi, 2015; Taleb, Hamza, & Wefky, 2013).

A review of the literature shows that the majority of researchers agree on the productivity of brainstorming either in its typical form (e.g., Abedianpour & Omidvari, 2018; Ammade & Khairil, 2018; Mohammad & Hussein, 2013; Zarei & Feizollahi, 2019) or in integration with some technology (Vijayakumar, 2011). However, despite the several advantages stated in the literature, it seems that some researchers attribute some drawbacks to brainstorming. For example, Isaksen and Gaulin (2005) put forth thatsome factors such as fear of being judged, feeling the pressure of following a particular line of thinking, and losing motivation for working in groups can lead to the inhibition of some learners.

The ever-increasing development of technology has led to the emergence of a variety of educational technologies that have altered the conventional language teaching classes. One such instrument is the mobile phone, which can provide language learners with an immense amount of information regarding different subjects and help them gain numerous educational experiences (Kukulska-Hulme & Traxler, 2007). Various studies support the use of mobile phones for the improvement of writing (e.g., Amoush, 2015; Siddique & Nair, 2015) as well as other language skills and subskills of the English language. (e.g., Abdou, 2014; Abdul Aziz, Hassan, Dzakiria, & Mahmood, 2018**;** Hsu, Hwang, & Chang, 2013; Wang & Smith, 2013). The flexibility of mobile-based learning activities contributes to their application in different learning contexts because they can engage, motivate, and activate the learning mindset of the language learners (Ciampa, 2014). However, their use in the classroom as a source to brainstorm learners was a new role that this study attempted to examine. The fact that learners could get engaged in individual or cooperative brainstorming based on their preferences and pace was the reason for the use of mobile phones in one of the treatment groups.

Wordle, another tool used to brainstorm the participants,together with other applications such as wikis, social networks, and blogs, is associated with Web 2.0 technology. Wordle and different types of word clouds (Tag Crowd, Make Cloud, To Cloud) have been implemented by teachers to facilitate learning and teaching (Ramsden & Bate, 2008) as they can provide an active classroom situation. Wordle, initially developed by Feinberg (2009), is substantially one of the

widely available word cloud generators. It shows the frequency or importance of words in a text and permits viewers to have "an overview of the main topics and the main themes in a text and may illustrate the main standpoints held by the writer of the text" (McNaught & Lam, 2010, p. 630).

Some researchers have examined the use of word clouds for educational purposes. For example, Xie and Lin (2019) reported that word clouds could enhance the participants' learning by contributing to building schemata. Reyes-Foster and deNoyelles (2016) also showed that word clouds, combined with online discussions, had a positive impact on the critical thinking of the participants. In their study, Brooks, Gilbuena, and Koretsky (2014) foundthat the application of word clouds as an analytical technique could be beneficial for the assessment of learners' written explanations and reflections. Baralt, Pennestri, and Selvandin (2011) reported that using wordle promoted the overall writing performance, lexical acquisition, and writing strategies of Spanish L2 learners. The researchers of the current study used wordle as a technology-based activity, which could be compared with mobile-based brainstorming but was more controlled since learners were provided with a list of concepts to generate ideas.

All in all, the purpose of this study was to examine the differential effects of three types of brainstorming on promoting Iranian EFL learners' writing skills. The researchers were also interested in exploring the processes that the participants went through while exposed to different types of treatment. A convergent mixed method design helped the researchers to fulfill the objectives. In this design, qualitative and quantitative data are gathered "roughly the same time and then integrate the information in the interpretation of the overall results (Creswell, 2014, p. 15). The quantitative phase had a nonequivalent control group pretest-post-test design. For the qualitative part, the researchers gathered data each session immediately after the classroom instruction about the participants' learning experiences and perceptions. Students' comments could also help researchers improve classroom procedures. The dependent variable in the quantitative phase was the writing ability, and the independent variable was brainstorming manipulated in three different modes. The following research questions contributed to the achievement of the objectives.

RQ_1: Do the three types of brainstorming (mobile-assisted, wordle-assisted, and typical cooperative brainstorming) have different impacts on Iranian EFL learners' argumentative writings?

RQ_2: What do the results of the qualitative phase elucidate regarding the efficacy of the type of instruction the participants received?

RQ_3: What is the participants' perception regarding the role of the different types of treatment in eliminating errors and developing their argumentative essay writing?

Method

Participants

Initially, the participants were 68 (n1= 26, n2=22, n3=20) male and female learners in three intact classes selected based on convenience sampling. After the treatment, three students could

not take the post-test, and the number of participants reduced to 65. They were undergraduate students majoring in English Translation or TEFL at Islamic Azad University, North Tehran Branch. They had taken an essay writing course in the fifth semester of their study. The researchers randomly assigned the three intact classes into two experimental groups and one control group. One of the researchers taught the mobile-assisted (n=26) and the wordle-assisted (n=22) groups, and the other instructedthe cooperative brainstorming group (n=20). However, both researchers discussed and agreed on the classroom procedures of each session, cooperated on preparing the weekly lesson plans and correcting the assignments.

Instruments

The instruments used to gather quantitative data included a Preliminary English Language Test (PET), a writing pretest, two writing post-tests, and a writing rubric. The PET (Sample Test 6) retrieved from https://www.cambridge-examshad 43 questions consisting of reading and writing modules. The total score each test taker could gain was 60. The reliability of the test computed viaCronbach's alpha showed that the test was reliable (r=0.82).

The next instrument was a writing pretest on "*Explain what makes you a unique individual*" taken from 501 writing prompts. The researchers selected the topic because it was a general one and did not need any expert information. The two other instruments were two writing post-tests. One was the same as the pretest, and the other was an unseen topic (*Education must be free for everyone*). The reason for administering two post-tests was two-fold. First, comparing the pretest and post-test of the participants on the same topic could provide a clearer picture of their improvement regarding the writing ability. Second, writing on an unseen topic could decrease the practice effect and increase the internal validity of the study.

The writing rubric FIPSE Project adopted from Allen (2009; Appendix A) was used to rate the writings. Before rating, the researchers reviewed the components of the rubric and agreed on how to correct the essays. Then they cooperated on scoring three compositions to arrive at a mutual understanding regarding the elements of the rubric.

The researchers prepared some paper strips, printed three phrases on them: "*what I think about the class today*, *what I learned/liked today*, and "*what I did not learn/like today*" and distributedamong the participants at the end of each session. The information gathered through the paper strips were a valuable source of information for the qualitative phase.

Materials

The coursebook was *Academic writing* (Bailey, 2003). The researchers also used a series of topics for practicing writing in the classroom. Before the study, the researchers prepared a list of 15 issues adopted from 501 writing prompts or from the internet, and in the first session, asked the participants to select eight of the ones that they preferred most. The researchers selected six of the topics for the treatment.

Procedure

The treatment took 14 sessions, each session 90 minutes. The first and last ones were allocated to taking the pretest and post-test on a seen topic. Twelve sessions were devoted to practicing argumentative writing. In the first session, the participants sat for the PET and took the writing pretest. They also selected their favorite topics from the list prepared by the researchers. In the second session, the teachers briefed the participants on the type of instruction and classroom activities and explained the function of the paper strips. Likewise, the teachers created a WhatsApp group for each class to enable sharing ideas. Each session, the teachers spent 20 to 30 minutes to teach the coursebook, which comprised the rules and mechanics of writing. Writing on each topic took two sessions. Table 1 shows the topics covered during the instruction.

Table 1.
List of Topics Practiced in the Groups

Sessions	Topics
Session 1: Pretest	Explain what makes you a unique individual
Sessions 2 & 3	Explain how different modern life would be without computers
Sessions 4 &5	The advantages of using technology in the classroom
Sessions 6&7	The role of early literacy in the future success of children
Sessions 8 &9	Define the meaning of true friendship to you
Sessions 10 & 11	Describe a significant environmental problem and what you believe should be done about it
Sessions 12 & 13	Explain the causes and effects of prejudice
Session 14: Post-test	Explain what makes you a unique individual
Final Exam session: performed by the college administration on the unseen topic	Education must be free for everyone

Mobile-assisted Brainstorming Group (MABG)

Each session, first, the teacher asked the students to form groups of three members. Then he wrote the topic of the day on the board with no further explanations and asked the participants to use their mobile phones and search for some information about the subject, take notes, and prepare an outline. They were free to interact about the issuein their groups or with other groups. This stage usually took about 30 minutes. Then the teacher checked the outlines and selectedone or two, which seemed to be more comprehensive than the others, and shared them via WhatsApp. The class discussed the issues mentioned in the outline. In the next step, the students started to draft their essays individually.

The following session began with the teacher's instructions on writing covering different chapters of the coursebook. Then the students reviewed the outline prepared in the previous class available in the WhatsApp group, provided comments, or asked the teacher for clarifications. Afterward, they started to write or finalize their essays and hand them in. The teacher corrected the papers and gave both linguistic and metalinguistic feedback to the students' errors. A list of the most frequent mistakes in the writings shared on the WhatsApp group helped the students

focus on grammar and rules of writing. The participants were supposed to circle those errors which applied to their compositions. At the final stage, the learnersrevised their essays at home and submitted them the following session.

Wordle-assisted Brainstorming Group (WABG)

Before the class, the teacher searched the internet, read about the topic, found some keywords, and prepared a wordle. In the class, first, the teacher asked the students to make groups of three; then, he shared the wordle via WhatsApp. The students started examining the wordle and talking about the concepts in their groups. They tried to generate ideas based on the keywords, take notes, and prepare an outline. The teacher shared one or two of the outlines, which seemed more inclusive on WhatsApp. The next step was to start drafting essays. In the subsequent session, the students in theirgroups reviewed the outline and the wordle and beganwriting. The teacher corrected the compositions, and similar to MABG, he prepared a list of the most frequent errors and shared them in the WhatsApp. The learners were expected to review the list and find the ones which were relevant to their compositions. As an assignment, they had to revise their essays at home and hand in them to the teacher. Figure 1 is a word cloud prepared by wordle on *"The role of early literacy in the future success of children."*

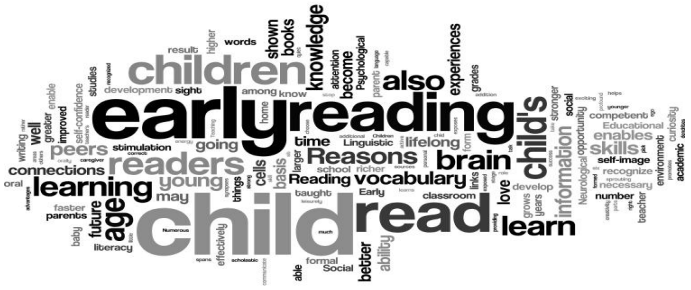

Figure 1. Sample Wordle prepared to brainstorm learners

Cooperative-brainstorming Group (CBG)

The teacher started the class by introducing the topic of the day after she had divided the class into groups of three. The groups had ten minutes to negotiate the issue. Then the teacher wrote the students' ideas on the board and asked them to add as many as keywords they could. The students were supposed to discuss the topic in the groups and prepare an outline. The teacher shared the most comprehensive onesin the WhatsApp and asked the students' opinions about the issues. The final version of the outline prepared cooperatively was shared via the WhatsApp to help the groups develop drafts. In the following session, the groups reviewed their drafts and developed essays cooperatively. The teacher corrected the papers and provided linguistic and metalinguistic feedback on the errors. Like other groups, the participants had to re-write theircompositions at home and submit them to the teacher.

Post-test

The first post-test, which was the same as the pretest, was administered on the 14th session of the class to 65 students. Three of the participates in MABG had quit the course during the treatment. The post-test on the unseen topic was administered two weeks after the final session.

Results

Quantitative Results

Table 2 shows the descriptive statistics of the three groups on PET. As shown, the means of the MABG (M= 51, SD=1.5), WABG (M=50, SD=1.2), and the CBG (M=50, SD=1.1) were very close to each other. The skewness ratios of the groups (1.88, 0.054,0.34, respectively; obtained from dividing statistic by standard error) were between ±1.96, indicating that the distributions of the scores were normal.

Table 2.

Descriptive Statistics, PET

	N	Min.	Max.	Mean	SD	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
MABG	26	47.00	53.00	51.2308	1.47804	-.914	.486
WABG	22	48.00	53.00	50.6818	1.21052	-.027	.491
CBG	20	49.00	53.00	50.8000	1.10501	.177	.512
Valid N (listwise)	20						

A one-way analysis of variance (ANOVA) could reveal whether there were any statistically significant differences between the groups regarding the general English proficiency test. The results of the Levene's test showed that the assumption of the homogeneity of the variances was met [F (2,65) =1.104, p>0.05]. As Table 3 shows, there were no statistically significant differences between the means of the groups at the outset of the study, F (2,65) = 1.21, p>.05.

Table 3.

One-way ANOVA, PET Scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.044	2	2.022	1.210	.305
Within Groups	108.588	65	1.671		
Total	112.632	67			

Table 4 shows the descriptive statistics obtained from the performance of the groups on the writing pretest. As shown, MABG (M=11.92, SD=.97), WABG (M=11.9, SD=.92), and CBG (M=11.86, SD=1) had very close means and standard deviations in the writing pretest.

Table 4.
Descriptive Statistics for Writing Pretest

	N	Mean	SD	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
MABG	26	11.9231	.97665	.19154	11.5286	12.3176	10.00	13.00
WABG	22	11.9091	.92113	.19639	11.5007	12.3175	10.00	13.00
CBG	20	11.7500	1.16416	.26031	11.2052	12.2948	10.00	13.00
Total	68	11.8676	1.00602	.12200	11.6241	12.1112	10.00	13.00

The researchers performed a one-way ANOVA to examine whether there were any statistically significant differences between the groups regarding the writing skills at the outset of the study. Before running the test, the researchers ensured that the variances of the groups were homogeneous, F (2,65) =1.291, p>0.05. Table 5 indicates the results of the one-way ANOVA pointing to no statistically significant differences between the means of the groups, F (2,65) = .190, p>.05.

Table 5.
One-way ANOVA for Writing Pretest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.394	2	.197	.190	.827
Within Groups	67.414	65	1.037		
Total	67.809	67			

Table 6 illustrates the descriptive statistics for the seen and unseen post-tests. As shown, the means of the groups are higher in the seen than the unseen test. WABG has the highest means for the seen (M=15.31, SD=.94) and unseen (M= 15.63, SD=.85) tests compared to MABG's seen (M=14, SD= 1) and unseen (M= 13.60, SD=1.03) tests and CBG's seen (M=14.55, SD=.6) and unseen (M=14.35, SD=.74) tests.

Table 6.
Descriptive Statistics for Seen and Unseen Posttests

	N	Mean	SD	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Post-test Seen								
MABG	23	14.0435	1.02151	.21300	13.6017	14.4852	12.00	16.00
WABG	22	15.3182	.94548	.20158	14.8990	15.7374	14.00	17.00
CBG	20	14.5500	.60481	.13524	14.2669	14.8331	13.00	15.00
Post-test Unseen								
MABG	23	13.6087	1.03305	.21541	13.1620	14.0554	12.00	15.00
WABG	22	15.6364	.84771	.18073	15.2605	16.0122	14.00	17.00
CBG	20	14.3500	.74516	.16662	14.0013	14.6987	13.00	15.00

The Levene's test for the seen F (2,62)=2.26, p>0.05, and the unseen F (2,62)=1.589, p>0.05 post-testsshowed that the homogeneity of variances was assumed, and thus it was legitimate to perform ANOVA (Table 7).

Table 7.
Test of Homogeneity of Variances for Seen and Unseen Post-tests

		Levene Statistic	df1	df2	Sig.
Post-test Seen	Based on Mean	2.262	2	62	.113
Post-test Unseen		1.589	2	62	.212

A one-way between-groups ANOVA explored the impact of three modes of brainstorming on the writing ability of the participants (Table 8). The results show that there was a statistically significant difference in writing scores for the three groups: F (2, 65), p<.05. The effect size, calculated using eta squared, was 0.27. Using the guidelines proposed by Cohen (1988, pp. 284-287), the effect size was large. In other words, 27 percent of the change in the participants' writing ability was due to the independent variable.

Table 8.
One-way ANOVA for Seen Post-test

	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Between Groups	18.459	2	9.230	11.755	.000	0.274
Within Groups	48.679	62	.785			
Total	67.138	64				

Posthoc comparisons using the Scheffe test indicated that the mean score for the WABG (M=15.32, SD=.94) was significantly different from MABG (M=14.04, SD=1.02) and CBG (M=14.55, SD=.60). However, no significant differences were observed between MABG and CBG group.

Table 9.
Post Hoc ScheffeTest for Group Comparisons on Seen Post-test

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MABG	WABG	-1.27470*	.26425	.000	-1.9375	-.6120
	CBG	-.50652	.27091	.183	-1.1860	.1730
WABG	MABG	1.27470*	.26425	.000	.6120	1.9375
	CBG	.76818*	.27376	.025	.0816	1.4548
CBG	MABG	.50652	.27091	.183	-.1730	1.1860
	WABG	-.76818*	.27376	.025	-1.4548	-.0816

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

Another one-way ANOVA was run to examine the effect of three modes of brainstorming on the writing performance of the participants on the unseen topic (Table 10). The results show that there was a statistically significant difference in writing scores for the three groups: F (2, 65), p<.05. The effect size, calculated using eta squared, was 0.49, indicating a large effect size.

Table 10.
One-way ANOVA for Unseen Post-test

	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Between Groups	47.096	2	23.548	29.723	.000	0.49
Within Groups	49.119	62	.792			
Total	96.215	64				

Table 11 illustrates the results of the posthoc comparisons using the Scheffe test. The mean score for the WABG (M=15.63, SD=.85) was significantly different from MABG (M=13.60, SD=1.03) and CBG (M=14.35, SD=.74). However, there was no statistically significant difference between the mobile and control groups.

Table 11.
Post Hoc ScheffeTest for Group Comparisons on Unseen Post-test

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MABG	WABG	-2.02767*	.26544	.000	-2.6934	-1.3619
	CBG	-.74130*	.27214	.030	-1.4238	-.0588
WABG	MABG	2.02767*	.26544	.000	1.3619	2.6934
	CBG	1.28636*	.27500	.000	.5966	1.9761
CBG	MABG	.74130*	.27214	.030	.0588	1.4238
	WABG	-1.28636*	.27500	.000	-1.9761	-.5966

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

Qualitative Results

The researchers collected the paper strips each session and analyzed them. The first phrase, "*what I think about the class today,*" helped the researchers learn about the usefulness of the classroom procedure during the treatment. MABG, more than the other two groups, showed interest in the classroom procedure. The participants were fascinated by using their phones in the class. Also, they believed that the use of mobile phones for learning about a topic lowered down their anxiety, changed their attitude toward writing skills, and gave a positive atmosphere to the class. As the students' comments revealed, for most of the participants, using rather than switching off mobile phoneswas a pleasurable incident. However,some participants considered the use of the device ineffective because it hindered thinking, distracted attention, and persuaded themto copy ideas from the internet or to get involved in the social media like Telegram and Instagram instead of doing their chores.

For WABG and CBA, the classes were not as impressive as the MABG. Some of the notes in the initial sessions reflected objections against the classroom activities in WABG. The leanersdoubted the usefulness of wordless for practicing writing and mentionedthat utilizing the concepts in the word clouds required cognitive involvement, which was impossible during the limitedtime of the class. However, the comments from the fifth session showed a change in the attitude of the learners. They provided more encouraging responses regarding the applicationof the word clouds and stated that they had learned how to relate the concepts, categorize them, and create ideas. They believed that the classroom procedure was very beneficial and that they felt excited about learning how to proceed with writing essays. They contended that at the beginning of the course, using wordle seemed impractical, but later they found it quite exciting and productive.

The CBG, in general, was positive from the beginning to the end of the course. The learners liked the classes, enjoyed cooperative learning, and working with peers. Some students believed that the teacher should have a more assertive role and should help them in their effort to distinguish between the appropriateness of the ideas stated in the class. However, they emphasized that writing was a demanding activity, and selecting ideas and categorizing them was time-consuming and even dull.

Participants in the three groups expressedconstructive ideas regarding preparing outlines before writing and thought they helped organize their thoughts. Moreover, all participants insisted on the benefits of WhatsApp since they could use the materials with more ease at home or in the class. The groups also asserted that they enjoyed the carefully pre-planned classroom practices andappreciated the clarity of teachers' expectations.

The students' comments on the two phrases of "*what I learned/liked today*" and "*what I did not learn/like today*" helped the researchers find out the participants' writing problemsand answer the third research question. The participants' responses pointed at the merits and demerits of each type of treatment. The primary advantages stated by the groups was that they realized how to organize their notes and arrange them to form an essay. They also declaredthat they had learned to think about reasons for their positions regarding a topic.

One of the major themes mentioned by the respondents referred to the grammatical points they had learned each session. Subject-verb agreement, coordination of tenses, avoiding the use of prepositions at the end of a sentence, dangling modifiers, unclear antecedents, misplaced adverb use, and excessive use of passive voice were the most stated grammatical points. Some of the themes on the paper strips were related to the style of writing, such as avoiding too long sentences, repetition of the same concept, avoiding multi-topicality, and excessive and inappropriate use of connectors.

For MABG, the answer to "*what I learned/liked today*" was mainly concerned with how to find appropriate materials, extract ideas from long texts, skim when looking for information, and focus on the coherence of the essays they read. In answering the second phrase "*what I did not learn/like*," the respondentsmainly mentioned that they had problems with finding and

eliminating repetitious ideas, time-budgeting, and dealing with the bulk of the information they found on the internet.

On the other hand, WABG statedthat they had learned to think about the accuracy of their essays. They learned to avoid multi-topicality, search for vocabulary, look for synonyms and keywords, and prepare graphic organizers. However, the participantspointed outthat they had difficulty injudging the importance of ideas, writing concisely about all issues, and managing form and content simultaneously.

In answering "*what I learned/liked today,"* CBG members stated that they had learned to pay attention to others' opinions, respect others' viewpoints, cooperate with classmates, and realize that people may perceive similar issues differently. The group's responses to "what I did not learn/like" was mostly concerned with differentiating between ideas, organizing them, and relating them. They also complained about not learning how to expand their vocabulary knowledge. Some of the participants pointed to their hesitation in opposing general opinions of the class and their reluctance to express personal ideas.

Discussion

The present study sought to compare the effects of using three different types of brainstorming on Iranian EFL learners' writing ability. The statistical analysis revealed that the use of wordle was significantly more effective than the other two techniques employed in the study. However, comparisons of the mean scores of the pretest and post-tests of the other two groups showed the efficacy of thetreatments in improvingthe argumentative essay writing, as well. The finding that the means of MABG and CBG on unseen delayed post-testwas lower than the immediate post-test showed the superiority of using word clouds. The small increase observed in the mean of WABG on the unseen delayed post-test indicates the lasting effect of the treatment and underscores the role of practice effect in MABG and CBG. The resultslead to an affirmative answer to the first research questionin favor of WABG.

One reason for the finding arises from the type of input received by WABG.Word clouds presented conceptsin isolation and provided learners with a "visual stimulus" (Randall, 2007), which activated learners' minds to work on the words, their meanings, and theirrelations to each other.To do so, learners had to use their world knowledge as well as language knowledge leading to active mental involvement.Such involvement facilitated the retention of ideas inherent in words and eased the process of composing essays. In other words, the input received via wordle matched with the information stored in the minds of learners about that word and led tothe generation of ideas.Word clouds as cognitive tasks tapped learners' attention and working memory to manipulate the information on a subject and blocked the irrelevant data. In this study, the skills related to comprehension and processing skills, in-built in working memory capacity (Robinson, Mackey, Gass, & Schmidt, 2012), enhanced the participants' ability to construct the information provided via word clouds. Thisinferencefinds support from Sharwood Smith (1991), who argues that learning will be augmented if the input is processed in the cognitive structure of the learners.The fact that WABG could extend their knowledge to unseen topics in delayed post-

test shows that the participants were successful in transforming data into their long-term memory. Word clouds allowed learners to link the words with ideas and structure and to use recall as they started writing (Zimmerman, 2014). The learners gradually gained the ability to apply their conceptual understandingsof the words to their writings. Their complaints at the beginning of the treatment regarding the required cognitive involvement and their adjustmentto the task during the treatment indicate their improvement in information processing (Purpura, 2014). That is to say, deep involvement in the concepts and their relations fostered learners' cognitive skills and stimulated cognitive processes (Combs, 2004) necessary for thinking, reasoning, and generating ideas in argumentative writing (Kellog, 1994).

The process of knowledge formation or building "networks of relationships" or schemata explains how constructing clusters of related concepts can lead to understanding (Lefrancois, 1991; p.83). The items presented in the word clouds worked as units and activated the learners' background knowledge, which, when combined, created more complex concepts to be transformed into the textual format. Some research findings attest to the decisive role of schema building in the improvement of the writing ability (e.g., Qin, 2016; Sun, 2014).

The reason for the advantage of word clouds can also be aligned with Bruner's (1973) discovery learning that perceives learners as the processors of the information who can "categorize objects or events that have similar properties" (Lefrancois, 1991, p. 85). The words presented to the participants via wordle directed learners to look for the relation between the concepts and categorize them as they should appear in a text. This assumption is consistent with the information processing approach, which states, "deriving information, abstracting, sorting, organizing, analyzing, and retrieving" explain the way individuals' cognitive structure deals with information (Le Francois, 1991 p.196).

Another interpretation designated to the presentation mode of words in wordle derives from noticing. In contrast to the provision of concepts embedded in sentences in MABG and CBG, the saliency of lexical items in word clouds enhanced the participants' attention helping them retrieve the underlying information the concepts carried. Therefore, in line with Xie and Lin (2018), the researchers assume that word clouds acted as visual cues that could attract learners' attention to the leading concepts. Schmidt's (1990) noticing hypothesis lends some support to this finding.

In the same line, input modality can explain the superiority of WABG to the other two groups. Word clouds integrated visual and textual features and boosted students' creativity in thinking about an issue(Baralt, Pennestri,&Selvandi, 2011).This interpretation finds significance by considering that learners in MABG encountered a considerable amount of information from which they had to selectand thenclassifyin a descending (or ascending) order. Cooperative brainstorming also drenched the participants with diverseideas (stated by class members), which could lead to confusion.

Moreover, the amount of attention required in working with word clouds was longer, and thus learners had to spend more time on comprehension before production. Therefore, learners first had to foster some abstract knowledge about a subject and then transfer it into accessible

knowledge. The superiority of WABG to the other groups in unseen delayed post-test, again, gives way to the assumption that learners could successfully change procedural knowledge to declarative (Dekeyser, 2015);" that is moving from knowing "that something is the case" to know "how to do something" (Lefrancois, 1991; p.83).

The results obtained from studying the students' comments on the paper strips showed that integrating brainstorming with technology was successful in creating a joyful environment in the class. Thus, the integration of conventional techniques andtechnologies for pedagogical purposes could be appealing and can motivate learners to engage in writing activities.According to the participants' comments in MABG and WABG, the classes were efficacious in raising attentiveness toward writing both at higher-level and lower-level skills. The students' responses in CBG verified the criticism against typical brainstorming sessions regarding feeling inhibition (Isaksen &Gaulin, 2005). This finding draws teachers' attentiontoconsider learners' personality factors when implementing cooperative learning activities in writing classes. The present study suggests an alternativeto conventional brainstorming.

The results of this study align with the findings of other scholars (e.g., Bralt et al., 2011;deNoyelles& Reyes-Foster, 2015; Dugan &Muilenburg, 2012; Viegas, Wattenberg, & Feinberg, 2009; Xie& Lin, 2018) who verified the role of word clouds in enhancing learning,improving critical thinking, facilitating understanding new concepts, and motivating learners.

Conclusions, Implications, and Further Research

This study shows the need for renovations in undertakings such as brainstorming, outlining, and drafting as typical classroom activities manipulated in writing classes.The use of word clouds can enhance learners' focus on writing, activate their background knowledge, and develop their cognitive skills to transfer concepts to written language. Moreover, they can evoke practicing different strategies such as concept maps and graphic organizers as learners get mentally involved in the act of writing.

One limitation of this study was that it did not focus on learner strategies in the treatment groups. Also, this study was limited in using learners' think-aloud protocols as they were involved in using word clouds for writing. Meanwhile, interviewing the learners could provide a deeper understanding of the quality of the treatments.

Further research on the processes which learners follow for knowledge construction via word clouds will encourage teachers to implement such tools in their classes. The use of word clouds for enhancing learners' thinking skills through writing is suggested. Additionally, the present study can have an illuminating role in studies that focus on the ways of transferring learners' passive vocabulary into active. Studies on incidental vocabulary learning also can benefit from the use of word clouds in EFL/ESL classes.

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Appendix A

Writing Rubric (FIPSE Project) Retrieved from http://web.roanoke.edu/Documents/Writing%20Rubrics.July%2007.doc

	Below Basic	Basic	Proficient	Advanced
Ideas	Shows minimal engagement with the topic, failing to recognize multiple dimensions/ perspectives; lacking even basic observations	Shows some engagement with the topic without elaboration; offers basic observations but rarely original insight	Demonstrates engagement with the topic, recognizing multiple dimensions and/or perspectives; offers some insight	Demonstrates engagement with the topic, recognizing multiple dimensions and/or perspectives with elaboration and depth; offers considerable insight
Focus and Thesis	Paper lacks focus and/or a discernible thesis.	Some intelligible ideas, but thesis is weak, unclear, or too broad	Identifiable thesis representing adequate understanding of the assigned topic; minimal irrelevant material	Clear, narrow thesis representing full understanding of the assignment; every word counts
Evidence	Little to no evidence	Some evidence but not enough to develop argument in unified way. Evidence may be	Evidence accurate, well documented, and relevant, but not complete, well	Evidence is relevant, accurate, complete, well integrated, well documented, and

		inaccurate, irrelevant, or inappropriate for the purpose of the essay	integrated, and/or appropriate for the purpose of the essay	appropriate for the purpose of the essay.
Organization	Organization is missing both overall and within paragraphs. Introduction and conclusion may be lacking or illogical.	Organization, overall and/or within paragraphs, is formulaic or occasionally lacking in coherence; few evident transitions. Introduction and conclusion may lack logic	Few organizational problems on any of the 3 levels (overall, paragraph, transitions). Introduction and conclusion are effectively related to the whole.	Organization is logical and appropriate to assignment; paragraphs are well-developed and appropriately divided; ideas linked with smooth and effective transitions. Introduction and conclusion are effectively related to the whole.
Style and Mechanics	Multiple and serious errors of sentence structure; frequent errors in spelling and capitalization; intrusive and/or inaccurate punctuation such that communication is hindered. Proofreading not evident.	Sentences show errors of structure and little or no variety; many errors of punctuation, spelling and/or capitalization. Errors interfere with meaning in places. Careful proofreading not evident.	Effective and varied sentences; some errors in sentence construction; only occasional punctuation, spelling and/or capitalization errors.	Each sentence structured effectively, powerfully; rich, well-chosen variety of sentence styles and length; virtually free of punctuation, spelling, capitalization errors.