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An Investigation of Iranian EFL University Learners' Creative Thinking and Critical Thinking Skills in a Pedagogical Blog: A Mixed-Methods Approach

Seyyed Mohammad Reza Adel*, *Hakim Sabzevari University, Sabzevar, Iran*
Akram Ramezanzadeh, *Sharif University of Technology, Tehran, Iran*

Abstract

The present study explored the effect of a pedagogical blog on Iranian EFL learners' creative and critical thinking skills using a mixed-methods approach. In the pedagogical blog, the researchers asked learners divergent and evaluative questions based on Lindley's model (1993). The quantitative data were collected by administering Creativity Test Questionnaire (ATC) and the Persian version of the California Critical Thinking Skills Test and were analyzed using SPSS Version 16.0 software. The qualitative data consisted of the posts written by the participants of the study in the class blog and were analyzed using thematic analysis. The findings revealed that the pedagogical blog significantly improved the participants' creative and critical thinking skills, which were represented in their posts by the main themes of fluency, elaboration, and flexibility as components of divergent thinking and inference, evaluation, induction, and reconstruction as features of open and active critical thinking skills. Further findings and implications are discussed in the paper.

Keywords: Pedagogical blog; Creative thinking skills; Critical thinking skills; Mixed-methods approach

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Corresponding author: Department of English Language, Faculty of Literature and Humanities, Hakim Sabzevari University, Sabzevar, Iran
Email address: sm.adel@hsu.ac.ir

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1. Introduction

Reviewing the use of weblogs in higher education settings, Sim and Hew (2010) defined blogs as personal webpages that have been evolved. They also indicated that typically blogs have four features: '(a) individual ownership, (b) hyperlinked post structure, (c) updates displayed in reverse chronological order, and (d) archival of postings' (p.152). Furthermore, Deng and Yuen (2011) viewed blogs as easy-to-update websites, which provide the opportunity for people to share their thoughts, opinions, and emotions with others.

In the last decade, blogs and blogging in English language classroom were empirically investigated from different perspectives, including learners' writing performance (Asoodar, Atai, & Vaezi, 2016; Lee, 2010; Sun, 2010; Vurdien, 2013), learners' reading comprehension (Ducate & Lomicka, 2008; Yakut & Aydin, 2017), learners' oral proficiency (Sun, 2009), learners' autonomous and independent learning (Bhattacharya & Chauhan, 2010; Blackstone, Spiri, & Naganuma, 2007), and learners' intercultural competence (Melo-Pfeifer, 2015). Illuminating the importance of blogs in language learning and teaching, Vurdien (2013) argued that blogs and blogging are extensively explored by the researchers because they can be used for various pedagogical purposes, encourage learners to express their ideas, help teachers ask their learners questions, and provide the opportunity for collaboration.

In their comprehensive review of the current studies on the use of Web 2.0 technologies in L2 learning, Wang and Vasquez (2012) explained that these studies mainly focused on L2 writing and students' autonomy. They reported that a majority of studies were either qualitative or quantitative. Moreover, Melo-Pfeifer (2015) asserted that the main studies on the use of blogs in language classroom focused on the development of language skills and knowledge in the target language. But there seems to be no relevant

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literature on the effect of blogs and blogging on language learners' higher-order thinking despite the importance of higher-order thinking skills such as creative and critical thinking skills in learning English. Roy (2014) referred to the interrelatedness of higher-order thinking skills and the language development and argued that different aspects of reading and writing are related to such skills.

Addressing the empirical studies on the use of weblogs in higher education, Sim and Hew (2010) also argued that most studies included self-report data such as interviews and surveys or content analysis. They also concluded that a majority of the studies were conducted in countries in North America and Europe and called for further research in other contexts regarding the influential role of contexts in collecting and analyzing data.

Indeed, the present study was conducted to focus on skills other than language skills in order to investigate the effect of a pedagogical blog on the Iranian EFL learners' creative and critical thinking skills. Additionally, the researchers conducted a mixed-methods study because such a study could 'present more evidence for the findings and interpretations' (McKim, 2017, p. 212). The researchers conducted a sequential explanatory mixed-methods study. First, a quantitative phase was carried out to find whether a pedagogical blog could affect English learners' creative and critical thinking skills. Then, a qualitative phase was conducted to probe how English learners' creative and critical thinking skills were influenced by a pedagogical blog.

2. Review of the Related Literature

Lee (2010) defined blogs as 'websites, typically authored by an individual and organized in a reverse chronological order over a period of time' (p.

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212). Additionally, Vurdien (2013) explained that blogs can be used for different educational goals in language teaching and argued that:

> They assist language teachers in their task of asking their students questions, exchanging views and encouraging students to discuss different issues, as well as expressing their concerns. Learners are afforded the opportunity to collaborate with their peers to work towards a common goal (p. 128).

Considering the pedagogical importance of blogs, researchers and educators of the language teaching and learning also investigated the use of blogs and blogging in language learning and teaching contexts from different perspectives, including L2 writing, perceptions of the pedagogical uses of technologies in the classroom, students' autonomy in such a new environment, and oral proficiency (Wang & Vasquez, 2012). But as Wang and Vasquez's comprehensive review of the use of technologies such as blogs in language learning and teaching indicated, no study has been conducted to explore the effect of blogging on language learners' higher-order thinking skills, including creative and critical thinking skills. Kern, Ware, and Warschauer (2017) also pointed out that research studies on the network-based language teaching addressed the effect of such teaching on language use or tested theories of second language acquisition within this context. Thus, in this section, the researchers reviewed the research studies on social media and technology in educational contexts, which explored language learners' creative and critical thinking.

McLoughlin and Mynard (2009) probed online discussion forums as forms of asynchronous computer-mediated communication for providing the opportunity of higher-order thinking. In their article, they defined higher-order thinking as 'skills such as comprehension, analysis, synthesis,

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evaluation, and application' (p. 148). Also, they conducted their study at a women's university in the United Arab Emirates and selected their participants from the students who were studying for Bachelor of Education in order to become English teachers. They asked their participants to take part in regular online discussions and answer discussion prompts. They also used content analysis to analyze their participants' posts. Finally, they concluded that online discussion forums improved their participants' higher-order thinking and provided the chance of exploration and integration for their participants. By exploration, they referred to sharing and comparing information. They also defined integration as connecting ideas, synthesizing, and finding solutions. They also demonstrated that the medium itself could be regarded as very important.

Furthermore, Eftekhari, Sotoudehnama, and Marandi (2016) compared the effect of teaching argument mapping via Rational ™ software versus paper and pencil on Iranian EFL majors' critical thinking skills development. In fact, the participants were 180 EFL undergraduates, who were randomly assigned to three groups. Each group included 60 students. There were two experimental groups and one comparison group. The first experimental group participated in a reading course, whereby argument mapping was taught via Rational ™ software, whereas the second experimental group took part in a reading course in which argument mapping was taught via the traditional medium of paper and pencil. Also, the comparison group participated in a conventional reading course without any instruction on argument mapping. All 180 students were pre-and post-tested with the California critical thinking skills test. The findings indicated that there was a significant difference between the critical thinking skill scores of the students in the experimental group who received argument mapping via Rational ™ and the scores of the students in two other groups. They argued that the technology made it possible to present argumentative

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texts hierarchically. Thus, stronger memory links were made and the cognitive load on memory were decreased.

The present study also addressed English learners' higher-order thinking. But this study focused on both creative and critical thinking skills and used a pedagogical blog to create an opportunity for discussion and participation which Peppler and Solomou (2011) considered as important features of the Web 2.0 environment producing 'a creative contribution' (p. 14). Loveless (2007), reviewing the literature on creativity, new technologies and learning, also considered creativity as an essential skill in human life. Studying the social side of creativity in social networks, Perry-Smith and Shally (2003) also explained that creativity is a widely unexplored field of study in such an environment.

As expressed by Shakirova (2007), critical thinking skills are also very important because they enable teachers and learners 'to deal effectively with social, scientific, and practical problems' (p.42). Addressing the importance of critical thinking skills in higher education, Behar-Horenstein and Niu (2011) argued that 'advancing critical thinking skills also relates to higher education's goal of building responsible citizens. An increasingly complex society requires individuals to base their judgments and decisions on careful evaluation of evidence' (p.25). Focusing on the positive role of critical thinking skills in EFL contexts, Hashemi and Ghanizadeh (2012) referred to this point that critical thinking skills improve learners' higher order learning skills, which can help them achieve higher levels of language proficiency.

Lee (2010) also explained that critical thinking skills are even 'essential for the implementation of blog projects in L2 instruction' (p. 212). Creativity and criticality as the two sides of the thinking skills coin were investigated in a pedagogical blog in the present study. Kirton (2003) defined creative thinking as divergent or flexible thinking and as production and application of many thoughts to solve a given problem with a variety of

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unusual, original ideas. Erwin (2000) also provided an operational definition of critical thinking:

> Most attempts to define and measure critical thinking operationally focus on an individual's capability to do some or all of the following: identify central issues and assumptions in an argument, recognize important relationships, make correct references from the data, deduce conclusions from information or data provided, interpret whether conclusions are warranted based on given data, evaluate evidence of authority, make self-corrections, and solve problems (p. 156).

Although Eftekhari et al. (2016) compared the effect of computer-aided argument mapping via *Rationale* ™ software on EFL majors' critical thinking skills by conducting a quantitative study, the present study focused on the effect of the use of a class blog as a pedagogical tool on both creative thinking and critical thinking skills of EFL university learners. It should be added that the participants' creative and critical thinking skills were studied in both quantitative and qualitative phases. Therefore, the following questions, including two quantitative research questions and one qualitative research question guided the current study:

1. Does a pedagogical blog significantly influence EFL learners' creative thinking skills?
2. Does a pedagogical blog significantly influence EFL learners' critical thinking skills?
3. How does a pedagogical blog influence EFL learners' creative and critical thinking skills?

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3. Method

The present study utilized a mixed-methods approach in which the data were collected sequentially as there were two different sources of data including questionnaires and a pedagogical blog. In line with Creswell's (2003) explanation on the nature of a mixed-methods research, the researchers used a mixed-methods approach to expand their understanding from the quantitative phase of the study to the qualitative phase in order to confirm the results gathered from different data sources. The sequential explanatory strategy was used as quantitative data collection and analysis were followed by qualitative data collection and analysis in order to further explain and interpret the results of the quantitative method through qualitative method.

3.1. Participants

The researchers used the mixed-methods approach in order to examine both the breadth and the depth of their research questions. Furthermore, the sequential mixed-methods sampling was utilized. Teddlie and Yu (2007) defined sequential mixed-methods sampling as a specific type of sampling in mixed-methods approach whereby the qualitative phase of the study uses a subsample of the quantitative sample. In addition, the sampling was nested as the sample members chosen for the qualitative phase involved a subset of the participants, who were chosen for the quantitative phase of the study. In the first phase of the study including the quantitative strand, a random sample of 60 Iranian EFL students was a representative sample of EFL students enrolled in higher education in one of the universities in Iran. These students, including those studying in daily, overnight, and Pardis courses, had the course of sociolinguistics. In fact, the researchers first used a

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convenient sampling. Then, they randomly assigned students to a control and an experimental group.

Additionally, all these 60 students were administered a pretest and a posttest to measure the participants' creative and critical thinking skills. Abedi's (1993) Creativity Test Questionnaire (ATC) and the Persian version of the California Critical Thinking Skills Test developed and validated by Khodamorady, Saidozakerin, Alavi Majd, Yaghmaei, and Shahabi (2005) were used in this study. The experimental group also received the treatment. In the second phase of the study including the qualitative strand, a purposive sampling was used by which the researchers selected 30 students from among all participants. These students where those who regularly practiced blogging. Posts submitted by the purposive sample generated data for the qualitative phase of the study.

3.2. Instruments

3.2.1. The questionnaire of creative thinking skills

Abedi's Creativity Test Questionnaire (ATC) developed in 1993 as the Persian version of Torrance Test of Creative Thinking (Torrance, 1990) was used to measure the participants' creative thinking skills. This test included 60 multiple choice items measuring fluency (generating many ideas, possibilities, and solution), originality (combining existing ideas and creating new and unusual ones), elaboration (the process of embedding an idea by adding details), and flexibility (looking for connections and going beyond obvious to provide alternative solutions). ACT is a self-rating instrument for measuring creative as an ability founded on the renowned Torrance Tests of Creative Thinking with a strong theoretical foundation, which was mainly designed to replace the lengthier Torrance Tests of

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Creative Thinking (Althuizen, Wierenga, & Rossiter, 2010). Sample items from the ATC questionnaire are presented in Table 1:

Table 1

Sample items from the ATC questionnaire

Subskill	**Sample item and scoring**
Fluency	''If you had to participate in a contest in which you were asked to come up with as many words as possible which began with the letter ''J,'' how would you do?''
	_ I would do poorly. (1 point)
	_ I would do okay. (2 points)
	_ I would do very well. (3 points)
Flexibility	''How do you approach a complex task?"
	_ I come up with a single approach. (1 point)
	_ I may be able to come up with few approaches. (2 points)
	_ I will be able to come up with a variety of approaches. (3 points)
Originality	''Do people think that you come up with unique ideas?''
	_ No, they don't. (1 point)
	_ Sometimes, they do. (2 points)
	_ Often, they do. (3 points)
Elaboration	''When you get interested in something, how much attention do you pay to the details?''
	_ I do not pay much attention to the details. (1 point)
	_ I pay attention to some of the details. (2 points)
	_ I pay attention to all of the details. (3 points)

The validity and reliability of this test were also confirmed by Abedi (1993). In fact, the reliability coefficients for fluency, originality, flexibility, and elaboration were respectively reported as 0.85, 0.82, 0.84, and 0.80. In the present study, the total reliability of the above-mentioned questionnaire was 0.74, which was calculated using Cronbach's alpha.

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3.2.2. The questionnaire of critical thinking skills

The Persian version of the California Critical Thinking Skills Test, Form B (CCTST) was used to measure the participants' critical thinking skills. This test contained 34 multi-choice questions on five critical thinking skills including analysis, evaluation, inference, inductive, and deductive reasoning and was translated by Khodamorady et al. (2005) who confirmed its construct validity and reported the reliability of 0.62 for the test. Investigating the reliability, validity, and normality of the Persian version of the California Critical Thinking Skills Test; Form B, Khalili and Hossein Zadeh (2003) indicated that CCTST is more comprehensive than other measuring tools of critical thinking skills because it is mainly based on the APA Delphi consensus conceptualization of critical thinking. They also suggested that 'items selected for inclusion in the CCTST cover the domain of the five CT cognitive skills identified by the Delphi experts: interpretation, analysis, evaluation, explanation, and inference' (pp. 31-32).

In the present study, the total reliability of the above-mentioned questionnaire was 0.77, which was calculated using Cronbach's alpha. The features of five critical thinking skills explained by Facione (1990) can be summarized as follows:

Analysis: Identifying assumptions and claims, their role in the construction of argument, considering details and situations, and taking into account their interactions

Inference: Coming to a conclusion through reasoning, collecting evidence, and recognizing conditions and facts

Evaluation: Assessing the credibility of sources from which claims are made and information comes out and judging the quality of interpretations,

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opinions, beliefs, and inferences to decide how strong or weak the arguments are

Deduction: Making a decision in a context which is exactly defined and the existing rules, conditions, policies, values, and procedures will determine the ultimate outcomes

Induction: drawing inferences based on prior experience, known conditions, case studies, simulations, and analogies

3.2.3. A pedagogical blog as the treatment

A pedagogical blog was constructed by the researchers through which the students were asked questions related to the course of the study, i.e. sociolinguistics. The class blog used in the present study was considered as a pedagogical one because it provided the opportunity for communications through the questions were asked by the researchers. The participants were asked to think about the questions and share their ideas. They were also asked to reflect on each other's comments. Thus, it was possible for them to review each others' comments. It should be added that the users of the blog could submit their comments. Their comments were also shown and could lead to further discussion. Therefore, the class blog was both an intra-community and an inter-community blog. Reading questions and responses, reviewing comments, and sharing ideas required the use of English as a foreign language accompanied by emoticons or other possibilities provided by the blog to manage language and meanings.

3.3. Procedure

Before the experiment, all participants were pretested. First, the Persian version of Torrance Test for Creative Thinking (TTCT) was utilized to

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measure creative attributes. The second instrument used was the Persian version of California critical thinking skill test administered to measure participants' critical thinking skills. At the end of the treatment, all participants were post tested by these two tests once more.

The main purpose of the current research was to investigate the effect of questioning in a class blog on the Iranian EFL learners' critical thinking and creative thinking skills. At the beginning of the semester, the researchers informed the students that they were required to use the class blog. The researchers constructed a class blog and the students were strongly encouraged to express their views on questions asked in the blog. They were also asked to upload each comment or question for others to view, answer the questions of the blog, write about their views and feelings, ask their own questions, and interact with the researchers. In fact, blogging was considered as a part of their regular class requirements. All participants were taught how to use the class blog and shared user name and password of the blog and were co-administers of the blog. Thus, they could enter the blog to post their comments. The researchers started the blog by posting the following comment: Process of Becoming

The purpose of this blog is to provide an opportunity for learners to air their views on the questions and topics covered and asked in this semester. Learners can ask their own questions, have inter-actions together and add their comments when they feel it is necessary. We are interested in understanding learners' world views and ask them to reveal their own selves as an individual person who has his/her own history and story.

As the aim of this research was creating an opportunity for learners to share their answers, ideas and feelings, the researchers put comments on the students' posts when it was necessary and encouraged the learners to interact with each other. Participants could concentrate on each question for about two weeks. Although some predetermined questions were asked in

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each blog, the participants were not limited to those questions and were allowed to ask their own questions in addition to posting their own comments and answers to the researchers' questions. Some examples of the questions asked by the researchers are as follows:

1. Express your view about the following sentence:
   "But if thought corrupts language, language can also corrupt thought."
2. Who is a literate person in your opinion?
3. Based on your own experience, do children and adults learn a language differently? Please explain.
4. How can our educational system empower English learners and teachers?
5. Out of the three variables, i.e. textbooks, teachers, and learners in an educational setting for learning English, which one, do you think, may play a better and more important role?
6. All human communication is intrinsically multimodal. Do you agree or disagree? Give your reasons.

Questions asked were divergent and evaluative. There are multiple approaches to classify the questions. One of these approaches was proposed by Lindley (1993) which consisted of five basic types of factual, convergent, divergent, evaluative, and combination. Mishra (2007) explained these questions as follows:

1. **Factual:** Questions which require simple answers based on obvious facts.
2. **Convergent:** Questions that can be answered through comprehension, application, analysis, inference, or conjecture based on personal awareness, material presented, or read.
3. **Divergent:** Questions which make it possible for learners to explore alternative answers.

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These questions are asked in order to stimulate imaginative and creative thought and are answered based on creation, imagination, inference, or projection. One important feature of this type of question is that it may not have a definite answer.

4. **Evaluative:** Questions requiring higher levels of cognitive and/or emotional judgment. The answer to these types of questions is often analyzed from different perspectives.
5. **Combination:** Questions that blend any of the four other questions.

Further, Adams (2010) argued that asking questions can lead to strengthening thinking, learning, action, and result. In the present study, divergent and evaluative questions were asked in the blog to stimulate learners to think more deeply and allow learners to express their own voices. Questions asked in the constructed blog were related to the topics covered in the class including language and thought, language and media, language and gender, language and age, language and identity, multiliteracies, critical discourse analysis (CDA), critical pedagogy, multimodality, and computer-assisted language learning (CALL) based on the teacher's syllabus, who was one of the researchers in this study. He taught the course of sociolinguistics. The class was discussion-based, whereby the students had the opportunity to participate by contributing comments, asking their own questions, and listening to others. Controversial issues were of importance and the students were also asked to find their own positions in these discussions. But in the class blog, the researchers mainly focused on questioning. Additionally, the students of the control group were the students of the same teacher and had the course of sociolinguistics. But these students did not receive the treatment of blogging.

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3.4. Data Analysis

The present study explored the effect of blogging on the Iranian EFL learners' creative and critical thinking skills. Data collected through quantitative phase i.e. pretest-posttest design with the treatment and with the control group were analyzed using t-test. Furthermore, data collected through qualitative phase were analyzed using thematic analysis.

4. Results

4.1. Quantitative Data

In order to check the normality of distribution of creative thinking scores before and after treatment, Shapiro-Wilk tests were conducted. Tables A and B (Appendix) show the normality of the distribution of participants. Additionally, an independent samples *t*-test was conducted to check if the two groups were homogenous before the treatment. Table 2 indicates that there was no significant difference between two groups considering their creative thinking skills (t_{58}=-.069, p<.05).

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Table 2
The independent samples t-tests for creative thinking skills before the treatment

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Creativity	Equal variances assumed	.037	.849	-.069	58	.945	-.10000	1.45351	-3.00951	2.80951

In order to answer the first research question, i.e. to see whether the pedagogical blog affected the creative thinking skills of the participants significantly, another independent samples t-test was calculated after the treatment. Table 3 demonstrates the descriptive statistics of creative thinking scores of participants after the treatment. As it was revealed, the mean score of the creative thinking skills of the experimental group (mean=118.26) was higher than that of the control group (mean=100.73) after the treatment.

Table 3
Descriptive statistics of creative thinking skills after the treatment

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Creativity	Control	30	100.7333	11.02641	2.01314
	Experimental	30	118.2667	14.73193	2.68967

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To check the level of significance, the independent samples t-test was conducted.

Table 4

The independent samples t-tests for creative thinking skills after the treatment

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
creativity	Equal variances assumed	2.381	.128	-5.219	58	.000	-17.53333	3.35962	-24.25834	-10.80832

According to the results (Table 4), there was a significant difference (t_{58}=-5.219, p <.05) in the participants' creative thinking skill scores after the treatment was given to the experimental group.

In order to check the normality of distribution in scores of critical thinking skills before and after treatment, Shapiro-Wilk tests were conducted. Tables C and D (Appendix) show the normality of the distribution of participants. Also, an independent samples t-test was conducted to check if the two groups were homogenous before the treatment considering their critical thinking skills. Table 5 indicates that there was no significant difference between the two groups with regard to their creative thinking skills.

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Table 5
The independent samples t-tests for critical thinking skills before the treatment

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Criticality	Equal variances assumed	.090	.765	-1.548	58	.127	-1.40000	.90440	-3.21034	.41034

In order to answer the second research question, i.e. to see whether the pedagogical blog affected critical thinking skills of participants significantly, an independent samples t-test was calculated. Table 6 demonstrates the descriptive statistics of critical thinking skill scores after the treatment.

Table 6
Descriptive statistics of creative thinking skills after the treatment

	groups2	N	Mean	Std. Deviation	Std. Error Mean
Criticality	control	30	18.6000	2.59442	.47367
	experimental	30	21.9333	4.08473	.74577

As the mean indicates, critical thinking skills of the participants in the experimental group, the treatment (mean=18.60), are higher than those of the control group (mean=21.93). To check the level of significance, an independent samples *t*-test was conducted after the treatment (Table 7).

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Table 7

The independent samples t-tests for critical thinking skills after the treatment

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Criticality	Equal variances assumed	5.655	.021	-3.773	58	.000	-3.33333	.88348	-5.10181	-1.56486

Based on the results, there is a significant difference (t_{58}=-3.773, p<.05) between the scores of critical thinking skills of participants after the treatment in favor of the experimental group.

4.2. Qualitative Data

In order to answer qualitative research questions i.e. how practicing in the pedagogical blog influenced the Iranian EFL learners' creative thinking and critical thinking skills as reflected in the participants' writing in the class blog, thematic analysis was used. Data analyzed by the researchers included all entries of the blog sent by the students participated in the study. 'Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within data' (Braun & Clarke, 2006, p. 79). The researchers used both inductive and theoretical thematic analysis to discover new themes emerging through existing themes on creative and critical thinking skills. Attributes of creative thinking including fluency, originality,

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elaboration, and flexibility and attributes of critical thinking skills including analysis, inference, evaluation, deduction, and induction were the predetermined themes of interest for the researchers of the present study.

The researchers conducted thematic analysis through six phases. Six phases of thematic analysis are: familiarization with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final report (Braun & Clarke, 2006). The researchers also followed the following stages:

1. Reading and rereading whole data
2. Creating the initial codes adopted from the definition given for attributes of creative thinking and critical thinking skills in order to categorize those parts of data identified as indicators of creative thinking and critical thinking skills, from the participants' own words, and the concepts extracted from the existing literature in terms of creative and critical thinking skills
3. Incorporating codes into larger themes of *fluency, originality, elaboration, flexibility, analysis, inference, evaluation, deduction,* and *induction* as attributes of creative thinking and critical thinking skills and emerging themes extracted from the existing literature
4. Considering themes within the whole picture of data
5. Writing report

More specifically, the researchers analyzed each post separately. The analysis occurred at the message level whereby each post was regarded as a whole unit of analysis. Each post was read twice to three times and the meaningful concepts and issues were listed. Then, the researchers generated initial codes by organizing concepts into larger categories. To code the data, they also utilized the hybrid process that involved both deductive and inductive thematic analysis. Although the above-mentioned attributes of creative and critical thinking skills were considered as a template of codes

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that were used for organizing texts, the researchers read posts carefully to see whether there are other meaningful patterns in the data that could not be explained by these attributes. After coding the qualitative data, all codes were analyzed to check whether they could be combined to construct more abstracts categories or themes.

The analysis of the collected qualitative data regarding the creative thinking skills revealed three themes of fluency, elaboration, and validation. The theme of validation emerged through data analysis and involved the examination of the relevance and effectiveness of the ideas. In fact, through blogging, the participants could generate new ideas, elaborate them, and think about their validity. The following example is a post sent by Mohsen, a male learner, who generated his new idea about the role of information technology in people's personal and professional life:

> *Technology and all its belongings are the other aspects of language. Technology is a language that aims at conveying information. Just like language that may have either positive or negative effects on human life (whether it is used or misused), technology may either help us in our professional lives to go ahead or may prevent us from moving.*

The following example is also a post sent by Reza, a male learner, who elaborated on the definitions given by his classmates for the word of literacy:

> *I think all comments written here in this window are true. But I want to elaborate on them. I think a literate person is the one who has the most useful knowledge in relation to the situation where he/she is, e.g. a person in a village can be literate if and only if he knows reading and writing. But another person in a big city who has a*

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> *Ph.D., but do not know how to speak English or how to use computer can be illiterate.*

The following comment was also made by Zahra, a female learner, who examined the relevance of her classmates' answers and comments on a question concerning literacy:

> *All my friends talked about the notion of literacy from its cultural aspect, but the question is about literacy and its influence not about the culture. To some extent, we all know what literacy is and have some ideas about it in our minds. But I think when we know about the theories of literacy and literacies, it helps us think more about them and therefore understand them better. As a consequence, we can apply them more efficiently. I believe knowing things is not enough for us and does not influence our life unless we think about them deeply and challenge our mind to really understand them.*

Concerning the critical thinking skills, the analysis of the collected qualitative data revealed three themes, including inference, induction, and reconstruction. In fact, the participants had the opportunity to achieve their own conclusions based on reasons and evidence and to infer based on prior experiences and analyses. Moreover, the new theme of reconstruction, which emerged through the analysis of the qualitative data, consisted of sub-themes of self-direction and self-correction. As argued by Scriven and Paul (1987), 'critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking' (as cited in Mulnix, 2010, p. 3). The following comment is an indicator of the theme of induction, which was posted by Efat, a female learner:

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To some extent, I disagree with you. This year, I have some deaf students. They communicate through signs and gestures. Sometimes, they use lip-reading. In short, they don't use language as we use it. They hear just some vague noises. Because they never hear them, they don't know that such objects or events exist. For example, they don't know different models of cars, since they have not heard about them. I really come to the conclusion that they don't know and use names for the concepts and this led them not to be able to think about them at all. I have found this through their writings and reactions. Although they may be clever individuals, they are somehow retarded concerning thinking and analyzing.

As it can be understood from the following examples, the students of the experimental groups found the opportunity to self-monitor their own thinking and conclusions:

I think there is a misleading point in my comment and I should have talked differently. Yah, in the 3rd paragraph of my post, I mentioned that the same story is not true about the second part of the sentence, but I did not want to deny the effect of language on thoughts. Just the extent to which language affects thought is the point that I disagree with. I mean language does not affect thought to the extent that thought affects language.

Definitely, I do not mean to deny the effect of language on thought. Let me present you with an example. Suppose a river whose bank is thought, and the place where the river runs into, let say, the sea is language. Water can effortlessly flow into the sea but it is not easy to flow against the currency and toward the bank of river, if not impossible. Therefore, the first part of your sentence is OK (I mean,

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> *"If thought corrupts language"). However, the same story is not true about the second part of the sentence (I mean, "language can also corrupt thought").*

In fact, the quantitative analysis of the data revealed that the pedagogical blog provided an opportunity for the participants of the study to become more skilled, creative, and critical thinkers. Furthermore, the qualitative phase of the study not only indicated the frequency of themes of fluency, elaboration, inference, and induction, but also directed the researchers to the newly emerged themes of validation of ideas and reconstruction.

5. Discussion

The quantitative analysis of the data revealed that there was a significance difference between the control group and the experimental group after receiving the treatment concerning their creative thinking and critical thinking skills. Bai (2009) also argued that asynchronous online discussion can improve students' higher order thinking because 'it allows students to read, to think, to reflect and formulate their thoughts in writing' (p. 162).

In their analysis of higher-order thinking in online discussions, McLoughlin and Mynard (2009) also found evidence of higher-order thinking processes and argued that online discussions provided their participants with an opportunity to share their ideas and reflect on their own posts and opinions. In addition, McLoughlin and Mynard reported the evidence of exploration and integration, whereby their participants could ask questions, provide their own personal narratives, and upload unsupported opinions. Such a difference between the findings of the study conducted by McLoughlin and Mynard and the findings of the present study may be due to the nature of questions and prompts, which were used in two studies.

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Whereas McLoughlin and Mynard referred to clear prompts, the researchers of the present study alluded to divergent and evaluative questions which were posted as prompts. Although McLoughlin and Mynard addressed online discussion forums, the present study focused on a pedagogical blog.

In fact, blogging provided the possibility for creative thinking skills and this result was also in line with the findings of the study conducted by Peppler and Solomou (2011) as well as Ducate and Lomicka (2008). Although Ducate and Lomicka (2008) mainly referred to the university students' creativity in posting pictures, writing unique comment, and changing the background of the blogs, the findings of this study showed the importance of three themes of fluency, elaboration, and validation, which could be considered as features of both convergent and divergent thinking (Cropley, 2006). Thus, in agreement with Cropley, the researchers of the current study reported that creativity involved two components of convergent and divergent thinking.

The analysis of the collected qualitative data also revealed three themes for critical thinking skills i.e. inference, induction, and reconstruction. Illuminating the conceptions of critical thinking skills, Mulnix (2010) also referred to the fundamental feature of critical thinking skills and indicated that this feature includes the ability 'to recognize inferential connections holding between statement, where this would include the ability to understand the possibility that what we believe might be false and the ability to identify the sorts of evidence that would undermine our beliefs' (p. 10). In addition, the findings of the present study showed the theme of reconstruction, which included self-direction and self-correction. Although, Eftekhari et al. (2016) confirmed the effectiveness of technology on improving EFL learners' critical thinking skills, the current study specifically studied a pedagogical blog and the analysis of the quantitative phase of the study indicated that blogging not only enhanced EFL learners'

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critical thinking skills, but also improved their creative thinking skills. Also, through qualitative phase of the study, it was revealed that blogging helped EFL learners generate new idea, elaborate their own ideas, examine the validity of their ideas, analyze evidences, infer based on their own initial experiences, and reconstruct their own thinking and ideas.

6. Conclusion

The present study investigated the effect of a pedagogical blog on the Iranian EFL learners' creative and critical thinking skills using the mixed-methods approach. The analysis of the quantitative data revealed that the participants' creative and critical thinking skills significantly improved after the treatment.

The analysis of the qualitative data also revealed three themes of fluency, elaboration, and validation and drew the attention of the researchers to three themes of inference, induction, and reconstruction as well which are the indicators of critical thinking skills in a pedagogical blog showing that critical thinking skills in a pedagogical blog are both active and open. Mulnix (2010) explained that the active nature of critical thinking skills means 'the ability to recognize the structure of reasoning, taking some statements as justifications for others, and then evaluating or assessing the reasoning' (p. 9) and defined open as 'the disposition of being open to changing one's beliefs if a better alternative is presented' (p. 9).

The results of this study will be helpful for teachers of universities and can draw the attention of the researchers to the importance of the pedagogical blog. This study can also make many teachers and researchers think about the use of technology in order to support the use of language, improve thinking, and shape relations. Questioning is also an important aspect of teaching which can be used to improve learners' communicative

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skills. As stated by Chuska (1995), 'all learning begins with questions. Questions cause interactions: thought, activity, conversation, or debate' (p.7).

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Appendix

Table A

Tests of normality for scores of creative thinking skills before the treatment

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Control	.934	30	.063
Experimental	.986	30	.947

Table B

Tests of normality for scores of creative thinking skills after the treatment

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Control	.975	30	.671
Experimental	.965	30	.418

Table C

Tests of normality for scores of critical thinking skills before the treatment

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Control	.936	30	.069
Experimental	.943	30	.106

Table D

Tests of normality for scores of critical thinking skills after the treatment

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Control	.955	30	.226
Experimental	.968	30	.489

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Notes on contributors:

Seyyed Mohammad Reza Adel has a PhD in TEFL from Ferdowsi University in Mashhad, Iran. He is currently an assistant professor at Hakim Sabzevari University in Iran. His main area of research interest includes socio-applied linguistics. He has presented and published papers at many national and international conferences and leading journals such as *Teaching in Higher Education, Qualitative Research Journal, Journal of Intercultural Communication Research*, and *Higher Education*. He has taught graduate and post-graduate courses for more than a decade. He has also supervised some MA and PhD theses to completion.

Akram Ramezanzadeh is an adjunct English instructor at Sharif University of Technology. Her main areas of research interest include qualitative research, authenticity in education, socially just teaching, and CALL. She has also published papers in international journals, including *Teaching in Higher Education, Qualitative Research Journal, Adult Education Quarterly*, and *Higher Education.*

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