The Impact of Critical Thinking and Multiple Intelligences on Iranian EFL Students' Writing ability

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ABSTRACT

The present study was an attempt to explore the effect of teaching writing through critical thinking and multiple intelligences on the Iranian students' writing ability. In doing so, 120 students of RAD university took part in the study. The pre- and post-test of writing was used in order to collect the data. Critical thinking strategies aimed to develop the students' cognition to raise their own questions regarding the writing tasks and be able to create their own statements through logical reasoning and evaluating their statements by sharing their responses with their peers. Multiple intelligences inspired from Gardner's (1983) theory was also applied as a technique to help students' writing. The focused intelligence types included linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. Quantitative analysis revealed that critical thinking strategies had significant impact on the students' writing ability. However, only linguistic and interpersonal types of intelligence resulted in the students' significant improvement in writing. Findings contributed to use of critical thinking and multiple intelligence to develop students' potential in writing.

1. Introduction

1.1 Critical Thinking

Critical thinking assists individuals to think and analyze critically about their own learning, and to strive and develop expertise in their areas of professionalism (Phan, 2010). Critical thinking ability, which is one of the features that lead to individual differences in student learning, originates from Socratic reasoning characterized by mixing abstract and logical thinking that needed rational and objective processes such as order, structure and discipline (Hunter, 1991). According to Alfaro-Levferve (2004), critical thinking requires the specific knowledge of one's job which is contextual and should be learned inside the context. Facione (2004) asserted that critical thinking is a positive self-regulatory judgment and its construct has common characteristics with clinical judgment.

According to Fisher (2001), the concept of critical thinking is not a new idea as this notion was introduced by Socrates about two thousand years ago. Even though critical thinking enjoys a long history there is no particular all-agreed definition for the constructs which compose critical thinking. Fisher (2001) also stated that the modern critical thinking is founded by Dewey (1933) who noted critical thinking as the consideration of a belief which is dynamic, continual and vigilant or hypothetical form of knowledge supported by the background and the conclusions to which it would be inclined. Paul and Elder (2009) believed that critical thinkers raise deep questions, gather and assess relevant information, and come to well-reasoned conclusions and solutions. Nevertheless, Elder and Paul (2009) claimed that "Fair-minded critical thinkers work to improve their thinking whenever they can" (p. 46). Gunter, Estes, and Mintz (2010) argued that "good questions are educative – they provide the opportunity for deeper thought" (p.192).

Biesta and Stams (2001) pointed out the philosophical 'groundwork' for recent

arguments about the concept of critical thinking as criticality and deconstruction. It is depicted that criticality and deconstruction not only differ in their response to the question what it is to be critical but also arguing that transcendental critique is able to solve some of the problems of the dogmatic approach to criticality, while deconstruction provides the most coherent and self-reflexive conception of critique. Apparently, the application of critical thinking relies on social and cultural factors. As far as the cultural load of critical thinking is concerned, Davidson (1998) cited Ennis (1996) that the problem for educators is not whether critical thinking has value for people from non-Western cultures, but how and when critical thinking should be drawn upon. He added :

> Part of the English teacher's task is to prepare Students to interact with native speakers who value explicit   comment, intelligent criticism, and intellectual assertion. Maybe even more than the L1teacher, we as L2 teachers have good reason to introduce higher level students to aspects of critical thinking. If we do not, our students may well flounder when they are confronted with necessity of thinking critically, especially in an academic setting (as cited in Birjandi &Bagherkazemi, 2010, p. 121).

A critical thinker is able to reflect, explore, and analyze, and can choose to think in these advanced, complicated ways. To be a critical thinker is in fact announcing our reason and intellect with our emotions, attitudes, and dispositions. In addition, Paul and Elder (2001) noted that developing critical thinking is a progressive process which requires hard work, and becoming an excellent thinker is not possible by just taking a beginning course. Therefore, the important attributes of a critical thinker require a gradual growth of improvement. Critical thinking is viewed as a process rather   than an endpoint or objective (Petress, 2004) that leads to high quality decisions and judgments through analysis, assessment and reformulation of thinking (Giancarlo &Facione, 2007).

1.2 Multiple Intelligences

American   psychologist,   Howard Gardner put forth the theory of Multiple Intelligences in 1983 (Spirovska, 2013). As Spirovska (2013) maintained, this theory asserts that human intelligence and abilities cannot be accounted for by a single numerical indicator. In this theory, multiple has to do with almost autonomous modules

of intelligence in mind (Maree & Ebersohn, 2002). In the view of Gardner, intelligence is concerned with a bio-psychological potential to process information (Zhou & Griffiths, 2011). This potential can be activated in a cultural setting, contributing to solving problems or creating products that are valuable in a culture (Blythe & Gardner, 1990).   As Messick (1992) asserted, especially, this theory maintains that intelligent behavior does not emanate from a single unitary quality of the mind (a claim made by the g-based theory). Instead, as discussed by Gardner (1983), there are different kinds of intelligences generated from distinct metaphorical pools of mental energy. The mental modules known as autonomous intelligences are as follows:

- linguistic
- logical-mathematical
- spatial
- bodily-kinesthetic
- musical
- interpersonal
- intrapersonal
- naturalistic

They operate together and are then shaped and socialized by culture (Messick, 1992). According to Gardner (2004), the traditional tests used for measuring intelligence on the basis of IQ (e.g., Stanford-Binet Intelligence Quotient, Wechsler Intelligence Scale for Children (WISCIV), Woodcock Johnson Test of Cognitive Ability, and Scholastic Aptitude Test) do not take into account human's potential development span. Gardner elaborated on the following two important advantages of multiple intelligence in the context of education:

- Multiple intelligences provide us with a chance to plan our education program to motivate students to keep on learning (For example, musician and scientific training)
- Such a kind of intelligence allows for reaching more students, who seek to learn different disciplines and theories. Learning would be achieved easily provided that Students are trained by making use of their intelligence fields (Bümen, 2004, as cited in Aydemir & Karali, 2014).

Multiple   intelligence   theory   is closely concerned with two learning disciplines, namely, learning by doing and experiencing   and   the   discipline   of organizing   teaching   status   based   on

Students' capabilities (Maree & Ebersohn, 2002). Maree and Ebersohn (2002) argued that though Gardner (1983) has elaborated on the features of multiple intelligence theory by giving scientific evidence, he by far resorts to brain research and neuropsychology. Consequently, the theory has been widely accepted. Based on the results of brain research, each intelligence type occurs only in a specific part of the brain.

According to multiple intelligence theory, every human being possesses one or more mental modules specific to him/her. In fact, one learns more easily in line with this mental space. It is assumed that this theory allows for different learning environments to access information, resulting in an increase in motivation. Those teaching methods which are based on multiple intelligence theory contribute to the creation of an active, exciting learning environment for Students. The main principle of multiple intelligence theory has to do with catering to different intelligence areas of each Student. To make sure that Students can create connections among the information, teaching methods and techniques should draw on multiple intelligence theory.

2. Literature Review

As discussed by Al-Faoury, and Smadi (2015), the results of multiple studies performed have indicated the positive effect of drawing on multiple intelligences in different educational settings. In their study, Koura and Al-Hebaishi (2014) investigated the correlation between multiple intelligences, self-efficacy, and students' academic achievement. The results indicated that there is a significant positive correlation between logical intelligence and grammar scores, interpersonal intelligence and speaking scores. However, the results showed a negative significant correlation between:

- bodily intelligence and listening comprehension scores
- intrapersonal and listening comprehension scores
- musical intelligence and reading comprehension scores

Besides, no significant correlation was found between MIs and Students' achievement in different language skills. No significant relationship was found between self-efficacy and EFL achievement, either.

Roohani and Rabiei (2013) carried out an investigation to examine the relationship between Iranian EFL students'

language learning strategies (LLS) and their multiple intelligences as well as L2 proficiency. The data analysis revealed a significant positive relationship between students' LLS and their multiple intelligence. It yielded a positive yet not significant relationship between L2 proficiency and LLS. There were also significant correlations between some strategy types and a number of individual intelligences. The highest correlation was found between intrapersonal intelligence and cognitive strategies while the lowest correlation was found between naturalist intelligence and affective strategies.

In another study carried out by Esmaeili, Behnam, and Esmaeili (2014), they sought to shed light on how multiple intelligences are correlated with Iranian female and male students' writing ability. The statistical results indicated no significant relationship between girls and male Students' multiple intelligences and their writing performance. The results indicated no relationship between components of Students' multiple intelligences and writing ability, either.

Sajjadi Rad, Khojasteh, and Kafipour (2014) investigated how multiple intelligences are related with medical students' language learning, focusing on their writing skill. The results of the study showed significant relationship between participants' multiple intelligences profile and their writing performance and their general language achievement.

Critical thinking is one of the cognitive strategies that let the Students wean the dependency of teachers and make them active in writing process. Creativity and critical thinking are seen as closely linked, as creativity is seen as an indication that students have mastered the cognitive skills required for learning. In other words, a perceived lack of creativity is frequently seen as a sign that students do not possess the appropriate thinking and reasoning skills that they need to succeed.

In a recent study, Miri and Babajani Azizi (2018) examined the effect of teaching critical thinking strategies on the Iranian EFL learners' persuasive writing ability. The participants of the study included 60 male and female employees of Oil and Gas Company in Asaluyeh, Iran. Their age range was between 23 to 30. They were randomly divided into experimental and control groups. Both groups underwent 10 sessions of writing instruction. The control group was exposed to conventional writing instruction,

while the experimental received the instruction through concentrating on critical thinking strategies. The purpose was to teach "the techniques of critical thinking such as problem solving activities, raising questions, teaching logical reasoning, evaluating others' arguments regarding their writing" (p. 511). The pre- and post-test of writing was used as data collection instrument. It was revealed that the experimental group significantly outperformed the control group. The researchers aimed to recognize the role of critical thinking techniques in paving the way to develop their cognitive abilities in doing the writing tasks.

Similarly, Taghinezhad, Riasati, and Behjat (2019) investigated the effect of providing writing instruction through critical thinking strategies on the Iranian university students' writing ability. The participants of the study constituted 140 medical students of Jahrom University of Medica Sciences. They were assigned experimental and control groups randomly. The main focused critical thinking strategies included "evaluation, analysis, explanation, inference, interpretation, and self-regulation" (p. 45), all of which were practiced by the students although the teacher provided the necessary support to guide the students to foster their cognitive capacities. Results from descriptive and inferential analyses highlighted the significant difference between the experimental and control groups. Teaching critical thinking explicitly, as the researchers argued, could be an appropriate strategy through which students can raise their awareness of cognitive features involved in doing the writing tasks and be able to enhance their writing, particularly in academic context.

In sum, the literature reveals that critical thinking and multiple intelligences have been recognized as important elements of instruction, which can pave the way for students to develop their writing ability. However, previous studies have recommended conducting more research in this area to take into account teaching writing through critical thinking strategy and multiple intelligences on the students' writing ability. Therefore, the following research questions were addressed in this study as follows:
1. Do multiple intelligence types have statistically significant effect on Iranian EFL students' writing ability?

2. Does critical thinking instruction have statistically significant effect on Iranian EFL students' writing ability?
3. Do multiple intelligence types serve as a good predictor of Iranian EFL students' writing ability?
4. Does critical thinking instruction serve as a good predictor of Iranian EFL students' writing ability?

3. Methodology
3.1 Participants
To meet the objectives of the study, 120 undergraduate-student (72 females, 48 males) took part in the study. They majored in Teaching English as a Foreign Language (TEFL) students in RAD University, Iran. Participants were between the ages of 18 to 30. All participants had the same English teacher and they were in same level of English language proficiency, i.e., upper-intermediate. As to the sampling, the participants of the study were selected through purposeful convenience sampling in which the researcher selected the participants who were available at the time of the research while considered the major objectives of the study (Dornyei, 2007).

3.2 Instruments
In order to collect the required data, two main instruments were applied, which are explained below.

Writing Pre-Test:
The students' ability to write academically was initially checked by asking them to write an essay on: 'Learning about the past has no value for those of us living in the present. Do you agree or disagree? Use specific reasons and examples to support your answer.' as the writing pre-test. In fact, the purpose was to distinguish the students' ability to use critical thinking techniques and apply multiple intelligences in their writing and be aware of paragraph organization of different types of texts.

Writing Post-Test:
After the treatment sessions of teaching writing through, the same topic was given to the participants to look into their writing development as the writing pot-test. The purpose was to quantitatively look into the effect of critical thinking and multiple intelligence as techniques on the students' writing development. In order to rate the students' writing, four raters, who were expert in the field, Hamp-Lyons' (1992) rubric for academic writing was used, aiming to assess students' writing on the variety of components including task compliance/format, topic development,

organization, vocabulary, discourse control, sentence structure, and mechanics.

The reliability of the pre- and post-test of writing was checked by Guttman Split-Half Coefficient. It was estimated at .78 and .81 for the pre- and post-test, which reveals the logical measure of reliability (Farhady, Jafarpour, & Birjandi, 1994).

3.3 Procedures

The present study examined the effect of teaching writing through teaching critical thinking strategies and multiple intelligences on the students' writing ability. Initially, one of the researchers made the necessary coordination with the President of RAD University as well as the Dean of the Faculty of Foreign Language to get necessary permissions for conducting the study. Then, 120 BA students of TEFL were selected as the participants of the study. They were thoroughly informed regarding the objectives of the study. Then, they were exposed to writing instruction through critical thinking and multiple intelligences. Each is explained in the following:

As to the students' awareness of their critical thinking, one of the researchers taught the related strategies of problem solving activities, raising questions, teaching logical reasoning, and evaluating others' arguments regarding their writing. The students were encouraged to work on the writing tasks and try to challenge their writing. It is worth noting that all the participants had passed general course of Basic Writing. However, the instructor provided general guidelines concerning the structure of the writing concerning topic sentence, supporting sentence, and concluding sentence. The students were requested to concentrate on their writings and raise different questions regarding the topic to make their statements for the writing. The students shared their answers with their peers in order to develop their ideas regarding the topic. The teacher also provided feedback on their sentences and encouraged them to write on their own. The students were also exposed to writing instruction by developing their multiple intelligences as in the following.

Then students were asked to do Gardner's (1983) multiple intelligence test. This theory suggests that traditional psychometric views of intelligence are too limited. Gardner first outlined his theory in his 1983 book "Frames of Mind: The Theory of Multiple Intelligences", where he suggested that all people have different kinds of intelligences. Gardner proposed that there are eight intelligences, and has suggested the possible addition of a ninth known as "existentialist intelligence". This test contains the following characteristics:

1. Visual-Spatial Intelligence: Visual and spatial judgment

People who are strong in visual-spatial intelligence are good at visualizing things. These individuals are often good with directions as well as maps, charts, videos, and pictures.

Characteristics of visual-spatial intelligence include:

- Enjoys reading and writing
- Good at putting puzzles together
- Good at interpreting pictures, graphs, and charts
- Enjoys drawing, painting, and the visual arts
- Recognizes patterns easily

2. Linguistic-Verbal Intelligence: Words, language, and writing

People who are strong in linguistic-verbal intelligence are able to use words well, both when writing and speaking. These individuals are typically very good at writing stories, memorizing information, and reading.

Characteristics of linguistic-verbal intelligence include:

- Good at remembering written and spoken information
- Enjoys reading and writing
- Good at debating or giving persuasive speeches
- Able to explain things well
- Often uses humor when telling stories

3. Logical - Mathematical Intelligence: Analyzing problems and mathematical operations

People who are strong in logical-mathematical intelligence are good at reasoning, recognizing patterns, and logically analyzing problems. These individuals tend to think conceptually about numbers, relationships, and patterns.

Characteristics of logical-mathematical intelligence include:

- Excellent problem-solving skills
- Enjoys thinking about abstract ideas
- Likes conducting scientific experiments
- Good at solving complex computations

4. Bodily-Kinesthetic Intelligence: Physical movement, motor control

Those who have high bodily-kinesthetic intelligence are said to be good at body movement, performing actions, and physical control. People who are strong in

this area tend to have excellent hand-eye coordination and dexterity.

Characteristics of bodily-kinesthetic intelligence include:

- Good at dancing and sports
- Enjoys creating things with his or her hands
- Excellent physical coordination
- Tends to remember by doing, rather than hearing or seeing

5. Musical Intelligence: Rhythm and music

People who have strong musical intelligence are good at thinking in patterns, rhythms, and sounds. They have a strong appreciation for music and are often good at musical composition and performance.

Characteristics of musical intelligence include:

- Enjoys singing and playing musical instruments
- Recognizes musical patterns and tones easily
- Good at remembering songs and melodies
- Rich understanding of musical structure, rhythm, and notes

6. Interpersonal Intelligence: Understanding and relating to other people

Those who have strong interpersonal intelligence are good at understanding and interacting with other people. These individuals are skilled at assessing the emotions, motivations, desires, and intentions of those around them.

Characteristics of interpersonal intelligence include:

- Good at communicating verbally
- Skilled at nonverbal communication
- Sees situations from different perspectives
- Creates positive relationships with others
- Good at resolving conflict in groups

7. Intrapersonal Intelligence: Introspection and self-reflection

Individuals who are strong in intrapersonal intelligence are good at being aware of their own emotional states, feelings, and motivations. They tend to enjoy self-reflection and analysis, including daydreaming, exploring relationships with others, and assessing their personal strengths.

Characteristics of intrapersonal intelligence include:

- Good at analyzing his or her strengths and weaknesses
- Enjoys analyzing theories and ideas
- Excellent self-awareness

- Clearly understands the basis for his or her own motivations and feelings

8. Naturalistic Intelligence: Finding patterns and relationships to nature

Naturalistic is the most recent addition to Gardner's theory and has been met with more resistance than his original seven intelligences. According to Gardner, individuals who are high in this type of intelligence are more in tune with nature and are often interested in nurturing, exploring the environment, and learning about other species. These individuals are said to be highly aware of even subtle changes to their environments.

Characteristics of naturalistic intelligence include:

- Interested in subjects such as botany, biology, and zoology
- Good at categorizing and cataloging information easily
- May enjoy camping, gardening, hiking, and exploring the outdoors
- Doesn't enjoy learning unfamiliar topics that have no connection to nature

While a person might be particularly strong in a specific area, such as musical intelligence, he or she most likely possesses a range of abilities. For example, an individual might be strong in verbal, musical, and naturalistic intelligence.

It is worth mentioning that prior to writing instruction, the pre-test of writing was taken by the participants. Then, after the teaching of writing through critical thinking and multiple intelligence, the participants took the writing post-test to investigate the effectiveness of the treatment sessions on their writing ability.

4. Analysis and Discussion

The present study aimed to examine the effect of critical thinking and multiple intelligences on the Iranian students' writing ability. In order to analyze the data, descriptive and inferential statistics were employed. Initially, normality of data had to be checked as shown in Tables 1 and 2 below.

Table 1: One-Sample Kolmogorov-Smirnov Test of the Critical Thinking and Writing Ability of the Participants

		R1A	R1B	R1, Mean	R2	R1&2, Mean	Critical Thinking
N		120	120	120	120	120	120
Normal Parameters	Mean	5.20	5.30	5.25	5.24	5.25	20.39
	SD	.78	.63	.67	.59	.61	3.15
Asymp. Sig. (2-tailed)							.01*
		.00*	.00*	.00*	.00*	.00*	

The information provided in Table 1 makes it clear that none of the sets of data in the case of writing or critical thinking are

normal. That is to say, the scores given to the participants by the first rater on the first time, the scores given to the participants by the first rater on the second time, the mean of the two sets of scores assigned by the first rater, the scores given to the participants by the second rater, the mean of the three sets of scores assigned by the two raters, and the Students' critical thinking score are all non-normal since their significance values are all .00 which is below the standard .05 level of significance ($\alpha = .05$; $p<\alpha$).

Table 2: One-Sample Kolmogorov-Smirnov Test of the Intelligence Types

		Ling	Log /Math	Interp	Intrap	Bod/ Kin	Natu	Mus	Spa/ Vis
N		120	120	120	120	120	120	120	120
Normal Parameters	Mean	26.56	24.28	26.61	24.06	23.91	23.94	24.70	24.91
	SD	6.18	8.10	7.07	7.20	7.76	8.11	7.84	7.25
Asymp. Sig. (2-tailed)		.27	.13	.11	.32	.22	.19	.18	.42

On the other hand, all data sets obtained from all the eight intelligence types are normally distributed according to Table 2 for their significance values are all above the critical value. That is, the significance values of the linguistic, logical/ mathematical, interpersonal, intrapersonal, bodily/ kinesthetic, naturalistic, musical, and spatial/ visual types of intelligence are .27, .13, .11, .32, .22, .19, .18, and .42 respectively that are all higher than the α level ($\alpha = .05$; $p>\alpha$).

According to the results of Tables 1 and 2, the conclusion is that non-parametric kinds of formulae were the most appropriate in all cases because half of the scores are not normally distributed and the parametric formulae could not be used.

Table 3: Spearman's Rho between the Students' Linguistic, Logical/ Mathematical, Interpersonal, and Intrapersonal Types of Intelligence and Their Writing Ability

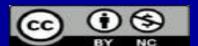|			writing
Spearman's rho	Linguistic	Correlation Coefficient	.52**
		Sig. (2-tailed)	.00
		N	120
Spearman's rho	Logical/ Mathematical	Correlation Coefficient	-.08
		Sig. (2-tailed)	.33
		N	120
Spearman's rho	Interpersonal	Correlation Coefficient	.25**
		Sig. (2-tailed)	.00
		N	120
Spearman's rho	Intrapersonal	Correlation Coefficient	.07
		Sig. (2-tailed)	.41
		N	120

Checking the *r* value reported in Table 3 for the correlation between the two variables of linguistic type of intelligence and the participants' writing ability, i.e. .52, it becomes clear that there was a significant correlation. The point is further confirmed by the *p* value reported as .00 which is smaller than the standard level. Checking the

coefficient of correlation for the participants' logical/mathematical type of intelligence and their writing ability (ρ = -.08), it becomes clear that the value is not significant since its level of significance is higher than the standard ($p = .33$; $\alpha = .05$; $p>\alpha$). The same point as the case of the correlation between linguistic type of intelligence and writing is true about the relationship between the Students' interpersonal kind of intelligence and their writing ability for the *r* value in this case is .25 with the significance value reported as .00 which is below the standard .05 level of significance. The last row in Table 3 reports the upshots of calculating the coefficient of correlation for the participants' intrapersonal type of intelligence and their writing ability. There was not a significant correlation between the two factors since the *r* value is reported as .04 with the significance value of .41 that is above the critical value of .05. Table 4 shows the correlation between the participants' writing ability and the other four intelligence types, i.e., bodily/ kinesthetic, naturalistic, musical, and spatial/ visual.

Table 4: Spearman's Rho between the Students' Bodily/Kinesthetic, Naturalistic, Musical, and Spatial/Visual Types of Intelligence and Their Writing Ability

			writing
Spearman's rho	Bodily/ Kinesthetic	Correlation Coefficient	.03
		Sig. (2-tailed)	.11
		N	120
Spearman's rho	Naturalistic	Correlation Coefficient	-.02
		Sig. (2-tailed)	.77
		N	120
Spearman's rho	Musical	Correlation Coefficient	-.05
		Sig. (2-tailed)	.56
		N	120
Spearman's rho	Spatial/ Visual	Correlation Coefficient	-.13
		Sig. (2-tailed)	.13
		N	120

Table 4 shows that there was not a correlation between writing and bodily/ kinesthetic type of intelligence due to the fact that the *r* value reported in this case is .03 with the significance value of the .11, which is more the standard .05 level. The calculated coefficient of correlation for the participants' writing ability and naturalistic type of intelligence (ρ = -.02) is not significant as a result of its level of significance which is higher than the standard ($p = .77$; $\alpha = .05$; $p>\alpha$). The same

point is also true about the correlation between the Students' writing ability and musical intelligence type since the ρ value reported in this case is -.05, which is not significant because of the significance value of .56 that is higher than the critical value (i.e., *p* = .77; *α* = .05; *p<α*). Moreover, the last type of intelligence, i.e., spatial/ visual, did not correlate significantly with the writing ability of the participants for the value reported was not large enough (*ρ* = -.13). The result was further confirmed by the significance value which is above the standard level (*p* = .13; *α* = .05; *p>α*).

In sum, there was a significant relationship between writing and linguistic, interpersonal, and bodily/ kinesthetic type of intelligence while the other types of intelligence did not have any significant effect on the participants' writing ability. Table 5 shows the relationship between the students' critical thinking and their writing ability.

Table 5: Spearman's Rho between the Students' Critical Thinking and Their Writing Ability

			writing
Spearman's rho	Critical Thinking	Correlation Coefficient	.54**
		Sig. (2-tailed)	.00
		N	120

As evident in Table 5, the students' writing scores and their critical thinking ones were significantly correlated (*r* = .54) as the level of significance of the suggested coefficient is smaller than the standard level (*p* = .00; *α* = .05; *p<α*). The upshots provided in Table 5 is a good piece of information in response to the second research question of the study which was about the possible effect of critical thinking on participants' writing.

Another point the researcher was keen on checking was the predictive power of the intelligence types and critical thinking which was then checked through regression analyses and their outcomes as provided below. Table 6 indicates whether linguistic type of intelligence can be a predictor of students' writing.

Table 6: Regression Model of the Students' Linguistic Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.586ᵃ	.343	.337	.50208

According to the results shown in Table 6, there is a relative relationship between the predictor variable (i.e., linguistic type of intelligence) and the predicted variable, that is, writing since the calculated correlation is .586. That is to say, 58.6 percent of the variation observed in the predicted variable is accounted for by the variation detected in the predictor variable (R^2 = .586; R^2 x 100 = 58.6). Table 7 shows the regression ANOVA for linguistic type of intelligence.

Table 7: Regression ANOVA for the Students' Linguistic Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.530	1	15.530	61.607	.00*
	Residual	29.746	118	.252		
	Total	45.276	119			

Table 7 shows that the predictive power portrayed in Table 6 is statistically significant because the calculated F is large enough to enjoy a level of significance smaller than the .05 standard at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}$= 61.607; *p* = .00; *α* = .05; *p<α*). Table 8 provides the regression model for the multiple intelligence of logical/mathematical and the students' writing.

Table 8: Regression Model of the Students' Logical/ Mathematical Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.063ᵃ	.004	-.005	.61822

Table 8 shows a very small relationship between logical/ mathematical type of intelligence, which is the predictor variable, and writing ability of the participants, which is the predicted variable. In fact, .4 percent of the variation observed in the predicted variable is because of the variation detected in the predictor variable (R^2 = .004; R^2 x 100 = .4). The significance level between the two variable is presented in Table 9 below.

Table 9: Regression ANOVA for the Students' Logical/ Mathematical Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.177	1	.177	.463	.49
	Residual	45.099	118	.382		
	Total	45.276	119			

As to Table 9, it can be inferred that the predictive power illustrated in Table 8 is not statistically significant either. The reason for such conclusion is that the F is not large enough to provide a level of significance below than the standard at one and a

hundred and eighteen degrees of freedom ($F_{(1,118)}$= .463; p = .49; α = .05; $p>\alpha$). The regression model for the students' interpersonal type of intelligence and their writing is provided in Table 10.

Table 10: Regression Model of the Students' Interpersonal Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.237ᵃ	.056	.048	.60172

As evident in Table 10, the calculated amount of relationship between the predictor variable of interpersonal type of intelligence and the predicted variable of writing ability of the students is 23.7 percent of the variation perceived in the predicted variable is the result of the variation observed in the predictor variable (R^2 = .237; R^2 x 100 = 23.7). ANOVA results are also provided in Table 11.

Table 11: Regression ANOVA for the Students' Interpersonal Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.553	1	2.553	7.050	.00*
	Residual	42.724	118	.362		
	Total	45.276	119			

To further confirm the results of Table 10, Table 11 shows that the predictive power reported in Table 10 is statistically significant although the F is acceptable to provide a level of significance lower than the standard at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}$= 7.050; p = .00; α = .05; $p>\alpha$). Table 12 provides the results of the interpersonal type of intelligence.

Table 12: Regression Model of the Students' Intrapersonal Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.046ᵃ	.002	-.006	.61877

According to Table 12, the relationship between the predictor variable (i.e., intrapersonal type of intelligence) and the predicted variable, that is, writing is not considerable for the calculated correlation is .046. This, in turn, means that 4.6 percent of the variation observed in the predicted variable is accounted for by the variation detected in the predictor variable (R^2 = .046; R^2 x 100 = 4.6). Table 13 reports ANOVA results.

Table 13: Regression ANOVA for the Students' Intrapersonal Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.096	1	.096	.251	.61
	Residual	45.180	118	.383		
	Total	45.276	119			

Table 13 suggests that the predictive power portrayed in Table 12 is not statistically significant as a result of the calculated F is not large enough to provide a level of significance smaller than the critical value at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}$= .251; p = .61; α = .05; $p>\alpha$). Table 14 indicate regression analysis for the students' bodily/kinesthetic type of intelligence.

Table 14: Regression Model of the Students' Bodily/Kinesthetic Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.224ᵃ	.050	.042	.60375

The outcomes of Table 14 shows the calculated amount of relationship between bodily/ kinesthetic type of intelligence, the predictor variable, and writing ability of the Students, the predicted variable. The table displays 22.4 percent of the variation observed in the predicted variable is due to the variation detected in the predictor variable (R^2 = .224; R^2 x 100 = 22.4). ANOVA results are also provided in Table 15.

Table 15: Regression ANOVA for the Students' Bodily/Kinesthetic Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.264	1	2.264	6.210	.11*
	Residual	43.013	118	.365		
	Total	45.276	119			

On the contrary, Table 15 is a good piece of information based on which it is possible to decide about the significance of the relationship between the bodily/ kinesthetic type of intelligence and writing. The so-called relationship is not statistically significant as the calculated F is large enough to enjoy a level of significance smaller than the .05 standard at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}$= 6.210; p = .11; α = .05; $p>\alpha$). Table 16 demonstrates regression model for naturalistic type of intelligence.

Table 16: Regression Model of the Students' Naturalistic Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.021ᵃ	.000	-.008	.61930

Table 16 shows the amount of the relation between the predictor variable of
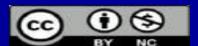
naturalistic type of intelligence and the predicted variable of writing ability. Accordingly, 2.2 percent of the variation observed in the predicted variable is the because of the variation observed in the predictor variable ($R^2 = .021$; R^2 x 100 = 2.1). The significance level for two variables is provided in Table 17 below.

Table 17: Regression ANOVA for the Students' Naturalistic Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.020	1	.020	.052	.81
	Residual	45.256	118	.384		
	Total	45.276	119			

Table 17 makes it clear that the predictive power shown in Table 16 is not statistically significant due to the fact that the calculated F is not large enough to provide a level of significance smaller than the critical value at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}= .052$; $p = .81$; $\alpha = .05$; $p>\alpha$). Table 18 shows regression analysis for the students' musical type of intelligence.

Table 18: Regression Model of the Students' Musical Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.045ª	.002	-.006	.61881

Going through the details of Table 18, it becomes obvious that there is not any relationship between the predictor variable (i.e. musical type of intelligence) and the predicted variable, that is, writing for the calculated correlation is .045. That is to say, only 4.5 percent of the variation observed in the predicted variable is accounted for by the variation detected in the predictor variable ($R^2 = .045$; R^2 x 100 = 4.5). Table 19 reports ANOVA results.

Table 19: Regression ANOVA for the Students' Musical Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.090	1	.090	.236	.62
	Residual	45.186	118	.383		
	Total	45.276	119			

To further confirm the outcomes of Table 18, Table 19 shows that the predictive power portrayed in Table 18 is not statistically significant since the calculated F is not large enough to enjoy a level of significance smaller than the .05 standard at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}= .236$; $p = .62$; $\alpha = .05$; $p>\alpha$). Table 20 shows the regression analysis for the students' spatial/visual type of intelligence.

Table 20: Regression Model of the Students' Spatial/ Visual Type of Intelligence and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.125ª	.016	.007	.61457

According to Table 20, the relationship between the predictor variable of spatial/ visual type of intelligence and the predicted variable of writing is not considerable as the calculated correlation is .125. That is to say, 12.5 percent of the variation observed in the predicted variable is the result of the variation observed in the predictor variable ($R^2 = .125$; R^2 x 100 = 12.5). Table 21 indicates the significance level for two variables.

Table 21: Regression ANOVA for the Students' Spatial/ Visual Type of Intelligence and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.708	1	.708	1.875	.17
	Residual	44.568	118	.378		
	Total	45.276	119			

Table 21 shows that the predictive power illustrated in Table 20 is not statistically significant either. The reason for such conclusion is that the F is not large enough to provide a level of significance below than the standard at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}= 1.875$; $p = .17$; $\alpha = .05$; $p>\alpha$).

To wrap up the upshots of the above-presented Tables (6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, and 21), it can be inferred that intelligence types do not generally serve as a good predictor for the participants' writing except for the linguistic and interpersonal types of intelligence.. Table 22 provides the results of the regression analysis for the students' critical thinking.

Table 22: Regression Model of the Students' Critical Thinking and Their Writing Ability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.606ª	.367	.362	.49269

As shown in Table 22, the conclusion is that there is a relationship between the predictor variable (i.e. critical thinking) and the predicted variable, i.e. writing for the calculated correlation is .606. That is to say, only 60.5 percent of the variation observed in the predicted variable is accounted for by the variation detected in the predictor variable ($R^2 = .606$; R^2 x 100 =

60.5). Table 23 concentrates on ANOVA results.

Table 23: Regression ANOVA for the Students' Critical Thinking and Their Writing Ability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.632	1	16.632	68.519	.00*
	Residual	28.644	118	.243		
	Total	45.276	119			

Table 23 is provided to conclude about whether the relationship illustrated in Table 22 is statistically significant or not. According to the outcomes of this table, the predictive power of critical thinking is significant due to the fact that the F is large enough to provide a level of significance below than the standard at one and a hundred and eighteen degrees of freedom ($F_{(1,118)}$= 68.519; p = .00; α = .05; $p>\alpha$). It can be concluded that critical thinking can serve as good predictors for the students' writing.

To sum up the results of the study, it was found that critical thinking instruction had statistically significant effect on Iranian EFL students' writing and it was considered as the predictor of their success in writing. However, only the students' linguistic and interpersonal types of intelligence were found to be significantly effective on Iranian EFL students' writing, being as two good predictors of the students' development in writing essays.

The results indicated that critical thinking found to be positively correlated with writing. Studies have already found that there is a closer relationship between writing and critical thinking, and all the values and competencies, like critical thinking, are socially constructed and highly situated within different disciplines (Condon & Kelly-Riley, 2004).

The present study also found that multiple intelligence and critical thinking have a positive relationship with writing and most of the previous studies have come to a similar conclusion. Ghamati (2011), Hafez (2010), McMahon, Rose and Parks (2004), Burman and Evans (2003) and Gaines and Lehmann (2002) all found a positive relationship between multiple intelligence and Reading. Yi-an (2010), Sadri (2008), Cluck and Hess (2003) and Shah and Thomas (2002) also found a positive correlation between multiple intelligence and Foreign Language Learning, Vocabulary Knowledge and Strategies, Motivating ESL Students and Improving Spelling respectively .

In their study, Moheb and Bagheri (2013) sought to clarify the possible relationship between multiple intelligences and the application of writing strategies by Iranian L2 Students. The results analysis showed a correlation between "logical, existential, kinesthetic, verbal and visual intelligences" and "general writing strategies" employed by the subjects. Moreover, the findings indicated a correlation between "naturalistic, logical, kinesthetic and visual intelligences" and "pre- writing strategies ."

The findings of this study can make the researchers and teachers aware of how multiple intelligences could influence students' writing. This encourages them to take the necessity of using a variety of ways in teaching for each students. The teachers are more likely to care about the strength and weakness of different intelligences among different students when teaching. Being exposed to a variety of teaching ways, the amount of learning will definitely increase. Knowing about how their intelligences act, the students themselves would also know how to improve themselves most efficiently through using different types of intelligences best.

5. Conclusion

The present study investigated the effect of using critical thinking strategies and multiple intelligences on the Iranian university students' writing ability. Results revealed that critical thinking significantly affected students' writing ability. It was also found that using critical thinking could be the significant predictor of the students' writing ability. As to the multiple intelligence, linguistic and interpersonal types of intelligence has significant impact on the students' writing ability. These two types of intelligence were the significant predictor of the students' writing.

Findings of the study can be beneficial for teachers of academic language context to employ critical thinking strategies and multiple intelligences as effective technique to improve the students' writing ability. Students can also benefit from the above-mentioned techniques to increase their potential of academic writing. As to the limitations, the current study was limited to university students' writing ability, while other groups of students from different context can be taken into account. Finally, this study was limited to applying two techniques of teaching writing, while other strategies can be considered in future research and have a comparative investigation of the various applied techniques.

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