



## **The Effectiveness of 4MAT Model in Developing Argumentative Writing Skills among EFL Majors**

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#### ABSTRACT

The present research aimed at empirically investigating the effectiveness of 4MAT model, an instructional model capitalized on learning styles and brain hemispheres, in developing argumentative writing skills among EFL majors at the Faculty of Education, Al-Azhar University. To fulfil the purpose of the research, the experimental method was adopted (pretest - posttest control group design). An argumentative writing test with a scoring rubric was developed by the researchers for collecting the target data after assuring its validity and reliability. The participants, totalling 49, were randomly selected from the fourth year EFL majors at the Faculty of Education, Al-Azhar University and assigned into two groups: the experimental group (N= 25) and the control one (N=24). The statistical analysis of the data elicited using independent samples *t*-tests revealed that there was a statistically significant difference between the mean scores attained by the experimental group and the control one underscoring the effectiveness of 4MAT model in developing argumentative writing skills as the effect size was large (Cohen's *d*= 0.88). The researchers developed a number of recommendations and suggestions for the future researchers.

*Keyword:* 4MAT Model, Argumentative Writing, Learning Styles, Brain Hemispheres.

## فاعلية نموذج مكارثي في تنمية مهارات الكتابة الجدلية لدى طلاب شعبة اللغة الإنجليزية كلغة أجنبية

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### ملخص:

تمحور الهدف الرئيس للبحث الحالي حول استقصاء فاعلية نموذج مكارثي 4MAT (أحد النماذج التعليمية التي تعتمد على أساليب التعلم وتفضيلات نصفي الدماغ البشري) في تنمية مهارات الكتابة الجدلية لدى طلاب شعبة اللغة الإنجليزية كلغة أجنبية بكلية التربية، جامعة الأزهر، وقد تبنى البحث المنهج التجريبي من خلال استخدام تصميم المجموعة الضابطة ذي الاختبارين القبلي والبعدي، وتمثلت أداة البحث في اختبار للكتابة الجدلية ومقياس تقدير متدرج لجمع البيانات؛ حيث تم تطبيقه قبلياً وبعدياً على طلاب عينة البحث بعد التأكد من صدقه وثباته، وتكونت عينة البحث من 74 طالباً من الفرقة الرابعة بشعبة اللغة الإنجليزية، تم اختيارهم وتوزيعهم عشوائياً إلى مجموعتين: المجموعة التجريبية وبلغ عدد طلابها 25 طالباً، والمجموعة الضابطة وبلغ عدد طلابها 24 طالباً، ولقد أسفر التحليل الإحصائي للبيانات من خلال اختبار للعينات المستقلة عن وجود فروق ذات دلالة إحصائية بين متوسطي درجات مجموعتي البحث لصالح المجموعة التجريبية، مما يؤكد فاعلية نموذج مكارثي في تنمية مهارات الكتابة الجدلية؛ حيث كان حجم الأثر كبير طبقاً لمعادلة كوهين ( $d=0.88$ )، ولقد قدم الباحث مجموعة من التوصيات والمقترحات لباحثي المستقبل.

الكلمات المفتاحية: نموذج مكارثي، الكتابة الجدلية، أساليب التعلم، نصفي الدماغ.

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## Introduction

The process of writing is infrequently stress-free even for professionals as it places heavy cognitive demands on attention, sequencing, working memory, and processing speed and involves several steps to be followed so that the final text can communicate what the writer wants to convey. Over and above, writing in a foreign language is considered one of the most complex and demanding skills to be mastered. It is more multipart and challenging than writing in one's mother tongue as it imposes a great confrontation for most students in different contexts. To write in a foreign language, learners need to activate and coordinate several linguistic skills including, but not limited to, semantics, syntax, spelling and writing conventions (Zamel, 1985).

Pertinently, there are four main writing discourses, namely narrative, expository, descriptive, and argumentative. Each of which requires specific techniques and is done for different purposes and for different audiences (Badger & White, 2000). Argumentative writing has been proven by researchers to be the most difficult discourse of writing (Dastjerdi & Samian, 2011; Neff-van Aertselaer & Dafouz-Milne, 2008; Nippold & Ward-Lonergan, 2010) and one of the most sophisticated skills to teach (Dean, 2018; Salahu-Din et al., 2008; Zimmer, 2014).

Argumentative essay writing is a dynamic literacy practice where the author establishes a dialogic relationship with an audience defending a point of view and looking to convince, get an adhesion or persuade (Alvarez, 2001). More than that, it requires reasoning and higher thinking skills such as predicting, analysing, and synthesizing. Such skills are not so easy for any FL student or even for writing in one's first language. As for foreign language students, argumentative writing discourse is crucial to articulate their own ideas in academically appropriate patterns and approaches. It helps them acquire knowledge, promotes scientific thinking skills, and enhances comprehension (Golpour, 2014). Furthermore, argumentative writing can lead to an increase in intrinsic motivation and enhance problem-solving skills in the academic settings (Chinn, 2006; De La Paz, 2005; Sampson & Gleim, 2009).

Learners at the university level often face difficulties in the use of complex and appropriate elements in producing argumentative writing (Ferretti, Andrews-Weckerly & Lewis, 2007; Kaur, 2015; Neff-van Aertselaer & Dafouz-Milne, 2008). Most EFL learners have partial understandings of argument; for instance, a for-and-against structure inserted between introduction and conclusion. Consequently, learners need to develop analytic and evaluative skills in order to write effective, well-thought of and cohesive argumentative essays, and learners need to be aware of the appropriate schematic structure, style and register for effective presentation of their position (Schwarz, et al., 2003; Wu, 2006; Zohar & Nemet, 2002).



Nippold and Ward-Lonergan (2010, p. 238) noted that “argumentative writing is a challenging communication task that needs sophisticated cognitive and linguistic abilities”. According to Toulmin, Rieke and Janik (1984), argumentative writing is a set of interrelated claims and supporting statements that enforce the arguer’s position. It involves the process of stating a claim, providing data to support that claim, acknowledging the possible counterarguments, and offering rebuttals (Toulmin, 1958). Based on these definitions, many models of argument structures have been developed by researchers and educators, e.g., Toulmin, 1958, 1984 (the Toulmin model of argumentation); Mitchell & Riddle, 2000 (the triangle model); Scriven, 1976 (the scriven model of argumentation); Walton, 1998 (the dialectical method of evaluating argument).

Toulmin’s (1958) model of argument structure is the most prominent framework for teaching and analysing argumentative text and essay writing. From Toulmin’s point of view, every argument is composed of six interconnected parts: claim, data, warrant, backing, rebuttal, and qualifiers, respectively. Claim is an expression of the position that is advanced in the argument. The elements datum, warrant and backing fall within the term grounds. Datum is the information that is expressed to support the acceptance of the claim. Warrant (often implicit) is a rule of inference that justifies the transition from the datum to the claim and reveals the relevance of the data for the claim. Backing is information such as reasonable evidence, statistics or expert ideas that provide a rationale for a warrant. Qualifiers and their interrelated rebuttals are presented to qualify the relationship between the claim and warrant.

As such, much of what is required from the students to accurately produce a piece of writing depends on their ability to organize, critique, remember, reflect, evaluate, plan and reason, which entails focus, time, and specific practice to help them engage in and strengthen their executive function in the brain. Consequently, argumentative writing requires coordination of the brain left and right hemispheres, which entails a great deal of efforts by the teachers or instructors (Walton, 2007).

Argumentative writing places heavy load on the brain as it requires an integration of multiple cognitive functions simultaneously: hand-eye coordination, language, memory, creativity, insight, logic, spatial intelligence, abstract thought, and a lot of brain activity to accomplish. Brain scans show that many areas of the brain work in tandem during the act of writing, which creates strong neural connections for developing other skills (Dean, 2018). Similarly, individuals work differently even before they set pen to paper which may be attributed to the individual differences, the strategies adopted, the degree of skill mastery and the learning styles and addressing all the different types of learners within an argumentative writing class requiring a teaching model that can remediate and strategize the difficulties encountered by the students in an argumentative writing

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class (Erhard, et al., 2014; Zimmer, 2014).

With this in mind, argumentative writing requires orchestrating the teaching practices, adjusting the rhythm of the teaching, and avoiding the outdated traditional ones. Consequently, the instructor could address the learners higher thinking skills in an effective manner making use of their abilities, focusing on their learning styles and resolve the difficulties encountered (Berge, et al., 2016; Hasani, 2016).

Concordantly, 4MAT model (4 Mode Application Techniques), developed by Bernice McCarthy (1980), is a brain-based teaching model that incorporates the research on human brain processing preferences and learning styles to address diverse spectrum of learners. 4MAT model highlights learning in accordance with the way the brain is naturally designed to learn, and it has been gleaned from research in neurology and cognitive science to enhance teaching learning process. It was developed on the basis of constructivism, and it presents opportunities for students to understand the particulate nature of matter, such as modelling, visualization, theoretical knowledge, application, exhibiting individual creativity, the integration of these opportunities and knowledge transfer by interaction with activities (Aktas& Bilgin, 2015; Benchachinda, 2012).

McCarthy (1980) describes 4MAT as a model for delivering instruction in a way that engages, informs, and allows for practice and creative use of materials within each lesson. Students' journey through the learning process starts by asking four simple questions, namely why? (learners who seek a reason or motivation for learning), what? (learners who identify and seek knowledge), how? (learners who actively try out and apply knowledge allowing them to understand how they individually are going to use what they are learning) and what if? (learners who develop extensions of their learning to create new experiences) (McCarthy& McCarthy, 2003; Nowacki, 2011).

Consequently, if all four brain-based classifications are taught to all learners in a cycle that alternates from right to left mode information processing, and if in doing this, all styles are equally valued. This integration will allow learners to be comfortable some of the time and stretched and challenged at other times (McCarthy, 1990; McCarthy& McCarthy, 2006).

Originally, 4MAT model was developed on the basis of two major premises: 1) People have hemispheric processing preferences; and 2) people have major learning styles. McCarthy incorporated the research on human brain function and learning, into her theory. Research has proved that: a) both hemispheres of the human brain (right and left) process information and experience in different ways; b) both hemispheres are equally important for the whole brain functioning; and c) individuals rely more on one mode of processing than the other especially when they approach new learning (McCarthy, 1990). Research describes left mode as serial, analytic, rational, and verbal, while right mode as global, visual, and holistic. Left mode processing is systematic and problems are solved by looking at the

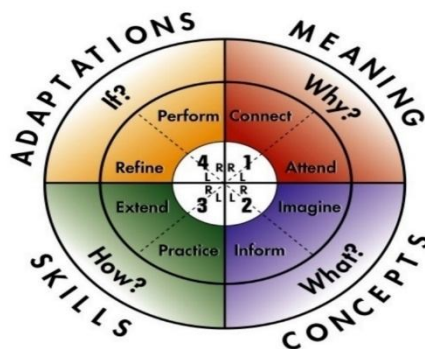
parts and sequence is critical. Right mode processing seeks patterns and solves problems by looking at the whole picture (McCarthy, 2000). The reality is that people approach learning with their whole minds, with their intuition, their beliefs, and their subjectivity intact. Accordingly, both ways of the brain function while designing their teaching courses should be taken into account. Such inclusion of hemispheric specificity as a further determinant of individual differences in learning is a further extension of Kolb's model by McCarthy (St Germain, 2002).

Likewise, grounded on the work of David Kolb's Experiential Learning Theory, specifically his cycle of interaction between concrete experiential, reflective observation, abstract conceptualization, and active experimentation, 4MAT model was developed (McCarthy & McCarthy, 2006). McCarthy has slightly changed the articulation of Kolb's theory to incorporate other theories and to reflect more recent research. Each change was an extension of rather than departure from Kolb's original dictum that individuals expand their adaptive processes through exercising them (St Germain, 2002).

Operationally, 4MAT model (McCarthy, et al., 1987) serves as a conceptual framework for teaching. It provides a system of planning instruction that assumes engagement with a variety of diverse learning activities results in higher levels of motivation and performance (McCarthy & McCarthy, 2006). 4MAT lesson planning comprises eight steps: 1) connect, 2) attend, 3) imagine, 4) inform, 5) practice, 6) extend, 7) refine, and 8) perform (McCarthy & McCarthy, 2006) (see figure:1).

Figure 1

*4MAT (Four Mode Application Technique) model*



The figure above (1) depicts that learning journey starts from the first and second steps of the first quarter (connect & attend), where students use their experiences. The aim of this stage is to make connections between the student's background and concepts (reflective observation). The fundamental question at this stage is "why?" tackling the imaginative learners. The third and fourth steps of the

second quarter are imagine & inform where individuals learn what a concept is. Students analyse their experiences and shape concepts (concept formulation). The fundamental question at this stage is “what?” tackling the analytic learners. The fifth and sixth steps of the third quarter are practice and extend where students implement the concepts and learning is individualized (active experimentation). The fundamental question at this stage is “how?” tackling the common sense learners. The seventh and eighth steps of the fourth quarter are refine and perform where practice and experience are integrated (concrete experience). The fundamental question of this stage is “what if?” tackling the dynamic learners. In other words, 4MAT model was developed to modify the events of instruction so that they, specifically, address the brain-based classifications and the different styles of learning. This is increasingly assisting the careers of students as well as the teacher (McCarthy, 1990, Nicoll-Senft& Seider, 2009; Tatar& Dikici, 2009).

### **Research Purpose**

The present research aimed to explore the effectiveness of 4MAT model in enhancing the argumentative writing skills among the EFL majors at the Faculty of Education, Al-Azhar University. The researchers developed a diagnostic test consisting of one argumentative essay question for assessing the participants’ argumentative writing skills and completed by (19) Fourth-year EFL majors at the Faculty of Education, Al-Azhar University (they did not participate in the final experimentation). Musa (2018) analytic scoring rubric was utilized in the analysis process of the test. It was revealed that 84.2 % of the candidates poorly organized their essays; 52.6 % did not write the introduction correctly; 89.5 % did not write the thesis statement correctly; 73.7 % poorly developed their argumentative essays; 94.7 % did not write the claims correctly; 89.5 % did not provide evidence to support the argumentative issue; 100 % did not provide the counter-arguments; 89.5 % did not provide coherent piece of writing; 57.9 % did not adhere to the writing conventions (grammar, spelling and punctuation); 63.1 % and did not write the conclusion properly.

Thereupon, the researchers sought to answer the following key research question:

1. What is the effectiveness of 4MAT model in developing argumentative writing among EFL majors at the Faculty of Education, Al-Azhar University?

### **Research Hypotheses**

1. There is no statistically significant difference between the mean scores attained by the experimental group in pre/post argumentative writing test.
2. There is no statistically significant difference between the mean scores attained by the experimental group and the control one in the post argumentative writing test.





## Methods and Procedures

### Design and Treatment Material

The current research adopted the experimental method (the pre/posttest non-equivalent group design). This design was selected because it potentially controls most of the threats directed to the internal validity of the research (Campbell & Stanley, 1963; Trochim, 2005). Specifically, this design potentially controls single group threats such as history, maturation, selection, testing, mortality, and regression. It also potentially controls most of the multiple group threats represented in selection-history, selection maturation, selection-instrumentation, selection-mortality, and selection-regression. As such, the experimental group studied the target content via 4MAT model, and the control one received the usual content via the usual model of teaching (see table: 1).

Table 1

*The experimental design adopted by the present research.*

GR <sup>1</sup>		X <sup>1</sup>	
GR <sup>2</sup>	O <sup>1</sup>	X <sup>2</sup>	O <sup>1</sup>

The treatment material of the present research was epitomized in a training outline developed in the light of Kemp model due to its flexibility; as well as it is non-linear in its design and does not have specific starting or end points (Morrison, Ross, & Kemp, 2004). The outline is consisted of five units devoted to teaching argumentative writing in the light of 4MAT model. The outline topics were as follows: overview of argumentative writing, conventions of argumentative writing, diverse types of argumentative essay, grammatical aspects for argumentative writing, scoring argumentative writing. The content validity of the program was assured via submitting it to three experts in the field of curriculum and instruction (EFL) who provided some constructive feedback ranging from linguistic to in-class activities. Such constructive feedback was thoroughly taken into consideration.

### Research Participants

The current research participants were 49 fourth year EFL majors at the Faculty of Education for Boys (Cairo), Al-Azhar University during the academic year (2019/2020). They were randomly selected and assigned into two groups, namely an experimental group (25 students) and a control one (24 students) using the SPSS tool "random distribution". Consequently, as randomization ensures equivalence in the cognitive output, the groups were assumed to be homogeneous to an adequate degree for ensuring the thoroughness of the results.

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## Research Instruments

To accomplish the purpose of the research, the argumentative writing skills list which mainly aimed at delineating the most adequate argumentative writing skills necessary for the EFL majors was developed. The development of the skills list was inspired by a review of literature considering the principal model of argumentative writing developed by the British philosopher Steven Toulmin. The model depicts three essential components for effective argumentation, namely the claim, the data, and the warrant (Toulmin, 1958). Furthermore, the skills list development made use of the International English Language Testing System (IELTS) test specifications and skills. The IELTS necessary skills include the styles and register relevant to the target audience, developing a thesis statement, providing compelling evidence, achieving coherence and cohesion, utilizing a good amount of vocabulary, and maintaining accuracy of language (Cotton & Wilson, 2011; Makkar, 2017; Moghaddam, 2015). More than that, the researchers reviewed the relevant literature to delimit the most appropriate skills relevant to the research participants (e.g. Abu El-Magd, 2017; Elnaggar, 2018; Hassan, 2018).

The list of skills was submitted to a jury in order to assure its content validity. The members were requested to judge the items of this argumentative writing checklist and give their feedback. The jury's comments revealed that most of the argumentative skills were mostly relevant to the purpose of the argumentative writing. More than that, all the jury's feedback was taken into consideration when designing the final form of the checklist which was consisted of 10 sub-skills under five main dimensions.

## The Argumentative Writing Test

The argumentative writing test was utilized as a pre/posttest to assess the potential effectiveness of 4MAT model in enhancing the research participants' argumentative writing skills. The test comprised mainly two tasks (two argumentative essays). In the light of the jury suggestions, each question of the test consisted of two alternatives and the student had to choose one of them to write about. The standard format of the test was that each examinee worked individually.

Furthermore, for determining the content validity of the argumentative writing test, it was submitted to a jury of specialists in the field of curriculum and instruction. The feedback of the jury recommended that each task of the test ought to be consisted of two alternatives and the student had to choose only one to write about for enabling him to select a topic of their interest and could express himself freely. Extra comments which were provided to sustain the participants generate ideas were recommended to be omitted as such comments, according to the jury feedback, limit the examinee creativity and they are not suitable for the fourth year EFL majors as they are advanced language learners. The word count of the pieces of writing ought not to be less than 200 words for allowing the



participants to have reasonable chances to express their views and enable the researchers to form a clear overview of the students' skills mastery. Adjusting the scoring rubric to include more specified items related to the development of ideas to echo with the argumentative writing. All the suggested comments provided by the jury were taken into consideration.

For assuring the reliability of the argumentative writing test, the pilot test was administered to estimate the required time for answering and determine test reliability. In details, the students' performance in the pilot test was assessed and analysed by two specialized raters. The percentages of agreement and disagreement concerning the students' performance were computed and statistically analysed using Holsti's formula, namely percent of agreement for calculating reliability (Holsti, 1969) as follows.

$$PAo = 2A / (N1+N2) \quad PAo = 2 \times 1672 / 2500 = 0.668^1$$

The results of the analysis showed that the test reliability was 0.67, referring that the test was highly reliable and ready to be administered to the research participants.

Over and above, an analytic hybrid scoring rubric consisting of five components was developed by the researchers for scoring the students' argumentative essays, namely relevance of ideas, development of ideas, coherence and cohesion, lexical resource, and grammar accuracy. The students' performance, according to the descriptors provided, ranged from exemplary, distinguished, successful, basic to failing, and the total score of the test was 100 marks (see appendix: 1).

## Research Procedures

Initially, the homogeneity of the groups was statistically measured via using the homogeneity test (Levene statistic) before conducting the statistical analysis (see table: 2).

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<sup>1</sup>PAo represents percentage of agreement between two coders, A is the number of two coders' consensus decisions, and N1 and N2 are numbers of decisions coders have made, respectively.

Table 2

*Homogeneity of the research groups.*

Variable	Group	N	Mean	Std. Deviation	Levene statistic	Sig. (2tailed)
Argumentative Writing Skill	Experimental	25	53.84	9.16	0.02	0.87
	Control	24	54.97	9.46		

Close inspection of the above table (2) shows that the homogeneity test factor was exactly 0.02, which is greater than 0.05 indicating that the groups were homogeneous in their argumentative writing skills.

The argumentative writing test was administered to the experimental group and the control one. The students' written product was assessed and analysed according to the developed scoring rubric. The pretest score was to be used as a baseline for comparing the participants' performance. The experimental group had received the outline content as planned and the control group received the usual content via the usual model of teaching. The instructional process was managed by the researchers via the 4MAT model accompanied by the handouts, which were prepared within the outline materials. The students' performance moved from the guided writing to the free one and feedback was provided for their written outputs.

Procedurally, the learners were cycled in terms of the four main quadrants of 4MAT starting from uncovering the meaning, then overviewing the concept, acquiring the skill and finally adaptation. Thus, answering the learners' questions, namely why, what, how and when and if and addressing their learning styles and brain preferences. Procedurally, relationships were established between the content and the participants' life experiences in order to enable them develop links with the topic via discussing some ideas relevant to the topic. Then, the participants were given information to help them learn the content through visualization, visual comparison, and analogy. After that, students practiced the information demonstrated and turned them into reality in parallel with the information they had already acquired. The students were asked to freely practice for applying their theoretical knowledge with the help of the provided feedback and suggestions to fine-tune their written products. Finally, students stepped back and study their output and assess their own products as well as that of their peers. Additionally, with the help of the given scoring rubric, the students amended, adjusted, enriched, and substantiated their written products before dissemination.

After completing the implementation, the writing test was administered. Responses of the research groups were assessed and statistically analysed versus their scores in the pretest and the posttest to explore the effectiveness of 4MAT model in enhancing the research



participants' argumentative writing. The attained data were analysed via making use of paired and independent sample *t*-tests.

## Research Results

The research question was used as a guide to highlight the data analysis, the descriptive and inferential statistics, and explanations of the yielded results.

To answer the research question, the subsequent hypotheses were posed:

### Hypothesis One

1) There is no statistically significant difference between the mean scores attained by the experimental group in pre/post argumentative writing test.

Deciding on the appropriate statistical technique necessitates adopting a paired sample *t*-test due to the nature of the hypothesis, sample number, and target data. Subsequently, a comparison between the pre and posttest mean scores of the experimental group was drawn to display the difference in the argumentative writing skills before and after the treatment. The following table (3) shows the results of the descriptive and inferential statistical analyses:

Table 3

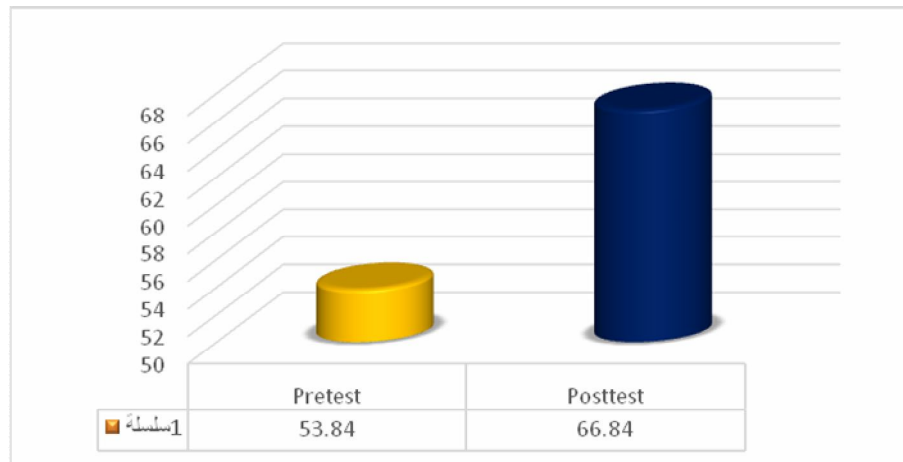
*Paired sample t-test results (Experimental group pre/post argumentative writing test).*

Group	Treatment	N	Mean	Std. Deviation	T-Value	Sig.(2tailed)	Cohen's <i>d</i>
Experimental Group	Pretest	25	53.84	9.16	5.39	0.001	1.07
	Posttest	25	66.84	7.38			

The data displayed above show that there was a statistically significant difference between the mean scores attained by the experimental group learners before and after the treatment in the argumentative writing as assessed by the argumentative writing test. The results of *t*-test yielded (5.39) which is significant (sig. = 0.002 tailed =  $P > 0.01$ ). Over and above, the consequent figure (2) below outlines the difference in the argumentative writing of the experimental group before and after the treatment.

Figure 2

*The experimental group (argumentative writing pre/posttest).*



Close inspection of the above figure(2) shows that there is a significant difference between the mean scores of the experimental group learners in the pre/post argumentative writing test. Thereupon, the first null hypothesis was rejected and the alternative one was accepted uttering “there is a statistically significant difference at 0.01 between the mean scores attained by the experimental group in the argumentative writing test before and after the treatment in favour of the posttest”.

To authenticate the results attained, the size of effect (a way of quantifying the size of the difference between two groups indicating the magnitude of the experimental effect) was computed. Bearing that in mind, the present research adopted Cohen's  $d$  due to its appropriateness and accuracy in identifying the effect size of the paired sample  $t$ -test (how much variance in the argumentative writing was a result of the 4MAT model). The results of the effect size uncovered that the value of Cohen's  $d$  was (1.07) which is a large effect size. Accordingly, 4MAT model has considerable effectiveness in developing argumentative writing among the EFL majors at the Faculty of Education, Al-Azhar University.

### **Hypothesis Two**

2) There is no statistically significant difference between the mean scores attained by the experimental group and the control one in the post argumentative writing test.

Deciding on the appropriate statistical technique necessitates adopting an independent sample  $t$ -test due to the nature of the hypothesis, sample number, and target data. Succinctly, a comparison was performed between the posttests of the experimental group mean score and that of the control one to reveal the difference in the development of the argumentative writing. Table (4) demonstrated the results of the

statistical analysis:

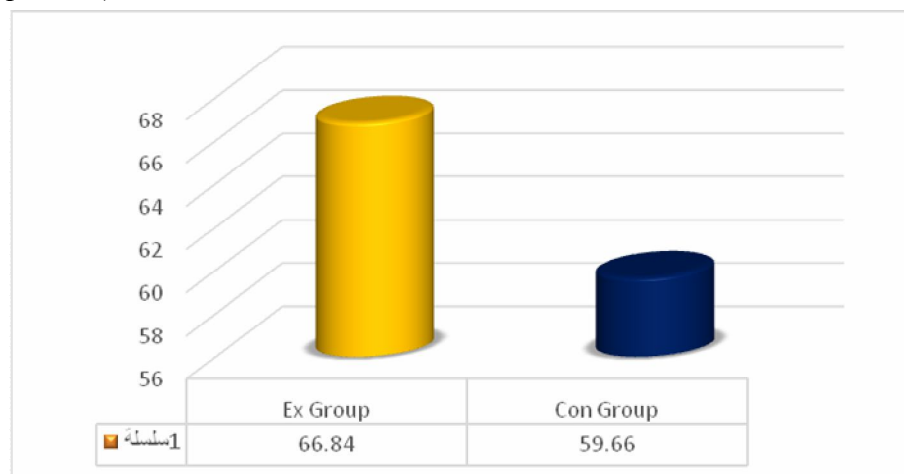
Table 4:

*Independent sample t-test results (Experimental and control groups post argumentative writing test).*

Group	N	Mean	Std. Deviation	T-Value	Sig. (2tailed)
Experimental group	25	66.84	7.38	3.09	0.00
Control group	24	59.66	8.80		

The results displayed above underscored that there was a statistically significant difference at 0.00 level between the mean scores attained by the experimental group and the control one (posttest) in the argumentative writing test as measured by the argumentative writing test. Results of the *t*-test yielded (3.09) which is significant (sig. = 0.00 2 tailed =  $P > 0.05$ ). Other than that, the figure (3) below delineated the mean difference in the development of the experimental group and the control one in the posttest.

Figure 3  
*Experimental group versus the control one (argumentative writing posttest).*



The figure (3) above disclosed that there is a significant difference between the mean scores of the experimental group and the control one. Accordingly, the second null hypothesis was rejected and the alternative one was accepted demonstrated that “there is a statistically significant difference at 0.01 level between the mean scores attained by the experimental group and the control one in the post argumentative writing test in favour of the experimental group.

To authenticate the results attained, the size of effect (a way of quantifying the size of the difference between two groups indicating the magnitude of the experimental effect) was computed. With this in mind, the present research adopted Cohen's *d* due to its appropriateness and accuracy of identifying the effect size of the paired sample *t*-test (how much variance in the argumentative writing was a result of the 4MAT model). The results of the effect size uncovered that the value of Cohen's *d* was (0.88) which is a large effect size. Accordingly, in the light of the results drawn above, 4MAT model has considerable effectiveness in developing argumentative writing among the EFL majors at the Faculty of Education, Al-Azhar University.

More critically, to substantiate the results of the statistical analysis, indicating that there was a statistically significant difference between the mean scores attained by the experimental group and the control one in the post argumentative writing test, a comparison was held between the sub-argumentative writing skills targeted by the present research. In other words, an independent sample *t*-test was used to calculate the significance of the means difference among the sub-argumentative writing skills after the experimentation (posttest). Table (5) displayed the results of the statistical analysis:

Table 5

*Independent sample t-test results (Exp/control argumentative writing posttest)(df=47).*

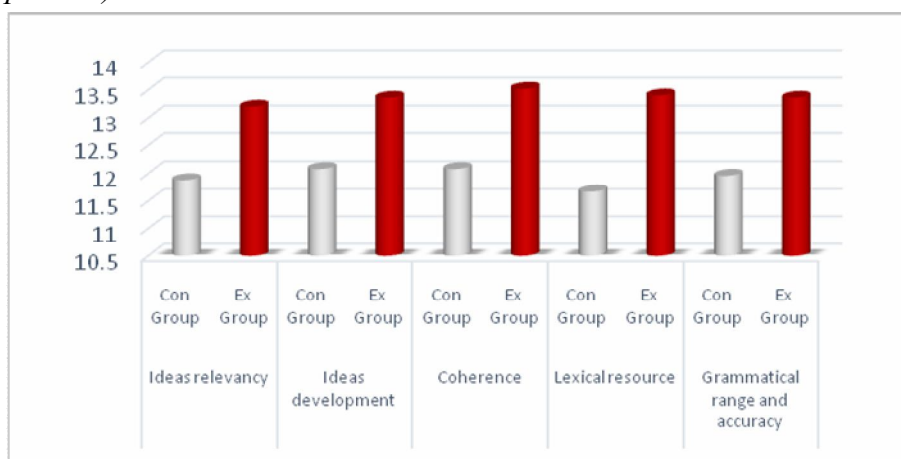
Writing skills	Groups	No.	Mean	Std. Deviation	T-value	Sig. (2tailed)	Cohen's <i>d</i>
Ideas relevancy	Control	24	11.88	1.65	2.80	0.01	0.80
	Experimenta	25	13.20	1.66			
Ideas development	Control	24	12.08	1.95	2.54	0.02	0.73
	Experimenta	25	13.36	1.55			
Coherence	Control	24	12.08	2.32	2.53	0.02	0.72
	Experimenta	25	13.52	1.61			
Lexical resource	Control	24	11.67	1.83	3.57	0.00	1.02
	Experimenta	25	13.40	1.55			
Grammatical range and accuracy	Control	24	11.96	1.97	2.70	0.01	0.79
	Experimenta	25	13.36	1.66			



The results shown above assured that there are statistically significant differences at 0.05 level between the mean scores attained by the experimental group and the control one in the argumentative writing skills. Results of the *t*-test respectively yielded (2.80, 2.54, 2.53, 3.57, 2.70) which were statistically significant at 0.05. Over and above, the figure (5) below delineated the mean difference in the argumentative writing skills of the experimental and control groups in the posttest.

Figure 5

*Experimental group versus the control one (sub-argumentative writing posttest).*



The figure (5) above unveiled that there are significant differences between the mean scores of the experimental group and the control one in the sub-argumentative writing test. To authenticate the results attained, the size of effect was computed. The results of the effect size revealed that the value of Cohen's *d* were (0.80, 0.73, 0.72, 1.02, 0.79) which are large effect sizes. Accordingly, in the light of the results drawn above, 4MAT model has a considerable effectiveness in developing argumentative writing among the EFL majors at the Faculty of Education, Al-Azhar University.

## Discussion of the Results

The main plausible interpretation of the superiority of 4MAT model is that it monitors the diversity of learning styles by means of instructional plans developed taking into account the differences in such styles and the dominant brain hemispheres preferences of students. Consequently, every phase of the 4MAT model was designed in accordance with the real existing abilities, aptitudes and needs of the participants, who theoretically and practically achieved better performance in argumentative writing skills (Al-Saleem, 2019, Inel, 2018, Jackson, 2001).

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4MAT model provided a systematic model for organizing and delivering instruction as the learners were cycled in a natural learning cycle. Initially, the students' personal experiences of the target teaching concept were developed through a systematic theoretical teaching. Next, students were provided with guided practice and application; Finally, students were given opportunities to integrate and synthesize their new learning. The system reflects the learning process as finding a reason or motivation for learning followed by constructing knowledge and information shadowed by finding ways for applying knowledge and concluded with developing extensions for the learners to generate new experiences regarding the learned material (Aktas & Bilgin, 2015; Benchachinda, 2012; Tezcan&Güvenç, 2017).

Taking into consideration the nature of the argumentative genre of writing which needs much comprehension of the different specifications followed by awareness in application, the different teaching strategies based on the constructivist theory under 4MAT model teaching model, enabled and encouraged students to advance their argumentative writing skills. Notwithstanding, the dynamic nature of 4MAT model allows the students to internalize the subject doing their own application and definitions (Nikolaou & Koutsouba, 2012; Nowacki, 2011; Tezcan&Güvenç, 2017).

Another reasonable interpretation of the results attained is that the adoption of 4MAT model in the classroom with its main premises, namely learning styles preferences and brain processing of information increased learners' motivation and willingness to write for developing their argumentative writing skills. It could be explained that giving the students the chance to apply the theoretical knowledge in a practical context following the normal cycle of learning was of great consequence and resulted in remarkable development in the participants' written products. Thus, apart from enabling active participation and interaction in lessons, 4MAT model provided students with practical opportunities for practicing and applying their learning outside the usual classroom (Aktas & Bilgin, 2015; Benchachinda, 2012; Tatar & Dikici, 2009).

Over and above, functioning the whole brain (left and right hemispheres) enables fruitful learning experience for the most students. 4MAT accommodates each student's unique learning style, enables students to functionalize the dominant styles with the non-dominant ones and ensures progression through a natural learning cycle. Thereupon, the 4MAT cycle begins with students subjectively connecting to the outside world and processing it through their own personal filters (Bawaneh, Md Zain & Saleh, 2011; Jackson, 2001; Tatar & Dikici, 2009).

Teaching and learning via 4MAT model depending on the student's frame of mind changes the focus on the creation of a conducive learning environment and learning communities. Such environment gave the students opportunities to ask questions, so they would improve, seek new knowledge, and make new discoveries,



master new skills for dynamism and perfect old skills needed for life-long learning. Moreover, making the best use of mind maps, worksheets, experiments, preparing and disseminating pieces of writing, which easily adapted to the steps of the 4MAT model, made the teaching learning process more fruitful and effective (Inel, 2018; Ruangtrakun&Chaiyasang, 2019).

4MAT model takes into consideration that each learner has different psychological, social, and physical development features in the teaching-learning process, the individualization of teaching is a significant feature of any successful teaching learning endeavour, student-centred is superior to teachers centred. In other words, the 4MAT teaching model is a cycle of the teaching processes which begins and ends with the learner himself/herself. Accordingly, 4MAT qualifies students to thoroughly understand the target learning construct, such as modelling, visualization, theoretical knowledge, application, exhibiting individual creativity, the integration of these opportunities and knowledge transfer through interaction with activities (Nikolaou &Koutsouba, 2012; Ruangtrakun&Chaiyasang, 2019).

The aforementioned detailed discussion offers insights into justifications for the impression that not only does 4MAT model help design a balanced teaching and give all learners the opportunity to learn in their own preferable way. It also aids the instructor to organize the teaching process based on the individual differences. More critically, the four sequential steps of 4MAT require that the teacher changes roles from motivator to information-giver, to coach, to evaluator (Inel, 2018; Nikolaou &Koutsouba, 2012; Tezcan&Güvenç, 2017).

4MAT facilitated learning, took individual differences into consideration, increased positive attitudes and motivation, made lessons more enjoyable, gave the opportunity to enhance what was learned, increased student self-confidence, and provided a base for life-long learning. Furthermore, 4MAT increased the learner motivation and engagement and provided students with greater opportunities for practice and application of their learning in real life settings. The literature includes a relevant number of studies which are echoed with the results of the current research signifying the effectiveness of 4MAT model in enhancing different abilities and skills (Aktas& Bilgin, 2015; Al-Saleem, 2019; Ruangtrakun&Chaiyasang, 2019; Tatar&Dikici, 2009).

## Conclusions

Based on the aforementioned experimentation, data analysis and the results yielded, the following conclusions were drawn.

- 4MAT model is based on prominent learning theories and principles served as foundation such as constructivism, brain-based learning theory and learning styles. Additionally, through

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experiences with alternative modes, learners were stimulated to develop a meaningful learning repertoire. As such, the learners are supported to develop their learning and produce fruitful learning outcomes.

- The model does not ask the learners to fit themselves in a particular learning method, yet it displays a variety of teaching learning strategies and methods. The new information and experiences are delivered by teachers and assimilated by learners in light of their unique learning styles.
- 4MAT model balances the right and left sides of the brain in the teaching learning process which is similar to alternating convergent and divergent patterns. Moreover, 4MAT model covers the total of learners as each one discovers new information with his own learning preference.
- Filling the gap between knowledge and application, 4MAT enables the students to comprehend the abstract concept, which is one of the problematic areas for all learners in general and EFL learners in particular. Another item of interest, it provides equal chances for learners to put such abstract knowledge in action, which is a missing component in teaching practical skills.
- Taking into account that there is no best teaching method or “one size does not fit all” and what might be convenient in such a situation may be inconvenient in another. 4MAT model is a lens through which the teaching learning process can be viewed as a series of questions about the fragmentation of the approach to content. Furthermore, it gives a number of instructional methods or cyclical context for learning stages and an appreciation for the diversity of learners.
- 4MAT Model is philosophically, theoretically, and structurally suited to the development of creativity. “The rise of civilization is directly related to our ability to be rational, theoretical and abstract, but learning is not all cognitive nor theoretical. There is more to growing up than increasing rationality’ (McCarthy, 1987, p. 13). With this in mind, argumentative writing is premised on logical, critical, and creative thinking. It empowers the learners to develop new ideas, reaching the result easily, recognizing different points of view and using language effectively.

### **Recommendation**

In the light of the results attained, the shadowing recommendations seem pertinent.

- The teaching learning process ought to be conducted guided by the learners’ learning styles (the main premises of 4MAT model) for promoting the teaching learning outcomes and adjust the learning environment to suit the learners’ preferences.
- Providing an in-service and pre-service training for teacher on



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4MAT model to experience a teaching process in which both the learning styles and the two sides of the brain are taken into account for achieving high quality learning outcomes.

- Explaining the criteria of evaluation to students before practicing, as 4MAT highlights, puts the learners on the right track and avoids the distraction caused by misunderstanding the final product specifications.
- Adopting 4MAT model in delivering the content enables the teacher to sequence the teaching learning content logically in a way that balances knowledge and skills.
- Designing curriculum content in the light of 4MAT model taking into account the learners' varied styles and brain hemisphericity is an effective way of saving much time and efforts and achieving the intended learning outcomes.
- Argumentative writing is an effective and advanced genre of writing which ought to be practiced and mastered by EFL learners at the faculties of education because of its consequences on the learners' mental abilities and thinking skills and strategies.

### **Suggestions for Further Research**

In the light of the results attained, the present research demonstrated the untrodden hot topics which need further investigations in future research:

- 4MAT teaching model effectiveness ought to be proved in different areas of the EFL programs at the faculties of education in Egypt, namely literature, grammar, translation, writing and speaking taking into consideration the different levels of maturation.
- Argumentative writing is one of the untrodden genres of writing due to its sophistication and further investigations are needed for enabling the students to use critical and logical thinking in their writing.
- A complete argumentative writing course is needed to be developed in a further future research.

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## References

- Abu El-Magd, M. A. M. (2017). Developing English language teaching researchers' oral argumentative skills through webinar. *Faculty of Education Journal, Port-said University*, 320-368.
- Aktas, I. & Bilgin. I. (2015). The effect of 4MAT learning model on the achievement and motivation of 7th grade students on the subject of particulate nature of matter and an examination of student opinions on the model. *Research in Science & Technological Education*, 33(1), 1-21.
- Al-Saleem. B. I. A. (2019). The 4MAT model in English language teaching. *Arab World English Journal*, 10(4), 112 -120.
- Álvarez. T. (2001). *Textosexpositivo-explicativos v argumentativos [Argumentative and expository-explanatory texts]*. ES: Octaedro.
- Badger, R.. & White. G. (2000). A process genre approach to teaching writing. *ELT Journal*, 54(2), 153-160.
- Bawaneh, A. K. A., Md Zain, A. N., & Saleh, S. (2011). The effect of Herrmann Whole Brain Teaching Method on students' understanding of simple electric circuits. *European Journal of Physics Education*, 2(2), 1-23.
- Benchachinda. T. (2012). Developing English writing ability of grade 6 students using the 4MAT system. *International Journal of Social Science and Humanity*, 2(6), 551.
- Berge, K. L.. Evensen. L. S.. & Thvgesen. R. (2016). The wheel of writing: a model of the writing domain for the teaching and assessing of writing as a key competency. *The Curriculum Journal*, 27(2), 172-189.
- Chinn, C. A. (2006). Learning to argue. In O'Donnell. A. M.. Hmelo-Silver. C. F.. & Erkens. G. (Eds.). *Collaborative learning, reasoning, and technology*, (pp.224-239). Routledge.
- Cotton, F., & Wilson, K. (2011). An investigation of examiner rating of coherence and cohesion in the IELTS academic writing task 2. In J. Osborne (Ed.), *IELTS research reports* (Vol. 12, pp. 235e310). Melbourne: IELTS Australia and British Council.
- Dastjerdi. H. V.. & Samian. S. H. (2011). Quality of Iranian EFL learners' argumentative essays: cohesive devices in focus. *Mediterranean Journal of Social Sciences*, 2(2), 65-76.
- De La Paz. S. (2005). Effects of historical reasoning instruction and writing strategy mastery in culturally and academically diverse middle school classrooms. *Journal of Educational Psychology*, 97(2), 139.



- 
- Dean, N. (2018). *A look at the write brain*. Brain World Magazine. Retrieved from: <https://brainworldmagazine.com/look-write-brain/>.
- Elnaggar, B. F. (2018). Developing a program-based on scientific discourse analysis to enhance engineering students' scientific argumentative writing skills. *Journal of Faculty of Education, Banha University*, 29(116), 1-22.
- Erhard, K., Kessler, F., Neumann, N., Ortheil, H. J., & Lotze, M. (2014). Professional training in creative writing is associated with enhanced fronto-striatal activity in a literary text continuation task. *NeuroImage*, 100, 15-23.
- Golpour, F. (2014). Critical thinking and EFL learners' performance on different writing modes. *Journal of Pan-pacific Association of Applied Linguistics*, 18(1), 103-119.
- Hasani, A. (2016). Enhancing argumentative writing skill through contextual teaching and learning. *Educational Research and Reviews*, 11(16), 1573-1578.
- Hassan, S. R. (2018). EFL develop to model learning flipped the using school secondary STEM of skills writing argumentative students. *Faculty of Education Journal, Tanta University*. 74 - 2.
- Holsti, O. R. (1969). Content analysis for the social sciences and humanities. *Reading, MA: Addison-Wesley (content analysis)*.
- Inel, Y. (2018). The effect of using the 4MAT teaching method in 6th-grade social studies education on the academic achievement of students. *Review of International Geographical Education Online*, 8(3), 440-458.
- Jackson, P. R. (2001). *The effects of teaching methods and 4MAT learning styles on community college students' achievement, attitudes and retention in introductory microbiology*, Doctoral Dissertation. The Lynn University, USA.
- Kaur, S. (2015). Teaching strategies used by Thai EFL lecturers to teach argumentative writing. *Procedia-Social and Behavioral Sciences*, 208, 143-156.
- Makkar, k. k. (2017). *IELTS academic essays from the past exams*. Chandigarh Publishing House.
- McCarthy, B. (1980). *The 4mat svstem: teaching to learning styles with left/right mode techniques*. Arlington Heights.
- McCarthy, B. (1990). Using 4MAT svstem to bring learning styles to schools. *Educational Leadership*, 48(2), 31-37.
- McCarthy, B. (2000). *About teaching 4MAT in the classroom*. About Learning Incorporation.

- McCarthy, B., & McCarthy, D. (2003). *About teaching companion: the 4MAT implementation workbook*. About Learning Incorporation.
- McCarthy, B., & McCarthy, D. (2006). *Teaching around the 4MAT cycle: designing instruction for diverse learners with diverse learning styles*. Corwin Press.
- McCarthy, B., White, C., & McNamara, M. C. (1987). *4MAT system: teaching to learning styles with right/left mode techniques*. Barrington.
- Mitchell, S., & Riddle, M. (2000). Improving the quality of argument in higher education: Final report. *School of Lifelong Learning and Education, Middlesex University*.
- Moghaddam, S. (2015). An investigation of IELTS preparation courses for university study: development of written and verbal argumentative texts. *Journal of Teaching English for Specific and Academic Purposes*, 2(4), 755-757.
- Musa, H. I. A. I. (2018). Dialogic vs. formalist teaching in developing argumentative writing discourse and reducing speaking apprehension among EFL Majors. *Journal of Language Teaching and Research*, 10(5), 895-905.
- Neff-van Aertselaer, J., & Dafouz-Milne, E. (2008). Argumentation patterns in different languages: An analysis of meta-discourse markers in English and Spanish texts. *Developing Contrastive Pragmatics Interlanguage and Cross-cultural Perspectives*, 87-102.
- Nicoll-Senft, J. M., & Seider, S. N. (2009). Assessing the impact of the 4MAT teaching model across multiple disciplines in higher education. *College Teaching*, 58(1), 19-27.
- Nikolaou, A., & Koutsouba, M. (2012). Incorporating 4MAT model in distance instructional material—An innovative design. *European Journal of Open, Distance and E-learning*, 15(1), 1-10.
- Nippold, M., & Ward-Loneragan, J. (2010). Argumentative writing in preadolescents: The role of verbal reasoning. *Child Language Teaching and Therapy*, 23(3), 238–248.
- Nowacki, A. S. (2011). Using 4MAT framework to design a problem-based learning biostatistics course. *Journal of Statistics Education*, 19(3).
- Ruangtrakun, T., & Chaivasang, S. (2019). Using 4MAT teaching model to enhance students' achievement and to maintain retention in mathematics. *Veridian E-Journal. Silpakorn University (Humanities, Social Sciences and arts)*, 12(6), 1248-1261.





- Salahu-Din, D., Perskv, H., & Miller, J. (2008). *The nation's report card: Writing 2007 (NCES 2008-468)*. National Center for Educational Statistics.
- Sampson, V., & Gleim, L. (2009). Argument-driven inquiry to promote the understanding of important concepts & practices in biology. *The American Biology Teacher*, 71(8), 465-472.
- Schwarz, B. B., Neuman, Y., Gil, J., & Ilva, M. (2003). Construction of collective and individual knowledge in argumentation activity. *Journal of the Learning Sciences*, 12(2), 219-256.
- Scriven, M. (1976). *Reasoning*. McGraw-Hill.
- St Germain, C. (2002). *Historical perspective: Major theories modeled in 4MAT system for teaching learning and leadership*. About Learning.
- Tatar, E., & Dikici, R. (2009). The effect of 4MAT method (learning styles and brain hemispheres) of instruction on achievement in mathematics. *International Journal of Mathematical Education in Science and Technology*, 40(8), 1027-1036.
- Tezcan, G., & Güvenc, H. (2017). The effects of 4MAT teaching model and whole brain model on academic achievement in science. *EgitimveBilim*, 42(192).
- Toulmin, S. E. (1958). *The uses of argument*. Cambridge University Press.
- Toulmin, S. E., Rieke, R. D., & Janik, A. (1984). *An introduction to reasoning*. Macmillan.
- Walton, D. N. (1998). *The new dialectic: Conversational contexts of argument*. University of Toronto Press.
- Walton, D. N. (2007). *Dialog theory for critical argumentation*. John Benjamins Publishing Company.
- Wu, S. M. (2006). Creating a contrastive rhetorical stance: Investigating the strategy of problematization in students' argumentation. *RELC Journal*, 37(3), 329-353.
- Zamel, V. (1985). Responding to student writing. *TESOL Quarterly*, 19(1), 79-101.
- Zimmer, C. (2014). *This is your brain on writing*. Retrieved from: <https://www.nvtimes.com/2014/06/19/science/researching-the-brain-of-writers.html>.
- Zohar, A., & Nemet, F. (2002). Fostering students' knowledge and argumentation skills through dilemmas in human genetics. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching*, 39(1), 35-62.