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Department of English

The Effect of Developing Critical Thinking Skills on Students' Argumentative Essay Writing

Case of Study: Third year students of English at Chadli Bendjedid University

Dissertation submitted to the Department of English in partial fulfillment of the requirements for the degree of Master of Art in Didactique de l'Anglais.

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Abstract

The purpose of this experimental study was to examine the effect of developing students' CT skills on their argumentative essay writing. The subjects were 3rd year students of English at Chadli Bendjedid University. They were evenly divided into an experimental group who received an extensive treatment, and a control group who did not receive any kind of intervention. The experiment adopted the pretest posttest design and a set of instruments in order to collect data. The participants were required to accomplish a critical thinking (CT) test to evaluate their CT level and an argumentative essay test to evaluate their writing and their CT in writing. Through the Statistical Package for the Social Sciences (SPSS), we conducted an independent sample two tailed t test to statistically compare the data. The findings of the study indicated that the experimental group improvements in CT and argumentative essay writing were statistically significant compared to the control group because the p-valued reached the level of significance. Furthermore, On the basis of the research findings, we put forward a set of recommendations for future studies. In addition to some implications for the institution and teachers to implement CT for lessons planning in order to develop students' CT.

Keywords: CT, argumentative essay writing, t test, experimental study.

ملخص

يستقصي هذا البحث التجريبي دراسة اثر تطوير التفكير النقدي على كتابة المقال الجدلي. عينات البحث كانو طلبة السنة الثالثة ليسانس المتمدرسين على مستوى قسم اللغة الانجليزية في جامعة الشادلي بن جديد- الطارف. تم تقسيم المشاركين بالتساوي الى كل من مجموعة تجريبية, حيث قام اعضائها باخذ حصص دعم معتمدة لبناء و تطوير مهارات الفكر النقدي, الى جانب مجموعة ظابطة لم تحضى باي نوع من الدعم. اعتمدت هذه الدراسة على التصميم القبلي و البعدي الى جانب مجموعة من الادوات لتجميع البايانات. طلب من الطلاب اجراء اختبار التفكير النقدي لتقييم مسةى تفكيرهم النقدي, الى جانب اختبار كتابة مقال جدلي لتقييم كتابتهم و مدى توضيفم للتفكير النقدي في المقال الجدلي. من خلال استخدام برنامج الحزمة الاحصائية (SPSS) تم توظيف اختبار تي (T test) لمقارنة بيانات هذا البحث بصفة احصائية. اشارت نتائج هذا البحث الى ان تقدم المجموعة التجريبية في التفكير النقدي و الكتابة الجدلية كان ذو دلالات احصائية مقارنة بالمجموعة المظبوطة هذا بسبب نتسجة p-value بلغت مستوى الدلالة. بالاضافة الى هذا, و وفقا الى نتائج البحث, تم طرح مجموعة من الاقتراحات للبحوث مستقبلا. الى جانب بعض التوصيات الى كل من المؤسسة و الاساتذة لتوضيف التفكير النقدي و تطويره لدى الطلاب.

الكلمات المفتاحية: التفكير, كتابة المقال الجدلي دراسة تجريبية ,T test.

Dedications

To the skeptical beings

Meriem Rahal

To my Day one: Dad and Mom

To my sisters: Malek and Chaima

To the one who was born too late to explore the seas, too early to explore the stars but just in time to graduate in the middle of a pandemic.

Fatma Dahmani

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List of Acronyms

CT	Critical Thinking
WGCTA	Watson-Glaser Critical Thinking Appraisal
WGCTA-FS	Watson Glaser Critical Thinking Appraisal Form Short
SQ	Socratic Questioning
EFL	English as Foreign Language
USCGA	United States Coast Guard Association
RED	Recognition of assumptions, Evaluating arguments and Drawing Conclusions.
AERA	American Educational Research Association
APA	American Psychological Association
NCME	National Council on Measurement in Education
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences

Chapter 1

Introduction

Humans were evolving and coping with modernity ever since the Neolithic revolutions, until we witnessed the technological complexity and the challenges that the 21st century offered. This made today's education yearn CT abilities, so that students can correspond with reality, process the hyper amount of information, strengthen reasoning abilities and solve problems. Today's world shows the necessity of acquitting and developing CT skills in every learning aspect, specifically in writing. Based on the assertion of many researchers as Twardy (2004) and Dariman (2019), who argued that developing critical thinkers fundamentally requires writing skills, and a good written material can perfectly reflect students' thinking abilities

This study investigated the effect of developing CT on students' argumentative essay writing. By Following the APA 6th edition format, the study initially composed of five main chapters. It is initiated by an introductory Chapter to the study which presented the reasons and the objectives behind this study. Afterwards, the second chapter contained a detailed review of the literature. The third chapter, which is the methods chapter covered information about how this study was conducted. Then, a results chapter through which the researchers reported the finding that were later on interpreted and discussed in the discussion chapter which also covered limitations and future recommendations.

Research problem

The argumentative essay is acknowledged as more than a mere organization of words and sentences because it calls for intellectual and CT abilities (Halpern; 1998). In other words, the ability to perform this kind of writing crucially demands students to be supplied with CT skills (Fahim & Mirazii, 2014). However, countless investigation namely Kuhn's (2005), Perkins's (1985), Hillocks's (2011) and Paul & Elder's (2008) showed that the vast majority of students

who do not possess nor improve CT skills fail to write good argumentative essays. This was due to the fact that their writing is CT free.

Researchers Paul and Elder argued that writing which is not based on CT might well be biased and egocentric. It exists without context or wider purpose (2008, p. 40). As this study majorly concerned with CT and argumentative essay writing, it aimed to systematically investigate 3rd year undergraduate students of English at Chadli Bendjedid University CT level and their use of CT skills (inference, recognizing assumptions, deduction, interpretation and evaluation) in the argumentative essay writing. This study also sought to examine what is the effect of developing CT skills on students' argumentative essay writing?

Research Questions

This study was conducted in an attempt to find answers to the following questions:

Question 1: What is the CT level for 3rd year English Students at Chadli Bendjedid University?

Question 2: Do 3rd year English students at Chadli Bendjedid University use CT in their argumentative essay writing?

Question 3: How does developing CT skills improve and affect students' argumentative essay writing?

Research Hypotheses

Besides the aforementioned research questions, we formulated the following hypotheses to answer them.

Hypothesis 1: 3rd year English students at Chadli Bendjedid University possess weak CT level.

Hypothesis 2: 3rd year English students do no use CT skills in their argumentative essay writing.

Hypothesis 3: Developing 3rd year English students' CT skills contributes in improving better quality argumentative essay writing.

Research Objectives

In an attempt to develop students' CT skills and examine its effect on improving students' argumentative essay writing. We formulated three questions to reach these objectives. First, we tried to determine students CT level. Then, we intended to develop students CT skills. Finally, we examined the effect of this development on students' argumentative writing. The study attempted to provide a set of recommendations that would aid future researchers and teachers to develop CT and thrive quality argumentative essay writing.

Giving the ultimate significance of the critical spirit, this study is significant in term of its theoretical contribution, which is a growing body of literature alongside its practical contribution. Ultimately, the finding of this study could be used as a background and a source for further researchers. In addition to this, the results could also help in providing statistical significance across related studies to increase the validity and the reliability of information.

Organization of the study

This research is divided into five main chapters. The first chapter presented a general overview about the study, it included the research problem, questions and hypotheses. In addition to the objectives and the organization of the study. The second chapter which is the theoretical part, it initiated the review of the literature concerned with CT and the argumentative essay. First, it introduced definitions of CT, its skills and levels, as well as how it can be developed and assessed plus its significance. Then, it covered the argumentative essay, arguments and argumentations. Aside from that it provided the criteria for argumentative writing and the relationship of CT and argumentative writing. Lastly, it emphasized some previous researches related to this field of study. The third chapter, which

is the first practical part of the study, introduced the methods adopted in this research by giving full description about the research design, subjects, setting, and instruments, besides the followed procedures in gathering and analyzing data. Next, the fourth chapter dealt with reporting detailed data about the results of the current study. Finally, the fifth chapter discussed and interpreted the results of the study in order to find answers for the aforementioned questions. It also highlighted the limitations that this study was subject to along with implications and recommendations for future research.

Chapter 2

Review of Literature

This chapter reviewed the literature related to this study which focused on CT and argumentative essay writing. Primarily, it presented CT, including definitions of the term from different perspectives (classical, modern, and cognitive psychological), its levels and skills, characteristics of the critical thinker, strategies and challenges in developing CT skills. It also included the approaches and challenges in assessing CT along with its significance in learning. Furthermore, it shed light on the argumentative essay, its definition, in addition to arguments and argumentation, besides criteria for good argumentative essay writing. Ultimately, this chapter dealt with the relationship of argumentative writing and CT, it also reviewed some studies related to the topic of this study.

Critical Thinking

Definition of Thinking

We homo-sapiens are 3.8 billion years of evolutionary success, we sit on top of the animal kingdom carrying inside our heads our holy brains, a small, yet mysterious organ that nurtured us with intelligence and the power to think, but what does thinking actually mean? Thinking is not restricted to one definition, many researchers as Jashari and Ballhysa (2005, p.23) defined it as a conscious and cognitive process humans generally execute in order to reflect on general knowledge and reason. They referred to this by the "conscious thinking".

According to Hazlitt (1916), thinking is the occupation of the mind that separates us from any other creatures and distinguishes humans from each other. Thinking can take a variety of shapes; a person may gaze at the stars and think about whether we are alone in the universe,

or simply think about his old times. But the sense of thinking we are willing to explain is the thinking with an end in view to solve problems and find solutions.

Definition of Critical Thinking

According to the literature on the history of CT, it can be defined according to three main perspectives: classical, modern, and cognitive psychological.

Classical perspective. The etymology of the term CT had roots back to the Greeks, the well- known era of the noble thought. Raphael Sanzio's fresco of "The School of Athens" (1509-1511) symbolized the marriage of arts, science, astronomy, mathematics, and philosophy. His work was an exhibition of theology, literature, and the intellectual minds at that time, which was considered to be the spark of "critical thinking" (Zucker & Harris, 2015).

The term critical refers to the Greek word " kritikos" which meant "discerning" meaning "to decide" (McKean, 2005, p. 451). The connection that these ancient words brought to novelty was the idea that CT involved using criteria in making judgements (Beyer, 1995; Lipman, 1991). Criticism fundamental basis was thinking to determine the value of beliefs. Socrates, the father of western philosophy, believed that a person is born to question the existence, make value of beliefs, and learn through skepticism. By questioning one's ideas he was boosting higher thinking within his students, because he believed that what matters is not what you think, but how you think. (Paul, Elder, & Bartell, 1997).

In other words, CT was a paved path to triumph knowledge, self-improvement and empowerment because it is a process of reevaluations of beliefs and ideas (Vaughn, 2008, p. 4). It involved logic and the ability to detect facility in statements, investigation, analyzing and evaluating evidence.

CT was explained and defined differently with a remained broad description to the concept that CT was beyond the automatic everyday thinking. It was commonly known and referred to as "reflective thinking" by Dewey (Dewey, 1910, p.6) who was considered to be the

philosophical father of modern CT. He defined reflective thinking as the active determination to reconsider and reevaluate standard beliefs and knowledge, with the aim of setting it up sagaciously.

Michael Scriven and Richard Paul (1987) argued that unlike the basic thinking which is a mere acquisition and retention of information blindly, CT is an intellectual disciplined process of actively and skillfully conceptualizing, analyzing, and evaluating information gathered from or generated by observation or experience. It is based on universal intellectual values and habits of exercising those skills to guide the behavior and mindset.

Another definition of CT was presented by Edward Glaser (1941) who stated that the ability to think critically required having the attitude to reconsider the problems and subjects thoughtfully, acknowledging methods to investigate logically and reasonably and most importantly, having the skills to apply those methods.

After paving the path for CT in educational setting, Blooms et al. (1956) purified the concept of CT and classified it into six major categories to map the learning objectives starting with three bottom skills i.e., knowledge, comprehension, and application, followed by three complex ones for the critical thinker to go through i.e., analysis, synthesize, and evaluation. CT was regarded as the core component in all educational programs since Ennis put forth CT as "reasonable reflective thinking focused on what to believe or do "(1996, p.166). As asserted by Turner (2005) and Halpern (2014), the term CT was analogous to reflective thinking in the context of decision making and problem solving.

Modern perspective. The concept CT went through many developments over the years. Many researchers such as Bloom (1956) amended the concept of CT to make it achievable in the current century education. In the era of modernity and even during the philosophical and historical times, CT was regarded as a reflection to reevaluate prior judgments based on what facts indicate, "It is about the guided and well-disciplined thinking to reason at the highest level

of quality in a fair-minded way" (Facione, 2015. p, 27). "We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteria-logical, or contextual considerations upon which that judgment is based" (Facione, 1990. p 2).

For further explanation, another definition was introduced by Paul and Elders (2002), who defined CT as the art of revolutionizing thinking by reconsidering plain thinking while thinking to make it veracious, sharp, well-founded, and reasonable. Bloom's (1956) stages of inquiry (Figure 1) were revised to develop the CT in modern education.

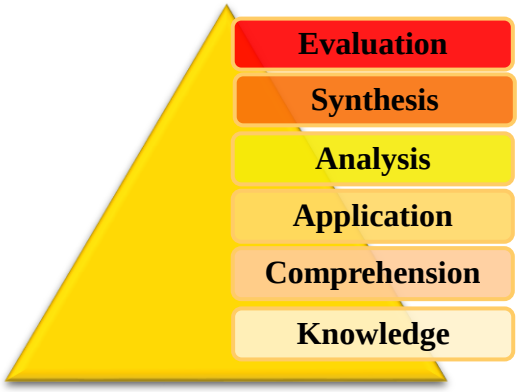

Figure 1. Bloom's taxonomy hierarchy. From Bloom et al. (1956).

Anderson and Krathwohl (2001) reviewed Bloom's Taxonomy framework into a 21st century version (Figure 2). It was composed of three basic skills namely: remembering, understanding, and applying, followed by three advanced and complex skills which are: analyzing, evaluating, and creating.

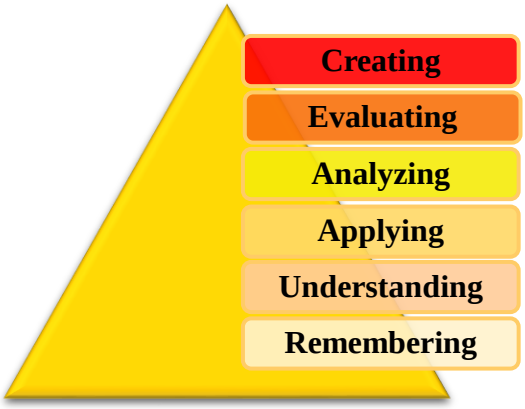

Figure 2. The 21st century revised taxonomy. From Anderson and Krathwohl (2001).

Cognitive psychological perspective. As a contradiction to the philosophical perspective, cognitive psychologists focused on the cognitive process of thinking and how people actually think, in contrast to how they could or should perform the thinking process under ideal conditions (Sternberg, 1986). Scholars immersed in the behaviorists' tradition, defined CT by the multiple actions and behaviors besides a list of skills that the critical thinker can perform (Lewis & Smith, 1993). Another explanation emerged, it included that CT is "the mental processes, strategies, and representations people use to solve problems, make decisions, and learn new concepts" (Sternberg, 1986, p. 3). In other words, this field tended to majorly focus on the production of thoughts, behaviors, and manifest skills as analyzing, interpreting, and formulating good questions. However, proponents of the philosophical perspective as Van Gelder (2005), argued that thinking is more than merely the sum of its parts. Claiming that the current perspective reduced a complex set of knowledge and skills. Likewise, Bailin (2002) stated that it is a misconception to reflect to CT as a series of discrete skills, and that behaviorists needed to define it in observable ways. He added that it is impossible to simply proceed through the "steps" of CT without actually engage in critical thoughts.

Critical Thinking Levels

According to Bloom (1956) and as illustrated in Figure 1, CT involves six major levels for students to go through in the thinking and learning process. Starting from the basic or the lower thinking skills and evolving into the higher order skills. Table 1 bellow provided a detailed description and explanation of CT skills.

Table 1

Bloom's Taxonomy Stages of Inquiry

Categories	Explanation
1. Knowledge	This level required recalling and retrieving knowledge from long term memory.
2. Comprehension	This level called for understanding the meaning of information and including answers to demonstrate the comprehension of a message.
3. Application	The ability to use information, ideas, and theories in a given situation (tests, exams…).
4. Analysis	The skill to achieve things and classify information, ideas, and theories into component parts.
5. Synthesis	The ability to create or decide on original product.
6. Evaluation	The ability to evaluate or make a judgment based on sensible reasons.

Note. Reprinted from Taxonomy of educational objectives; the classification of educational goals, by Bloom. Benjamin, 1946, New York: Longmans.

When Bloom's Taxonomy was revised by Anderson and Krathwohl in 2001, the six levels were reflected upon from a cognitive dimension (Figure2). The difference was in naming the levels. They stated that it was a process of remembering, understanding, applying,

analyzing, evaluating, and creating. Each category consisted of multiple subskills as explained in Table 2 bellow.

Table 2

The Cognitive Dimension Table (Blooms' Taxonomy Revised Version by Anderson and Krathwohl., 2001, pp. 67-68).

Category	Explanation
1. Remember: recalling and retrieving knowledge long-term-memory.	
Identifying. Retrieving.	Locating and retrieving the precise knowledge in long-term memory that is consistent with the presented material.
2. Understand: construct meaning from instructional message, including oral, written and graphic communication.	
Interpreting, Clarifying, Paraphrasing, Representing,	Changing from one form of representation.
Exemplifying, Illustration,	Finding a specific example or illustration of a concept or principle.
Classifying,	Determining that something belongs to a specific category.
Summarizing, Generalizing. Inferring,	Abstracting general themes or a major points and draw general conclusion from presented information.
Comparing, Concluding, Contrasting,	Detecting correspondence and construct the cause-and-effect between two ideas.

Table 2

Continued

3. Apply: carry out or use a procedure in a given situation	
Executing, Implementing.	Applying procedure to a familiar task.
4. Analyze: break material into its constituent parts and determine how the parts relate to one another to an overall structure or purpose.	
Differentiating, Discriminating, focusing, Selecting.	Distinguishing relevant from irrelevant parts of presented material.
Finding, structuring.	Determining how elements fit or function within a structure.
Deconstructing.	Determine a point of view, bias, values, or intent underlying presented material.
5. Evaluate: make judgment based on criteria or standard.	
Checking, Detecting, Monitoring, Testing.	Detecting inconsistencies within a process or product, determining whether a process or product has internal consistency, detecting the effectiveness of a procedure as it is being implemented.
Critiquing, judging.	Detecting inconsistencies between products and external criteria, determining whether the product has external consistency, detecting appropriateness of a procedure of a given problem.
6. Create: put elements together to perform a coherent or functional whole.	
Generating, Hypothesizing, Designing, And Planning.	Coming up with alternative hypothesis based on criteria. And devising a procedure to accomplish tasks.
Constructing.	Inventing a product.

Note. Retrieved from A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives / editors, Lorin W. Anderson, David R. Krathwohl; with Peter W.Airasian ... [et al.]. p, 31, United States: Addison Wesley Longman, Inc

Figure 3 illustrated the hierarchy and direction for developing and upgrading students' CT. The process begun with lower order thinking skills for freshman students (first year students). Afterwards, it involved higher order thinking skill, these are more devoted to graduate level students (Loseby. 2019, p 6).

Figure 3. CT skills process. From The Management Department at the United States Coast Guard Association (USCGA), (2019).

Critical Thinking Skills

Facione (1990) pointed out that CT is comprised of a set of skills which are namely: interpretation, analysis, evaluation, inference, explanation and self-regulation. Wade (1995) and Malir & Shoorcheh (2012) added a board picture composed of eight CT skills which were: questioning, defining a problem, examining evidence, analyzing assumptions and biases, avoiding emotional reasoning, avoiding oversimplification, considering interpretation, and tolerating ambiguity. Glaser (1937) and Watson-Glaser (1994) claimed that the core of CT consisted of skillful abilities in recognizing problems, acknowledging logical and valid inferences, plus the skillfulness and astuteness in applying CT.

Watson-Glaser (2002) strongly believed that CT is a necessary skill set for success. They described a set of steps for students to go through when improving higher thinking order. These were also considered to be a tool that can be widely used in measuring and assessing CT. These steps are:

1. Inference making: students' ability to distinguish between true or false conclusions from given date.
2. Recognition of assumption: students' ability to recognize an assumption of a given statement.
3. Deduction: students' ability in determining a decision on the conclusion.
4. Interpretation (induction): students' ability to consider whether the evidence and conclusions obtained can be generalized.
5. Evaluation of arguments: students' ability to give more following provided information.

Watson-Glaser introduced a developed version of their work namely Watson-Glaser II (2010). It was expected to assist in measuring and developing CT skills with the goal of improving professionalism and students' learning performance. Without any reduction in the essence of the needs in the goal of CT, they transformed the five structures into three inseparable ones, i.e., inference, deduction and interpretation. These were interconnected and associated with the withdrawal of Drawing Conclusions. Moreover, Recognition of assumptions and Argument evaluation were considered independent factors proposed in the RED Watson-Glaser model shown in Figure 4.

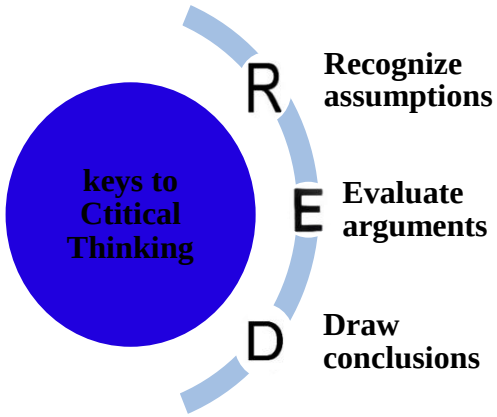

Figure 4. Watson-Glaser RED mode as the keys for CT. From (Rahmy Zulmaulida et al 2018 J. Phys).

The development of RED model of Watson-Glaser CT is explicitly explained in Table 3.

Table 3

Developed RED Model of Watson-Glaser CT skills

CT skills	Sub-CT	Description
Recognize Assumptions	Recognize (assumptions)	Giving comments with the correct information.
		Responding and questioning an assumption.
		Collecting keys or problems as the further information.
		Information and facts about the problem.
		The ideas or assumptions that support the strategy or plan.
		Is there strong evidence to support the given assumptions.
		What are the ideas you can explore.
		What to know for the next plan.
Evaluate objective Arguments	Analyzing Arguments objectively and accurately.	Analyzing arguments to evaluate, analyze information
		Questioning the quality of supporting evidence.
		Being objective to sort through the validity in Drawing more accurate conclusions.
		Identifying each argument as strong or weak.
		Identifying relevance and irrelevance.
		Looking for similarities and differences.
		Identifying conclusions.
	Deduction	Giving information through a list of decision making.
		whether the certain conclusion should follow the information in the given report.

Table 3

Continued

		Defining the problem.
		Selecting criteria to create a solution.
		Formulating the possible alternatives.
		Deciding what to do tentatively.
		Reviewing.
	Information	what information still need to be added**.**
Draw Conclusion		The results of investigation which become as specific Findings.
		Interpret the information found to draw conclusion.
		Analyzing how it will be done.
		How to interpret it.
		The reason to think that it is right answer or the accurate solution
	Conclusion (inference)	Giving the best judgment with quality decision.
		After analyzing all the facts what are the possible conclusions.
		The evidence that leads to a conclusion.
		Is there any new evidence that will impact a decision.

Table 3

Continued

	What are the conclusions that can be drawn?
	The decision must be based on the given information.
	Making generalization.
	Making conclusions and hypotheses.
	Interpretation of the statement.

Note. Retrieved from Watson-Glaser's Critical Thinking Skills. Rahmy Zulmaulida et al 2018. p, 3. J. Phys.: Conf. Ser. 1028 012094.

Characteristics of the Critical Thinker

By reminiscing the previous definitions of CT, we can understand that having the ability to think critically and analytically is not something a person can instinctively have. Being a critical thinker requires an active and skeptic mind ready to process and classify information by questioning it, to gain a broad picture about a given matter, rather than a simplified framework of inherited beliefs and assumptions obtained from a narrow and biased perspective (Facione, 2015).

Crebert (Crebert et al., 2011, p. 6) provided a group of features that classify. These features are:

1. Inquisitiveness about a wide range of issues;
2. Desire to be well-informed;
3. Alertness to opportunities to use CT;
4. Trust in the processes of reasoned inquiry;
5. Self-confidence in own abilities to reason;
6. Open-mindedness towards divergent world views;

7. Flexibility in considering alternatives and opinions;
8. Understanding of the opinions of other people;
9. Fair-mindedness in appraising reasoning;
10. Honesty in facing own biases, prejudices, stereotypes etc.;
11. Discretion in suspending, making or altering judgments;
12. Willingness to reconsider and revise views when necessary;

On the other hand, Glaser (1941) listed a set of abilities to think critically. They are:

1. Recognizing problems;
2. finding workable means for meeting those problems;
3. To gather and marshal pertinent information;
4. Recognizing unstated assumptions;
5. Using accurate and clear language;
6. interpreting data;
7. Evaluate and judging evidences;
8. Recognizing logical connection between propositions;
9. Drawing conclusions and generalizations (Fisher, 2001, p. 6).

Additionally, Willison & O'Reagan (2006) argued that critical thinkers are the ones who have the ability to determine the need of knowledge and critically evaluate it. The critical thinker can demonstrate the ability to organize the generated information in addition to synthesizing, judging and communicating knowledge (Crebert et al., 2011, p. 13).

Strategies in Developing Critical Thinking Skills

In accordance with the provided background and definition of the term CT, we can state that it comprises a large body of knowledge and does not tolerate passive learning once it is activated and developed within students. CT knows no limits and deadline because it sparks

within students a state of ecstasy to know more and be skeptical. As it was asserted by the astrophysicist and cosmologist Sagan (1979, p.31) “we are intelligent creatures and the use of our intelligence gives us pleasure, in this respect the brain is like a muscle. When we think well, we feel good. Understanding is a kind of ecstasy”.

Developing the ability to think critically is an essential step that can be achieved through different methods. It is an ongoing mental process that upgrades plain thinking into a complex one by analyzing and evaluating information (Mendelman, 2007, p. 300). He proceeded in claiming that developing CT has no specific level to start from, and that the process largely depends on students’ thinking level and aptitude. However, choosing an exact method to effectively do so is considered a methodological issue.

Groisser (1964) and Walker (2003) claimed that there are three different methods can be used to develop CT. First, questioning students’ answers in order to gain more understanding, provoke their logical and critical abilities, and develop new insights. Second, discussion and debate, because if offers the students the opportunity to analyze, synthesize, evaluate new information, and interpret previous knowledge to discuss and express their opinions (Walker, 2003). Finally, writing assignment. Such tasks require students to present their understanding upon a given matter in a written form. This was perceived as a very method effective, in light of the fact that writing naturally generates thinking abilities.

Another strategy was presented by Krulik and Rudnick (1984), it was called problem-solving method. This one aimed to help students having an analytical vision toward the problem. It required knowledge skills to identify problem and higher thinking skills to make good decisions.

Through questioning. Some questioning methods can be used to develop CT as the Socratic questioning (SQ).

Socratic questioning. Paul (1993) reviewed CT as the quality thinking that fosters logical and abstract reasoning. He advocated that SQ is an indispensable and powerful method to develop CT. By adopting this method, students' thinking standards will develop if asking the relevant and exact questions. Scanlan (2006) stated that students can develop their CT skills in all key areas of writing when the later method is incorporated in a writing class.

Because of the different adaptations of SQ, there is no precise method to be specifically conducted or followed. However, Paul (2008) created a whole method that he referred to it as a "system" rather than a method. He stated that training the mind to follow specific standards demands an organized procedure to be conducted systematically. The goal of CT is to set a disciplined manner of thinking, and SQ seeks to cultivate an inner voice through a strategy of questioning to discipline the mind (Paul & Elder, 2001).

Paul's model of SQ. Quality thinking can be derived from exact questions that stimulate thoughts. For this reason, Paul designed "The Element of Reasoning" (2008, p, 3). These elements aim to exercise the mind via questioning so to provide reasoned responses and display CT. It is composed of eight elements which are: Purpose, Question, Assumption, Information, Inference, Concepts, Interpretation and inference. These elements are used to assess students' thinking independently, and in writing (see Figure 5).

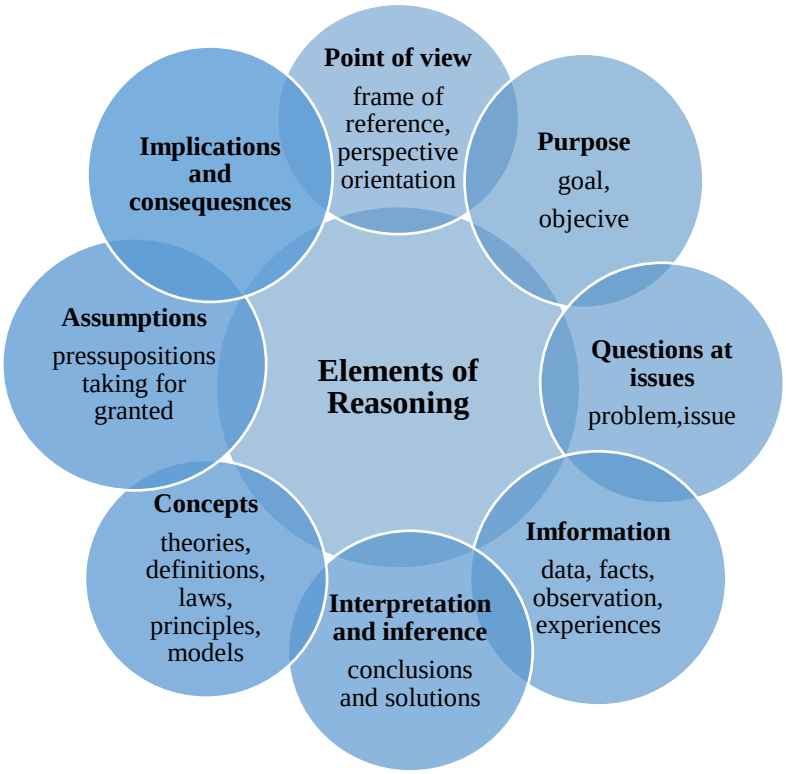

Figure 5. The Elements of Reasoning. From: Paul and Elder (2008, p.3).

According to Figure 5, the eight elements of reasoning are:

1. Questions of Purpose: ask students to define the given task.

2. Questions of Information: ask students to examine the quality of information and look for the source.

3. Questions of Interpretation: ask students to examine how we are organizing or giving meaning to information and to consider alternative ways of giving meaning.

4. Questions of Assumption: ask students to examine what we are taking for granted.

5. Questions of Implication: ask students to follow where our thinking is leading us.

6. Questions of Point of View: ask students to examine our point of view and to consider other relevant points of view.

7. Questions of Concepts: ask students to look at models, theories and help us define our ideas.

8. Questions of the Question itself: ask students to focus on what is the problem or issue that we are working on (Paul and Elder, 2008, p.6).

Through writing assignment. Northedge (2005) outlined learning principles and strategies to improve CT through writing. Strategies as debates which offer students the opportunity to argue and defend different point of view. It includes argumentation which helps in developing logical and reasonable arguments, criticism to consider strong and weak points. Analysis of arguments independently. In addition to providing supporting evidence to the arguments, objectivity and precision to constructing relevant ideas, omitting irrelevancies and stick to the arguments. These principles were reflected to as effective tools that permit to improve thoughts, since they provide an interpretation context and boost higher thinking skills (Resnick, 1987; Marzano, 1991).

In addition to this, Ackerman (1993) argued that not all writing promote CT. As it is the case for students who learn the art of writing as spelling, sentence structure, and composing ideas. He added that writing tasks that involve copying and dictating do not require any sort of cognition. Thus, many kinds of writing tasks trigger only lower thinking order. The level of thinking triggered depends fully on the choice of the writing tasks.

On this account, students will improve their CT through writing when dealing with the right assignments that exercise and activate their CT. The writing tasks must call for evaluation, inference, argumentation, and analyzing of ideas, taking into consideration that the relevant writing assignment should reflect and manifest their thoughts, it is the revealing of thoughts onto a written piece. Alternatively, CT can be undermined when dealing with poor tasks or when students have low writing capacities.

Through assessment. Shirkhani and Fahim asserted that assessment does not only focus on students' linguistic and communication competence, but also on integrating language learning and thinking skills. They presented a list of suggestions with the goal to help language learners specifically enhance and develop CT through assessment (2011, pp. 113-114). They included:

1. Use a chain of an ongoing assessment rather than one test or exam with a limited amount of knowledge; it gives the opportunity to assess a large amount of CT skills and knowledge.
2. Including the exact activities in which the students are compelled to think about the core objectives of the given course to promote CT skills, such activities that boost them to think, cooperate and ask questions.
3. Assimilating students' performance with the right feedback frequently helps students to develop their understanding of a given concept because it lays out the information about their performance and how they can do better.
4. Co-developing criteria for assessment. When students develop the criteria by looking at similar performance models, they will be able to relate to the objectives of the activities effectively.

Challenges in Developing Critical Thinking

Even though the thinking process is innate in human beings, Wood (2002) believed that thinking demands training to be improved. Equally, CT can be improved and developed through practicing and training students how to think effectively. However, this process is likely to experience some challenges. Paul (1987) besides Choy and Cheah (2009) identified a basic challenge which is concerned with teachers' understanding and perception of CT. When teachers do not fully understand the concept, they will experience difficulties in including CT

aspects in a lesson plan. Eventually, they won't be able to incorporate higher order thinking level.

Another challenge presented by Snyder and Snyder (2008) which addresses the lack of training devoted to CT for both teachers and students. This implies that teachers who lack training in CT methodology are not skillful enough to incorporate CT. Furthermore, there is an inadequacy in CT resources and limited time and effort in the classroom, because CT requires a long time and extensive effort to achieve the desirable outcomes. Another challenge addresses students' passive behavior in the classroom. Paul (1990) explained it by revealing that students always expect teachers to provide them with all the information they need, so they do no use any CT abilities. In addition to the psychological and the language barriers that hinder them for being active.

Assessing Critical Thinking

In the field of CT, there are two essential approaches for assessment, the testing and the curriculum approach. First, in the testing, also known as the psychometric approach, CT can be assessed separately in a single testing session. This was considered general and traditional due to its dependency on multiple choices testing format. The second approach is the curriculum approach in which CT is assessed in a specific learning context. It depends specifically on students' performance (Swartz and McGuinness, 2014). Furthermore, they explained that the latter approach involves making rubrics and are criterion- related. This is also accompanied with teacher-development assessment that demands authentic context. Assessing through the testing approach was recognized by multiple themes designers and many scholars in the field, each for a desirable outcome to be met. Some of the most widely used testing approaches is the Watson-Glaser Critical Thinking Appraisal which was adopted in this research because of its nature that is closely aligned to argumentative writing.

Watson-Glaser Critical Thinking Appraisal (WGCTA). The WGCTA measures three major CT domains, which are the ability to recognize assumptions, evaluate arguments, and draw conclusions (Watson & Glaser, 2010). It is composed of five tests that include reading passages and statements along with options to answer from. The tests dealt with every skill independently, which are: 1 inference, 2 recognition of assumption, 3 deduction, 4 interpretation, and 5 evaluation of arguments. The WGCTA provides a total final score for the five tests as a whole, the score is the result of the sub-scores addition (Watson & Glaser, 2008a, and 2008b).

Due to the multi-variation of the term, researchers have delineated multiple assessments to accommodate the assessment. However, Ennis (1993) suggested that the teacher or the researcher is free to design a CT test in accordance with the subject as long as they are easier to realize.

Challenges in assessing critical thinking. Major challenges in assessing CT were pointed out by AERA, APA and the NCME concerning the validity and reliability of the tasks. The degree of validity is "the degree to which evidence and theory support the interpretations of test scores for proposed uses of tests" (2014, p. 11). Moreover, Moss and Koziol (1991) measured CT skills through analyzing a writing task in the context of social studies, and revealed that most students have a high reliance on recalling their information as they supported an inference with argumentation or evaluated an argument rather than activating CT. the researchers stated that the assessment process is loaded with difficulties.

Another point was presented by Norris (1989) who clarified that the assessment remains difficult as long as there is no exact distinction whether CT is general or subject specific. In addition to that, assessing CT is confounded with subject-specific knowledge, which will result in students' failure in transferring CT to another subject that either requires additional

instruction in CT or additional instruction in the subject matter. Moreover, another challenge in designing assessment format is to strike a balance between the assessment authenticity and its psychometric quality. It was acknowledged that most current assessments rely on multiple-choice items when measuring CT, this is due to its privilege that lies in their objectivity, efficiency and high reliability. However, Norris (1989) argued that traditional assessment formats are ill suited for testing limited aspects of the construct. Even though scholars separately identified CT skills, yet depicting their effects individually through assessment is problematic. Norris (1989) added that irrelevant constructs result from using the multiple-choice format as test-takers' religious beliefs, political judgements, instead of reflecting CT when assessing deductive reasoning and judgments.

Significance of Critical Thinking in Learning

Despite the fact that CT roots originated in the Greek classical period, this did not enfeeble it throughout the past millennia. Yet, it strengthened its disposition and necessity in the 21st century. CT is regarded as an essential tool to obtain in all life aspects, because it offers people generally and students specifically the ability to make decisions, solve problems, and make their thinking abilities more accurate, objective and relevant (Cottrell, 2011).

CT is a set of valuable skills for students to obtain. As Robinson (1987, p. 16) asserted, it is no longer useful to spoon-feed the students with information in order to be successful, because they need not the information, but a higher thinking order to process the information in a constantly changing world. This made it a pillar in the current century education, regarding the fact that students are a click away from any possible information, this brings higher risks for them to decipher, interpret and analyze it. This latter flips the focus of education into feeding the students with the needed potentials to analyze, interpret and criticize rather than the outcomes. In other words, tracing the path for students to know how and what to learn is what

gives them the opportunity to appraise their learning and learning methods. Emir (2009) confirmed that this is how they manifest their CT abilities instead of the provided outcomes. CT absence can affect students' performance in different learning domains as they seem incapable of doing activities which others with developed CT skills may be able to do (Shirkhani & Fahim, 2011).

Language learning has no exceptions either, in view of the fact that language is not a mere communication tool, but also an instrument of thoughts. Considering that any language teaching approach which does not develop nor involve CT doesn't guarantee language proficiency (Kaliban, 2000). That is to say that even communication which emphasizes language use does not improve students' proficiency. In order to achieve the level of mastering the language, students have to think critically and creatively while using the language. In foreign language learning precisely, even a mere conversation requires different levels of thinking. This is due to the fact that languages are culturally determined (Chrystal, 2004).

Argumentative Essay

Definition

According to Sweat (2012), the argumentative writing, also referred to as the persuasive writing, is a type of writing that offers the students the opportunity to express their opinions and support them with logical arguments and evidences. In other words, the argumentative writing is an exhibition of arguments and ideas of a chosen position in order to persuade the audience on a particular issue. Langan (2005) highlighted that writers should first obtain knowledge about the issue, defend his view, support it with reasonable and logical evidences and acknowledge the opposite position to provide good argumentation, and eventually persuade the target audience.

The Argument

Definition. As stated in Cambridge Dictionary, an argument is a reason or reasons to support or oppose an idea or suggestion, or the process of explaining these reasons. Bowel and Kemp (2002) defined arguments as an analytical process of persuasions by proving good reasons. An argument is composed of two parts, claims or premises which lead to the second part that is a conclusion or inference.

Types of arguments. There are deductive and inductive arguments.

Deductive arguments. The deductive argument is a valid argument which contains true premises to support a valid and certain conclusion. The valid argument depends on the accuracy of the provided evidence (Boss, 2014, p.205). This means that if one premise is wrong, the conclusion is wrong. As an example, premise one is "all plants perform photosynthesis", premise two is "cactus is a plant" the conclusion is "Cactus performs photosynthesis".

Inductive Argument. The inductive argument is either strong or weak argument, it contains premises that provide probable not certain support to the conclusion (Boss, 2014, p.205). He added that inductive argument is not true or false argument. It is a strong argument when it consists of true premises that lead to high probably conclusion, that is if "all mammals are warm blooded", and "dolphins are mammals" therefore "dolphins are warm blooded". It is weak when the premises are true yet the conclusion doesn't follow neither certainty nor the probability. For instance, "Earth is terrestrial planet", "Venus and Mercury are terrestrial planets too" therefore "All planets are terrestrial".

Argumentation

Definition. Argumentation as it was introduced by Kuhn (2005) is a method to analyze and reveal the importance of issues and expressing viewpoints. A good argumentation structure

requires arguments that are supported with premises and opposing claims. Halpern (1998) considered argumentation as a stimuli to develop CT. It was claimed by Perksin (1985) that many students who do not have good argumentation ability, do not possess high CT level, and this latter doesn't improve by their growth of knowledge nor age.

Argumentation approaches. Two main approaches are considered:

***The formal logic approach*.** Studies on logical reasoning traced back to Aristotle who was an argumentation theorist, whose theories in logic, dialectic, and rhetoric were the foundation of the contemporary argumentation theories. Aristotle's argumentation approach laid to the formal logic through which he classified arguments into three categories, demonstrative, dialectical and rhetorical, based on their respective objectives to ultimately conclude with either deductive or inductive syllogisms (Van Eemeren et al., 1996). In the other hand, Wenzel (2006) conceptualized arguments as units of thoughts that are put together in a discourse to be criticized and evaluated. However, formal syllogisms i.e. inferences are seldom produced in real life scenarios (Toulmin, 1958).

***The informal logic approach*.** In contrast with the formal logic, the informal logic is perceived as a brunch of logic to develop non-formal argumentation (Blair and Johnson, 1987). This field of study was investigated by Van Eemeren (2009) as he pronounced that it is largely based on the work of Toulmin et al (1984) and Perelman & Olbrechts-Tyteca (1958). The informal logic and CT were synergistically identified (Johnson, 2000).

Wenzel (2006) developed three perspectives to assemble arguments in an active and lively way, rhetorical process, dialectical process, and logical product. Additional theory was introduced to the informal approach by Grice (1957) and was later developed by Walton (2007). It was the dialog theory, which indicated that an argument is perceived as a two sided dialog holding contradictory views. As a distinction between the rhetoric and the dialog argument,

Kuhn (1991) annotated that the rhetoric argument focuses on justifying what is been said. However, the dialog argument demands juxtaposing different sides.

Criteria of a Good Argumentative Essay Writing

In order to produce an essay, Heaton (1975) indicated that it takes more than mastering grammatical features for an effective written piece, because stylistic and thinking skills play a fundamental role in this process. Students must be able to produce grammatically correct sentences, manipulate those sentences in an effective way, and possess good thinking and judging skills in order to present relevant information to meet the purpose and the audience. In addition to good mechanical skills that combine the whole text successfully.

Unlike any written piece, Students must consider the following for an effective argumentative essay:

1. Formulate clear, firm and outstanding thesis statement for the reader to know what you are writing about and supporting which position.
2. Implement brief background information about the topic for more clarification.
3. Organizing an outline of evidences through which students explain why that argument is valid.
4. Insure essay credibility by addressing credibility, which is explaining and refuting the opposite position.
5. Make sure that you are familiar with the topic and make sure to have previous brainstorming in order to have a good amount of reliable information.
6. Be logical and reasonable in writing by avoiding logical fallacies and language manipulations.
7. Respect the structure of the essay and make sure to achieve the goal which is to persuade the audience (OnlineWriting Lab, n.d.).

Topic familiarity. In order to help students express and exhibit their CT abilities in the argumentative essay writing, familiar topics inspire them to activate their background knowledge, identify the problem, and evaluate their arguments (Mei, 2006). He argued that students' abilities to identify problems, evaluate and refute contrast positions created a high rated essay. On the contrary, students' low abilities in disputation and identifying the problem is linked to the raised argumentative topic. Cahyono (1992) argued that familiar topics propose better writing performance.

Counter-arguments in the argumentative writing. The recognition and refutation of the alternative view in argumentation determine the writer's thinking and understanding abilities, and his good raisoning skills. For the reason that it demonstrates the writers full acknowleging on the matter (Perkins and Tishman, 2001). Walton (1989) proclaimed that in order to ascribe good argumentation, the writer needs to be skilled enough to understand the necessity of considering and refuting the opposing views, because it is a crucial element in argumentation. Kuhn (1991) asserted that the absence of counter-argumentation is an obstruction to CT.

Critical Thinking and Biases in Writing

Perkins and his colleagues identified that students tend to support only their preferable viewpoint and ignore the evidences against it, it was termed as the "myside bias" (Perkins, 1985; Perkins et al., 1991). This phenomenon was investigated in CT and argumentation fields. Researchers as Felton (2004) besides Kuhn & Udell (2003) demonstrated that students with deficient writing skill abilities tend to pay more attention to their point of view and neglect the opposite position and its counterevidence, they added that it effects students' reasoning abilities. In accordance with this, Perksin et al (1991) argued that the myside bias indicates the lack of open-mindedness. On the contrary, the inclusion of counterargument in writing strengthens the writer's position and helps him achieve good reasoning. In the same line, Kuhn and Crowell

(2011) asserted that including and refuting counterarguments reflects CT in argumentative writing. O'keefe's (1999) referred to the use of the counter-arguments with "the two-sided message". He argues that its use in writing is more persuasive, and its absence will make the writers peril for the myside bias.

Fallacies in Argumentation

As defined in Oxford Dictionary (2006) "Fallacy is a false idea that people believe is true". In other words, Fallacies can be defined as erroneous reasoning that has a major focus on irrelevancies, this undermines the value of the argument resulting in a flawed argument. Numerous studies such as El Khoiri and Widiati (2017) revealed that the existence of fallacies and manipulation in students' argumentation is associated with their low CT skills.

Sinnott-Armstrong and Fogelin (2010) claimed that there cannot be finite number of fallacies. However, various types of fallacies are more likely to be applied which are: straw man fallacy, ad hominin fallacy, red herring fallacy, argument from ignorance, begging the questions and many others. Mayfield (2007) classified fallacies into four categories as it is explained in Table 4

Table 4

Types of fallacies

Type of Fallacy	Definition
Manipulation through language	Uses ambiguous words.
1. Word ambiguity	Hides meaning by creating words which make
2. Misleading euphemism	less acceptable idea seems positive.
3. Prejudicial language	Uses words that convey bias.

Table 4

Continued

Manipulation through emotions	Seeks to persuade by arousing fear.
1. Appeal to fear	Seeks to persuade by arousing pity.
2. Appeal to pity	Seeks to persuade by citing a fake or
3. Appeal to false authority	inappropriate authority.
4. Appeal to bandwagon	Seeks to persuade by appealing to the wisdom
5. Appeal to prejudice	of popular momentum.
a. Personal attack	Attacks the person's character on matters
b. Poisoning the well	irrelevant to the issue.
	Seeks to prejudice others against a person or idea so that their arguments will not be heard on their own merits.
Manipulation through distraction:	Diverts attention to other issues
1 Red herring	Claims that similar actions went unnoticed and
2 Pointing to another wrong	unpolished.
3 Straw man	Attacks a minor point in an argument, then
4 Circular reasoning	claims this maneuver invalidates the whole argument.
	Repeats the same conclusion in different words.

Table 4

Continued

Inductive Fallacy:	Draws conclusion from insufficient sampling
1 Hasty generalization	Assert there are only two (extreme) choices
2 Either-or fallacy	while actually there are many
3 Questionable statistics	Presents unknown or unsound statistics
4 Inconsistencies and contradictions	Uses claims that contradict one another
5 Loaded questions	Uses a biased question.
6 False analogy	Ignores significant differences when comparing
7 False cause	two things.
8 Slippery slope	Presents unreasonable claim of casual connection.
	Presents unwarranted claim that one event would lead to chain reaction.

Note. Reprinted from "Thinking for yourself: Developing critical thinking skills through reading and writing", by Mayfield, M., 2007, p. 130-131, Boston, MA/USA: Thomson Wadsworth.

This was referred to as the "fallacy approach", which assesses and evaluates the strength of arguments in the argumentative essay. It works on identifying if the presented arguments contain a fallacious statement and determines its strength and validity.

Argumentative Writing and Critical Thinking

Based on the previously stated definitions, the process of writing involves thinking, and a quality written product would not come into existence without a thinking process. This means that thinking and writing have a complementarity relationship. In other words, the writing process is considered to be a good platform for students to develop and exercise higher thinking skills. This is because when they write they have the opportunity to analyze facts, produce ideas, construct arguments, recall previous knowledge, solve problems and interpret information. This

make the writing process a vehicle for students to express their CT abilities (Barnawi, 2011). The argumentative writing does not measure only the writing performance, but also students' CT skills (Rahim et al., 2008), because the act of writing calls for a recursive process of thinking, organization, rethinking, and reorganization which are aligned with making evidence, analyzing and evaluating arguments, and forming judgments. Eventually, this will enjoin students to apply CT skills in the writing process (Cottrel, 2011). Nonetheless, Sadli (2002) stated that guiding students to activate CT skills is a must in argumentative writing, hence not being stuck in a free CT writing process.

Moreover, Twardy (2004) and Dariman (2019) stated that CT is yoked to the academic writing because it expresses the writers understanding abilities to analyze, evaluate, and synthesize arguments to ultimately present them in a coherent and convincing way for the readers. This means that the argumentative writing a stimuli to develop the CT skills.

Stapleton (2001) highlighted that CT and the argumentative essay writing are closely related. He conveyed that the argumentative writing promotes students' thinking and the CT abilities affect the written piece. This implies that argumentative writing reflects students CT abilities as it represents how critical they can think when they perform written activity which requires them to apply CT aspects (Dixon, Cassady, Cross, & Williams, 2005).

Related Studies

A large number of studies were conducted to examine the effect of CT skills on writing as well as their relationship. Jafari, Assadi, & Zoghi (2014) conducted an experimental study that aimed at examining the effect of CT strategies on Iranian EFL learners' writing performance. After eight week of instructions, the study revealed that CT strategies had a significant effect on students' writing performance across genders. This was due the fact that the writing performance was improved after the instruction.

Another study was found relevant to the variables of the current work was conducted by Pantea and Fahim (2012). In an attempt to investigate the relationship between CT and the argumentative writing. The results showed no big difference when comparing the control and experimental group final work, concluding that CT has no significant effect on the argumentative essay writing. Additional study was conducted by Keraghel and Bourekba (2017). In order to investigate the influence of CT based activities on argumentative paragraph writing for first year secondary school students. The study revealed that the experimental group students' writing ability was improved unlike the control group because they received neither a treatment nor instructions.

The previous reviews contributed information concerning prior studies which provided help and guidance in finding answers for the present study's questions. The current study is an expansion on investigating the effect of the variables.

This chapter provided the theoretical foundation to conduct this study. It entailed fundamental knowledge about CT by investigating its definitions, levels and skills. It also included CT development, its significance in learning as well as its assessment. The chapter also comprised essential literature on the argumentative essay by focusing on the definition, arguments and argumentation. Finally, the chapter covered the relationship between CT and argumentative essay and different studies on this relationship. The next chapter being the first in the practical part will focus on the methods adopted to conduct the current study. It will discuss the subjects, instruments, procedures of data collection and how data the will be analyzed.

Chapter 3

Methods

The present chapter dealt with the methods undertaken in order to conduct this experimental study. It depicted the research design, setting, and the subjects involved in this study. This chapter also explained the research instruments and the procedures used to gather the data along with the statistical programs that were used to analyze it.

Research Design

In the light of the fact that this true experimental research focused on investigating the effects of developing CT on students' argumentative essay writing, it opted for a pretest/posttest control group design. In order to collect data, researchers randomly assigned the participants into two groups i.e., control and experimental group, in addition to a treatment which was administered only to the experimental group. The pretest comprised a CT test to determine students CT level and with an argumentative essay writing test to evaluate students' writing and their use of CT in writing. With the purpose of perceiving how the treatment developed students' CT and affected their argumentative essay, the posttest took the same procedure as the pretest in terms of the CT test and the argumentative writing test to detect differences.

In line with this, the study adopted a quantitative approach to gather the data, this approach is suitable to investigate the effect and the relationship of the variables. Because of its scientific nature, it offers methodological objectivity and provides copious numerical data that enable hypotheses testing and generalizing the findings (Christensen and Johnson, 2012, p33 and Bryman, 2008, p394).

Research Setting

The researchers carried out the study primarily in Department of English at Chadli Bendjedid University where the pretest was properly conducted. However, the abrupt outbreak

of the virus led the researchers to adopt the Zoom cloud based videoconference, which provided a set of features that helped in accomplishing the experiment. The platform provided a classroom like atmosphere guaranteed the continuity of the work.

Subjects

The subjects of the current study were 30 3rd year students of English at Chadli Bendjedid University, El-Taref, Algeria. Because of the pandemic, only 12 students from the original subjects' size were able to join the online experiment. After that, the subjects were equally subdivided into two groups.

3rd year students of English were chosen due to their familiarity and exposure to argumentative writing during their learning experience. As a result, they were expected to produce average to good argumentative essays. As explained in the previous chapter, CT and argumentative writing are homogenized materials that serve one another (Palmer, 2012; Ramage et al, 2010; Stapleton, 2001; Yeh, 1998), thus the subjects aided the researchers in scrutinizing CT in their writing and coping with the research's objectives and questions.

Research Instruments

In the interest of establishing the experiment under the proper conditions, a set of instruments were carefully chosen and used in the data collection process. On this ground, this study adopted a CT test and an argumentative essay writing test for both the pre and posttest besides a set of argument structure activities, CT based practices, and logical fallacies exercise.

Critical thinking test. The CT test carried out in this research is a shorter version of the WGCTA- FS in the interests of brevity. As it was explained in the previous chapter (see page 25), the test main objective was to measure students' CT level in both the pre and posttest. The WGCTA- FS was chosen due to its large use in different fields of study, validity and reliability (Behar-Horenstein & Niu, 2011, p. 31; Wangensteen et al., 2010).

Essay. In order to address the argumentative essay topic for the participants and to ensure subject familiarity, a list consisted of 4 controversial topics were chosen due to their popularity as trending issues to students and we are all generally exposed to. Consequently, this will generate their CT while writing. The topics were: Feminism, Domestic Servitude, Refugees in foreign countries, and Terraforming Mars into our second home. Throughout a poll which was designed and addressed to the participants, the topic of Terraforming Mars into our second home gained more votes and was selected as the most common and familiar one to them.

Arguments' structure activities. A set of arguments' structure activities inspired from the Critical Thinking Handbook (Nuki, 2007, pp. 5–10), they were designed and directed to the experimental group during the treatment sessions in order to acknowledge the participants about the argument components and help them compose efficient arguments.

Critical thinking based activities. With the aim of developing students' CT, a set of CT based activities were handled to the experimental group. A set of five different activities, each discussed different CT skill which are: inference, recognizing assumptions, deduction, interpretation, and analyzing arguments. This exercise was aligned with SQ method as a device to provide them with a feedback. This task majorly aimed at operating students thinking and developing their CT abilities.

Logical fallacies activity. As this study aimed at developing students' CT to improve their argumentative writing, fallacies should not be neglected. Considering that its presence leads to fallacious arguments and faulty conclusions (Cottrell, 2011). We predicted that the quality of the written piece will be diminished. For this reason, Sinnott-Armstrong and Fogelin (2010) argued that this kind of activities aim at explicitly introducing and acquainting the students about the most used ones, train them to detect fallacies in given passages and develop their CT by avoiding making erroneous claims in argumentative writing. As demonstrated in

Table 4 (see page 32) in the previous chapter, the participants dealt with theses fallacies due to their frequent use:

1- Hasty generalization.
2- The Strawman Fallacy.
3- The Red Herring Fallacy.
4- Denying the Antecedent.
5- The AD hominin argument.
6- The Appeal to Authority/ Argument from Authority.
7- The Argument from Ignorance.

Argumentative essay grading rubric. Students' argumentative essay writing tests were objectively evaluated twice by the researchers with the help of one of the writing teachers at the Department of English at the university. The evaluation process relied on Saint Paul College's rubric for argumentative essay grading due to its analytical description of the argumentative essay characteristics (see Appendix L) besides its reliable and precise assessment. The rubric provides a total high score of 50 points.

Critical thinking in the argumentative essay rubric. In an attempt to evaluate students' use of CT in the argumentative essay writing and gain insights into their reasoning abilities over the quantity of information, the researchers adopted the Northeastern Illinois University rubric (2006), as demonstrated in Appendix M. The rubric can be applied to assess CT in different subject areas (Nobori, 2011).

Research Procedure

To run this study, a data collection procedure was adopted and comprised three main parts. The first part is a pretest to determine students' CT level, their argumentative writing and CT availability in the writing. The second part is a treatment of seven sessions with one per

day, it was designed and directed to the experimental group participants in order to develop their CT skills. Finally, a posttest was an embodiment of the pretest, it aimed to perceive how the treatment affected the participants' argumentative essay writing and notice any differences between the two groups.

Pretest. To answer the research first question, participants from both groups were pretested through the WGCTA-FS to test their CT level (see Appendix A), in parallel with an argumentative essay writing test to find the answer for the second question. In the writing test, the students were required to be impartial toward their personal views and support the given idea in the prompt, then develop it into a short essay (see Appendix B). The purpose behind compelling the students to support a given idea regardless their own views was to create a challenging atmosphere to spark their critical thoughts, as long as the topic is familiar to them (Liu, 2005). The researchers provided a general explanation to the participants which meant for elucidating the work process. The pretest took place on March the 9th and lasted for 1 hour. However, the first submitted paper was after 20 min. The CT test followed the WGCTA-FS scoring method which provides a final score for the whole test which was 30/30. This means that 6 points were the full sub-score for each skill (each correct answer awarded 2 points). On the other hand, The argumentative essay test was first assessed based on its quality according to Saint Paul College's argumentative essay rubric, then the researchers assessed the CT occurrence in the essay adopting the NEIU (2006).

Treatment. Unlike the control group, the experimental group received series of activities designed and targeted to develop participants CT skills. The treatment consisted of argument structure activities, CT based activities which covered the required CT skills i.e., inference, assumption, deduction, interpretation and evaluating arguments, besides logical fallacies exercises. With the effort to develop CT and assess students' performance

during the treatment, the researchers adopted SQ method to discipline participants' mind, cultivate their thoughts and help them stimulate understanding and generate CT.

SQ was present in all the treatment sessions, it took the form of questioning their answers by asking questions inspired from Paul's System as it was explained in the previous chapter(see page 21). Considering that there is no exact and finite way to apply the SQ method as long as it can be applied effectively (Scanlan 2006). The treatment held a period of seven days, a session every day. The researchers devoted 40 minutes for each session to make sure that the participants understand the process for best results.

The first session of the treatment took place on 10th June and dealt with argument structure activities. Participants were required to recognize and differentiate between facts and opinions in the given statements. After that they received another activity about the structure of arguments. They were asked to identify the premise and the inference within every argument. This treatments aimed to introduce and train the students about the underpinnings of arguments (see Appendix C).

The second session, 11th June, initiated CT skills based activities inspired from AssessmentDay Practice Aptitude Tests. These activities lasted until the sixth session of the treatment because the researchers handled the CT skills separately, i.e. one skill every day. Participants were required to respond/judge each given passage that dealt with specific skill from a list of a given statements. First they dealt with inference skill, (see Appendix D). They were asked to choose the correct inference beneath each statement. Then, on 12th June the students were trained on their recognition of assumptions skills (see Appendix E). They were required to choose from a list of suggestions the logical assumption based on the evidence in every statement. June the 13th was the fourth session of the treatment in which students trained their deduction skill (see Appendix F). By following the same technique the current treatment

opted for deduction treatment, they were asked to decide whether the stated conclusions follow or do not follow the statement. Next, students dealt with the fourth CT skill which was interpreting information. They were asked to choose the logical conclusion that follows every given passage (see Appendix G). The last CT skill based activity was on the 15th June. Students were required to judge the given arguments as strong or weak based on the previously stated statement (see Appendix H) this treatment aimed to strengthen the participants' CT skills and reasoning abilities.

The seventh session was the last session of the treatment which covered an explanation about logical fallacies, it aimed to provide a bigger picture for the participants about language manipulations and fallacious arguments in writing. Additionally, a practice was designed to help them detect fallacies in writing (see Appendix I).

Posttest. After completing the treatment, Participants from both groups accomplished the posttest. It was analogous to the pretest in terms of the CT test (see Appendix J). However, the researchers kept the same writing topic and reversed the writing prompt so the participants were required to write against the previous standpoint (see Appendix K). This technique compelled the students to think more critically. The posttest aimed to reflect the effectiveness of the treatment and to spot the differences between both groups performance. In order to make valid and reliable assessment, both of the pretest and posttest papers were carefully examined and analyzed.

Data Analysis

Because of the pretest-posttest design that this study adopted, it opted for an independent sample t test in order to test the hypotheses. By using the SPSS statistic software and Excel, the researchers ran a two tailed t-test to carefully investigate the significant difference between and within groups' mean scores. First, to do a pretest inter-groups analysis, we measured the

arithmetic mean of the pretest scores before any input i.e., intervention, this allowed us to identify if the subjects in both groups had the same baseline.

To determine how well the treatment worked, another between groups analysis was conducted at posttest stage. Finally, we carried out another t test to do a within-groups analysis in both the pretest and the posttest. The t-test helped the researchers in determining significant differences of the results through its *p*-value which level of significance is commonly $p \leq .05$. The test assumed a null hypothesis (H0) which suggested for an equal mean scores, i.e. statistically insignificant means. Plus an alternative hypothesis (HA), or the research hypothesis, which specified that the control group had lower mean compared to that of the experimental group after the treatment, i.e. statistically different means. We assumed that the (H0) was true until the evidence of significance rejects it, then the (Ha) must be true. Accordingly, the difference is considered statistically significant when the *p*-value$\leq .05$, and the H0 is rejected in favor of the Ha. However, when the *p*-value >.05 then the difference is not statistically significant and the H0 should be admitted.

After detecting significant differences, and for the noteworthiness and reliability of the study's findings (APA, 2009, p.34), we measured the effect size of the treatment in the posttest between and within-groups through Glass Delta. This latter was regarded as a scientific approach to the accumulation of knowledge, and a complement to the p-value results which were seen as statistically insufficient (Thompson, 2002, p. 66). The effect size helped in measuring the magnitude of the found differences. The Glass Delta was selected due to the small subject size 20< and the different SDs. The effect size values were defined by Cohen (1988, p.25) as follow: d= .2 small, d= .5 medium, and d= .8 to infinity considered as a large and excellent effect, these values can be converted to percentiles or interpreted as stated.

This chapter reported the followed methods to accomplish this study. It covered the precise information concerning the research design, setting, and subjects. Besides the used

instruments in the data collection procedures. Finally, it highlighted how that data are to be analyzed.

Chapter 4

Results

This chapter was devoted to answer the research questions and test the hypotheses, it systematically reported the results and the findings of this study. First, it represents the results of the subjects' pretest in both the CT test and the argumentative essay test. Then it provided an inter-groups analysis to detect statistical differences. After that, it outlined the posttest's results for both groups along with the inter-groups analysis. Concurrently, it methodologically reported statistical differences within the groups, besides a chart graph that demonstrated students' CT use in writing throughout the three stages of analysis.

Pretest Results

The pretest scores in Tables 5 and 6 bellow were considered as requisite data to compute participants' mean and standard deviation scores, so as to measure statistical differences inter and intra-groups.

WGCTA-FS pretest scores.

Control group.

Table 5

Control Group Sub-scores and Overall Score of CT Pretest

Participants N	Inference/ 6	Recognizing Assumption /6	Deduction/ 6	Interpretation /6	Evaluation of Arguments/ 6	Final Score/30
1	4	2	4	4	6	16
2	2	2	2	6	2	14
3	4	4	4	2	4	18
4	2	2	4	4	4	16

Table 5

Continued

5	4	6	2	4	2	18
6	4	4	2	2	4	16

According to the data presented in Table 5 above, participants owned a sub-score ranging scale of 2-6 and a whole ranging score of 14-18, but only three received the whole sub-score in variable skills. One participant (17%) received below average score (14), three students (50%) have managed to receive above average score which was 16, and two participants (33%) received 18/30 as the highest owned score in the group.

Experimental group.

Table 6

Experimental Group Sub-scores and Overall Score of CT Pretest

Participants	Inference/6	Recognizing Assumption /6	Deduction/6	Interpretation /6	Evaluation of Arguments/6	Final Score/30
1	4	2	4	2	2	14
2	2	2	4	2	4	14
3	2	2	4	4	6	18
4	2	4	4	2	4	16
5	0	2	2	2	0	6
6	0	6	4	6	4	20

Table 6 demonstrated the results of the CT test. The participants had a ranging score of 0-6 and 6-20 as whole score ranging scale. Two students received the highest sub-score, yet

another two received 0 as the lowest sub-score. However, three students received below the average (15), one participant managed to obtain 16, and two participants received good scores of 18 and 20 which were the highest scores so far in both groups.

Inter-groups analysis for CT pretest. Both groups' CT scores were analyzed through the SPSS to provide descriptive and inferential statistics.

Table 7

T test Results of the CT Pretest

Group	Mean	SD	SE	t	df	P	Mean Difference	SD Difference	95% CI for Mean Difference	
Control	16.333	1.506	0.615	0.805	10	.440	1.667	2.071	Lower	Upper
Experimental	14.667	4.844	1.978						-2.948	6.281

Table 7 above illustrated inter-groups mean scores difference in the pretest. The results showed that control group mean (M=16.333, SD= 1.506) was bigger that of the experimental group (M=14.667, SD= 4.844). To determine the significance of this difference, an independent t test was used. Table 9 suggested a *p* –value for the t test, t= 0.805 was *p*= .440 did not reach the level of significance in which *p*-value=.05. This indicated that the difference between the subjects performance in both groups was not significance. Which meant that the participants from both groups started from the same baseline.

Argumentative essay pretest scores.

Tables 8 and 9 bellow denoted that the participants received a score according to their writing quality besides an additional score to evaluate their CT use in writing. This latter was a must that the study dictated in order to evaluate their writing development throughout the experiment.

Control group.

Table 8

Control Group Scores of Argumentative Essay Pretest and CT in Writing

Control Group Participants'	Argumentative Essay Score/50	CT In Writing Score/24
1	25.25	10
2	15.25	9
3	13.75	6
4	26.25	13
5	15	7
6	11.25	8

Table 8 demonstrated the argumentative essay test scores' distribution along with CT evaluation in writing. Participants had a ranging scale of 11-26, the scores were generally weak to good, only two students owned above the average mark. In accordance with that, their CT scores were approximately at the same level of their writing, i.e. students with weak argumentative essay scores owned weak CT scores.

Experimental group.

Table 9

Experimental Group Scores of Argumentative Essay Pretest and CT Grading in Writing

Experimental Group Participants	Argumentative essay Score/50	CT in Writing Score/24
1	11.5	6
2	40	12
3	20	9

Table 9

Continued

4	23.75	10
5	17.5	8
6	11.25	9

By the same token of the previous table, Table 9 demonstrated the experimental group participants' scores in the argumentative essay test in parallel with an evaluation of their CT in writing. Even though they had a ranging scale of 11-40, their scores were weak. One student managed to own an excellent score in writing besides an average CT score, two students received acceptable scores, and all of the rest were weak scores. Accordingly, their low CT scores were weakened their written piece. For more illustration, Figure 6 bellow, demonstrated the differences in the participants mean scores of their CT in writing.

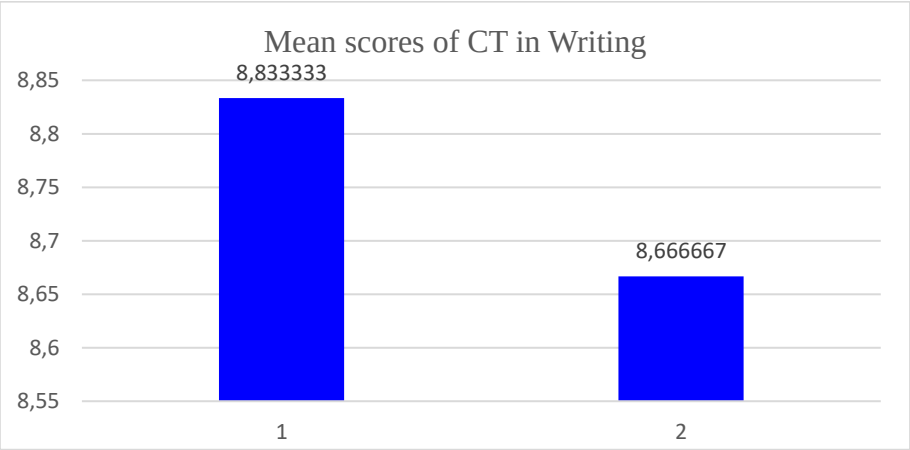

Figure 6. The Pretest Mean scores of participant's CT in writing

As illustrated in the bar chart in Figure 6 above, and by giving consideration to participants scores which were generally weak. We noticed that there was a slight difference in their mean scores. Control group mean score was labeled 1, and Experimental Group mean score labeled 2. Despite the fact that the control group mean (mean= 8.83) was more that of the experimental (mean=8.66), but both groups had weak CT use in their argumentative essay.

Inter-groups analysis for the argumentative essay pretest. Regardless the CT scores in writing, the researchers analyzed only the argumentative essay scores. This was due to the fact that CT in writing scores indicated how much did the participants implement CT in writing.

Table 10

T test Results of The Argumentative Essay Pretest

Group	Mean	SD	SE	t	df	P	Mean Difference	SD Difference	95% CI for Mean Difference	
Control	17.792	6.333	2.586	-0.582	10	.582	-2.875	5.056	Lower	Upper
Experimental	20.667	10.644	4.345						-14.141	8.391

Note. The negative t value indicated the results of means subtraction, the control mean was less of the experimental, M1 < M2.

Table 10 revealed the statistics of the argumentative essay test of the participants in both groups, it demonstrated that experimental group mean (M=20.667, SD=10.544) was bigger that of the control group (M=17.792, SD=6.333). In order to figure out whether this difference is significant or not, the t test revealed a t value, t= -0.582, with a *p* value of *p*= .582. Therefore, the difference of the inter-groups' pretest mean scores were not statistically significant. The results of Tables 7 and 10 provided sufficient data that helped us to proclaim that the participants started from the same point.

Posttest Results

The posttest aimed to measure its results in comparison to those of the pretest, to estimate the effect that the treatment had on the experimental group.

WGCTA-FS posttest scores.

Control group.

Table 11

Control Group Participants' Sub-scores and Overall Scores of CT Posttest

Participants N	Inference/6	Recognizing Assumption /6	Deduction/6	Interpretation /6	Evaluation of Arguments/6	Final Score/30
1	4	2	4	4	0	14
2	2	2	4	2	4	14
3	2	4	4	0	6	16
4	2	2	4	2	4	14
5	2	2	4	2	2	12
6	2	4	2	2	2	12

Table 11 above showed detailed data of the control group CT posttest scores. Participants had a ranging sub-scale of 0-6 and a ranging overall scale of 12-16. The table demonstrated a difference in the students' scores compared with theirs' in the pretest. One student (16.6%) received 16 as the highest owned score, Three (50%) received 14 and other two students (33.3%) owned 12 as the lowest score.

Experimental group.

Table 12

Experimental Group Sub-Scores and Overall Scores of CT Posttest

Participants N	Inference/6	Recognizing Assumption /6	Deduction/6	Interpretation /6	Evaluation of Arguments/6	Final Score/30
1	6	6	4	6	6	28

Table 12

Continued

2	6	6	6	6	6	30
3	4	2	6	6	4	22
4	0	4	4	2	6	16
5	6	2	0	2	0	10
6	2	6	4	6	4	22

Table 12 reported the experimental group detailed scores of the CT posttest after the treatment. Participants had a ranging sub-score of 0-6 and an overall ranging score of 10-30. Unlike the pretest, two student managed to obtain excellent scores of 30 and 28, three other students received acceptable mark, but one student received below the average score.

Inter-groups analysis for CT posttest. After the treatment took place, and to statistically reveal statistical differences, a two tailed t test was administered and reported in Table 13 bellow.

Table 13

T test Results of The CT Posttest

Group	Mean	SD	SE	t	df	P	Mean Difference	SD Difference	95% CI for Mean Difference		Glass' Δ
Control	13.667	1.506	0.615	-2.472	10	.033	-7.667	3.102	Lower	Upper	-1.029
Experimental	21.333	7.448	3.040						-14.578	-0.755	

Note. A negative Glass Delta results indicated that M1 < M2, it can be interpreted as positive results.

The results in Table 15 suggests that control group mean score and SD (M=13.667, SD= A.506) were less that of the experimental group (M=21.333, SD= 7.448). With the objective of appropriately comparing participants' means and determine whether this difference was statistically significant or not, the researchers ran an independent sample t test. As demonstrated in the table above, the *p*-value for the t test, t= -2.472, *p*= .033 didn't exceed the level of significance (*p*= .05), meaning that the difference was statistically significant. As a result, we measured the size effect of this difference through Glass Delta, d=1.029 which was an indicator of a large effect.

Argumentative essay posttest scores.

Control group.

Table 14

Control Group Argumentative Essay Posttest and CT Grading in Writing

Control Group Participants	Argumentative Essay Score/50	CT in Writing Score/24
1	25.75	8
2	27.25	6
3	33.25	10
4	33.25	10
5	11.75	9
6	21.25	7

Table 14 reported that four students had a ranging scale of 11-27, four students received good and acceptable scores, and other two received below the average scores. However, their CT use scores was generally weak. Unlike their performance in the pretest, none of the students received above the average score.

Experimental group.

Table 15

Experimental Group Scores of Argumentative Essay Posttest and CT Grading in Writing

Control Group Participants	Argumentative Essay Score/50	CT in Writing Score/24
1	31,25	19
2	45	17
3	45	22
4	40,25	23
5	42,5	22
6	37,25	23

According to the results presented in Table 15, students' scores were good to excellent. All the participants' scores were above the average. Similarly, their CT scores were generally different and developed from those in the pretest. All of the students managed to receive above the average scores.

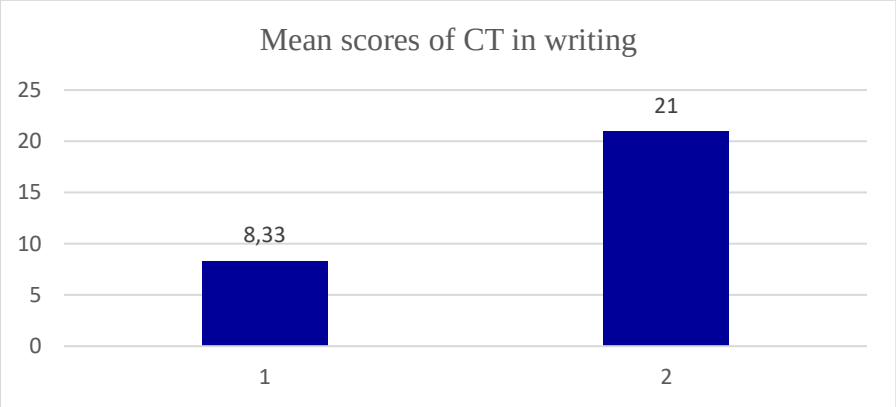

Figure 7. The Pretest Mean scores of participant's CT in writing

The bar chart in Figure 7 demonstrated the mean scores of participants' CT use in writing in the posttest. The Control group (labeled 1) scored a mean of mean=8.33, whereas the

experimental group (labeled 2) scored higher score of mean=21. The difference between the mean scores was clearly noticeable in Figure 7.

Inter-groups analysis for the Argumentative essay posttest.

Table 16

T test Results of The Argumentative Essay Posttest

Group	Mean	SD	SE	t	df	P	Mean Difference	SD Difference	95% CI for Mean Difference		Glass' Δ
Control	25.417	8.128	3.318	-3.735	10	.004	-14.792	3.960	Lower	Upper	2.794
Experimental	40.208	5.295	2.162						-23.616	-5.968	

The results of the t test in Table 16 above revealed that the two groups had different mean scores. Control group mean and standard deviation (M=25.417, SD= 8.128) were less than of the experimental group (M=40.208, SD=5.295), m1<m2. To figure out whether this difference is statistically significant or no, the *p*-value of the t test was less than 0.05 *p*=.004, which made the inter-groups posttest results statistically significant. Consequently we inferred with the alternative hypothesis that suggested for unequal means and rejected the null hypothesis. Because the t test revealed that the difference was statistically significant, we measured the effect size of the intervention, Glass Delta identified an effect size of d= 2. 794 as a large effect.

Intra groups analysis. By examining the results of both groups in the Pretest and the Posttest, we identified a difference within groups' performance. For this reason, the researchers run another t test to determine if there was a significant difference within groups' scores. In

essence, the researchers sought to demonstrate the significant effect and change the treatment had on the experimental group and how much did it affect them.

Table 17

Control Group Pretest-Posttest Scores Analysis

Control Group	Mean	SD	SE	t	df	P
CT Pretest	16.333	1.506	0.615	3.068	10	.994
CT Posttest	13.667	1.506	0.615			
Argumentative Essay Pretest	17.792	6.333	2.586	-1.813	10	.100
Argumentative Essay Posttest	25.417	8.128	3.318			

Table 17 above introduced a within-group analysis for the control group means and SD in the pretest and posttest. Starting with the CT pretest and posttest, an independent sample t test compared the participants' performance and resulted that there were no significant difference in the scores of CT pretest (M1= 16.333, SD= 1.506) and the posttest (M1=13.667, SD= 1.506) conditions t=3.068, *p*=.994. In line with this, the argumentative essay t test revealed pretest scores of (Mean1= 17.792, SD=6.333) compared to the posttest scores (Mean=25.417, SD=8.128) besides t value t=-1.813, *p*=.100. The *p*-value was an evidence for the insignificant difference. Table 18 bellow demonstrated the results of the experimental group.

Table 18

Experimental Group Pretest-Posttest Scores Analysis

Experimental Group	Mean	SD	SE	T	df	P	Glass' Δ
CT Pretest	14.667	4.844	1.978	-1.838	10	.048	-0.895
CT Posttest	21.333	7.448	3.040				

Table 18

Continued

Argumentative Essay Pretest	20.667	10.644	4.345	-4.026	10	.001	-3.691
Argumentative Essay Posttest	40.208	5.295	2.162				

The data in Table 18 represented the intra-group analysis for the experimental group. And by comparing it to the data in Table 17 which indicated that the difference was statistically insignificant for the CT (p=.994) and for the argumentative essay test (p=.100). However, Table 18 demonstrated a statistical significant difference within the group performance. This was due to the t test results that revealed t value of t= -1.838, and p value p= .048 in the CT, besides a t value t= -4.026 and p value p= .001 in the Argumentative essay test. Consequently, we rejected the null hypothesis which specified for a statistically equal means in favor of the alternative hypothesis.

After realizing that the SD and mean scores between and within the experimental group in the posttest had a significant difference, we measured the effect size of that difference through Glass Delta. The effect size in the CT was d= 1.061, and argumentative essay (d=2.325) which indicated that the effect was large. Besides that, Figure 8 bellow illustrated students' CT use in their writing in both the pretest and the posttest.

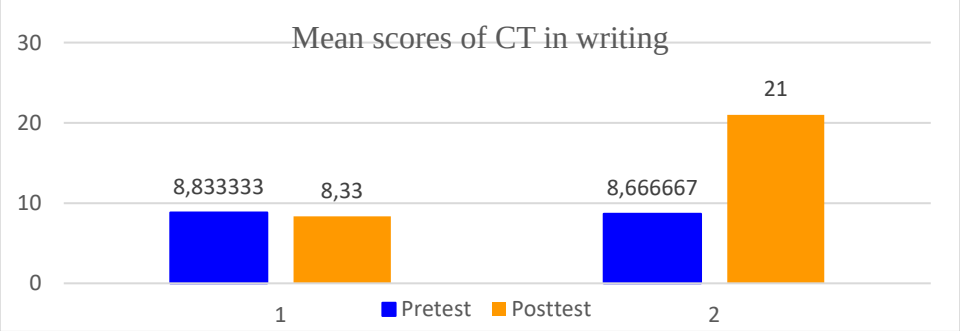

Figure 8. Intra-groups analysis of pretest and posttest's Mean scores of CT in writing

Figure 8 presented the intra-groups analysis of participants' mean scores in both the pretest and the posttest. The control group (labeled 1) means in both the pretest and posttest were at the same level, the pretest mean= 8.83, and posttest mean=8.33 showed slight difference but both performance remained weak. However, the experimental group (labeled 2) demonstrated a difference between their mean scores in the pretest mean= 8.66 and the posttest mean=21. The bar chart demonstrated that there was a change in students' mean scores, participants use of CT improved in the posttest.

This chapter reported the finding of the current study. First it provided detailed data about the subjects' owned scores in both the pretest and posttest. Then, through statistical software SPSS and Excel, the researchers reported statistical comparison between and within-groups in order to test hypotheses and detect significant differences, the chapter also provided the effect size of the significant differences for the validity of the research results. The statistical comparison dealt with both the CT test and the argumentative writing test, alongside bar charts that demonstrated the mean scores of CT use in writing between and within groups in both the pretest and posttest.

Chapter 5

Discussion and Recommendations

As this study aimed to investigate the effect of developing CT on students' argumentative essay writing, this last chapter was devoted to discuss and interpret the findings of the research. It aimed to provide answers for the three research questions and final judgment to the hypotheses. Additionally, the chapter provided important recommendations that addressed future studies and pedagogical considerations for the teachers and the institution.

Discussion of the Findings

The first question of this research investigated the level of CT for 3rd year English students. The researchers measured their CT level through the WGCTA-FS test in the pretest stage. The CT test scores demonstrated that the participants generally had a deficiency in all CT skills. What was found was that the mean score of the control group was higher that of the experimental. However, this different was not statistically significant as the t-test results suggested in Table 7. As a result, the participants from both groups had the same CT level which was generally weak. As it was hypothesized, 3th year English students possess weak to average CT skills. This was due to the fact that students do not exercise any CT skill in the learning process.

In an attempt to answer the second question of the research that suggested to investigate students' use of CT in the argumentative essay writing, the argumentative essay test assessed both students' writing quality and their CT use in writing. Participants' argumentative essay writing scores were generally acceptable yet, some students from both groups scored below the average. The difference between the participants performance was statistically insignificance. Their weak CT level was an indicator for their weak use of CT in writing. The reason that students received such scores was due to their weak CT level. Their writing contained biases, weak arguments without support, weak essay writing development, and even unrelated

arguments to the suggested thesis (see Appendix N and O). As a result the presence of CT was weak in their argumentative essay writing. Figure 6 demonstrated that students' CT use in both groups was at the same level.

According to the findings of the argumentative essay test, we approved the second hypothesis which suggested for weak CT skills use in 3rd year English students' argumentative essay writing.

In line with this finding, a study was conducted at the same university, Chadli Bendjedid. Algeria, was conducted with the aim to track EFL students' abilities and teachers' integration of CT in writing. Its finding revealed that students' CT skills in writing were inferior (Ati and Ati, 2018).

After the intervention, we analyzed its effect on developing CT skills besides the effect of the developed CT skills on students' argumentative essay writing. First, The WGCTA-FS scores that was exhibited in Table 11 and 12 presented significant difference between the groups. Experimental groups' participants had better scores that the control group whose scores showed no statistical significant improvement. The intra-groups analysis demonstrated the change within groups' performance in the pretest and the posttest. Staring with the experimental group, their CT test scores were generally improved after the treatment, they showed development in all the CT skills, participants owned better scores, and received higher mean score than of the pretest. This difference was statistically significance. However, the data in the results chapter revealed that control group participants' received lower scores than in the pretest, yet this difference was statistically insignificant.

Regarding the argumentative essay test, participants in the control group received better scores than they did in pretest. This finding could be explained by the probability of their familiarity with topic, good writing structure and vocabulary. In spite of that, their writing reflected weak CT, students committed a lot of logical fallacies in their writing and their weak

augments were evidence of their weak reasoning abilities (see Appendix P). This indicated that there was no change in their CT use in writing which remained at the same level (see Figure 8). The difference in their performance in pretest and the posttest was not statistically significant. The reason why the control group did not improve any CT skill was due to the fact that they did not receive any intervention. Being critical thinker is not instinct i.e., the human brain is not genetically hard-wired to think critically unless taught (Gelder, 2005, p. 42). This explained that the control group students did not improve any CT skill because they were not exposed to any treatment. This pattern of results was consistent with previous literature as Dong & Yue (2015), Qian (2015) and Golpour (2014), who investigated the relationship between CT and the argumentative writing and revealed that students with weak CT skills can only produce weak writing.

On the other hand, the experimental group received better marks than they did in the pretest. Their writing reflected higher level of CT (see Figure 8). Participants' writing included strong arguments, no language manipulations, good inferring skills, good acknowledging of the opposite position (see Appendix Q). As a result their writing quality was improved. Unlike the control group, having great amount of knowledge concerning a certain matter is not an indicator for CT skills Perksin (1985).

The results of the posttest provided answer for the third question. According the data in the results chapter, the treatment had a statistical significant effect on developing participants' CT skills. As a result, it had a large effect of improving students' argumentative essay writing. This allowed to approve the related hypothesis which claimed that developing CT skills contribute in improving students' argumentative essay writing.

This pattern of results was consistent with a study that was conducted to examine the effect of CT based activities on first year literary stream secondary school pupils' argumentative writing quality. The results showed that unlike the control group, experimental group students

who received CT based activities showed improvements in their argumentative essay writing. Which means that CT activities significantly affected students' argumentative paragraph writing (Keraghel and Bourakba, 2017). Furthermore, Pie et al (2017) carried out a study that dealt with CT and argumentative writing: inspection the association among EFL learners in China. The study findings suggested that undergraduate English students do not have good CT skills, which resulted in poor argumentative writing. Taken together, our results strongly highlighted that developing CT skills plays a fundamental role in effecting and improving argumentative essay writing.

Limitations of the Study

Although the present study's results clearly supported the hypotheses rose by the researchers, it was appropriate to recognize some limitations. These were related to the setting, subject and instruments. This was due to the fact that this study is a single strategy among variety that could be successfully employed.

First, due to the life-threatening occurrences of the Covid-19, it put us under a long term quarantine which made it difficult to have access to the same sample size the study opted for. This challenge generated using a virtual platform as an alternative which resulted in subjects' inadequacy. Despite the fact that the Zoom platform that the researchers opted for offered great opportunity to carry out the experiment in a classroom like atmosphere. Although, boosting the participants' will to work was challenging.

Second, because the quarantine lasted for a long period of time, participants were not fully devoted nor motivated to work. This factor limited the time that was dedicated in the treatment stage. One session, every day, for seven days were not fully sufficient. This was because the intervention could involve some other activities alas, this was not possible. Additionally, this also led to some modification in the CT test. We wanted to guarantee that

all the questions in the test are answered, so we decided to minimize the number of questions within every skill in order to avoid papers exclusion. In addition to this, the researchers measured students' CT level based on WGCTA-FS, it focused on five skills that are linked to writing. However, if choosing different testing formats, students' CT level might yield different results.

Lastly, this study opted to operate an interview to EFL teachers in order to accumulate their perceptions about CT in students' argumentative writing however, it was impossible to obtain. Despite these limitations, this study enhanced our understanding of the relationship between developing CT skills and its effect on the argumentative essay writing. With the expectancy that the current research stimulate further investigation of this important area.

Recommendations and Implications

Despite these limitations and based on the results of this study, it suggested important theoretical and practical implications for future researchers to take into consideration. Taking into account that more researches are needed with regard to developing students' CT skills and improving their writing.

For future researches. It would be useful and more accurate to extend the finding of this research by focusing on assessing and developing one CT skill. This offers the opportunity to easily track its improvement and make judgement. The CT skill should be directly linked to writing, specifically argumentative writing. There are various CT skills that can be adopted such as evaluating arguments, inference, and deduction…etc. This strategy provides better evaluating for students' writing, researchers can evaluate only students' use of that specific skill in writing instead of assessing the whole written piece, which could be irrelevant regarding to the study's purpose. Moreover, dealing with only one or two skills as maximum is a manageable and more specific task that provides direct results.

For better results, we suggested that the intervention span should last longer and include various activities besides the CT activities. Writing activities can be also implemented due the strong relationship these two variable have. As asserted by Moon (2008, p, 151) challenging writing activities can develop CT and CT activities develop writing skills. Within the same context, she suggested some activities for improving both the CT and writing for students. The following activities can be adopted by either teachers or researchers.

Evaluating CT in a presented essay. Moon (2008, p, 153) believed that students' should not only produce written work that reflects their CT, but also they are required to evaluate CT in other works to gain profound understanding. In such activities students were given already written essays, these included different levels of CT. Students were required to evaluate the CT in the essay, then they compared and discussed the criteria on which they did the scoring. The different level of CT in the essays help them to learn from the good ones and to recognize problems and potential biases in the poor ones.

Writing inferences. To develop students' inference skill and improve their writing at the same time, this practice requires the students to evaluate a given evidences and then summarize them into one logical and related conclusion. This kind of activity is flexible to deal with different CT skills, it offers better understating to the CT skills in writing.

Scaffolding. When introducing students' to understand and develop new concepts, scaffolding was regarded as an important element in the developing process. Kauchak and Eggen (1998, p, 313) argued that when training the students to develop higher thinking order, supplying the students with the right amount of scaffolding is beneficial. Because it aimed at gradually boosting the students to be independent in the learning process.

Group work activities. By dividing the group into manageable small teams, and through careful and strategic planning, researchers direct challenging tasks for students to solve difficulties through social interaction. Kauchak & Eggen Argued that this kind of cooperative

learning stimulate CT and provide deeper understanding for the students (1998, p.250). Though this method, the researcher can guarantee development and understanding to the whole experimental group.

For Teachers. Teachers at Chadli Bendjedid University need to contribute in boosting higher order thinking within students. Language learning should not be separated from CT. it is not a natural skill but rather a set of complex skills that requires a long time to be acquired. This makes designing a lesson plan that addresses CT not an easy task to maintain. Many teaching approaches are offered to teachers to design and redesign lessons in order to involve and develop CT within students, because it is not only necessary for them as students and for their academic achievement, but also for them as individual citizens of the 21st century.

The general approach. As explained by Ennis (1989) and Lai (2011), the General approach calls for teaching CT independently as a specific subject. It was named general because CT is was taught generally without referring to specific content. It can be taught through informal logic, in which students are introduced to CT via abstract variable (e.g., If A, then B. A is true, therefore B). In addition to that, Dumitru (2013) added that through this approach, CT can be illustrated by real world situations for students to transit its use beyond the educational setting. This approach can be founded in college programs usually labeled as "critical thinking" or "informal logic".

The infusion approach. As its name suggests, this approach calls for teaching CT explicitly besides a subject, it encourage students to think critically within every subject they are studying and gain deep understanding. Glaser (1884), Resnick (1987) and Swartz (1987) claimed that each subject has a peculiar logic that requires CT.

The immersion approach. McPeck (1981), one of the proponents of this third approach which implicitly train students' thinking within the regular subject. In other words, this approach calls for treating the content or the subject matter as a stimulus to generate students'

CT, it aims to challenge their intellectual abilities. However, Ennis (1989) argued that unlike the infusion approach, CT is an independent thinking system that and cannot be transferred.

The mixed approach. This approach is a combination of all the previous stated ones either implicitly or explicitly. The instructions consist of two parts, one part is devoted to CT and the other part is concerned with the content loaded with CT. The interventions through different approaches proved to be more effective in developing students' critical thinking than non-interventions (Tiruneh et al., 2014; Abrami et al., 2008).

For the institution. We suggested from the administration of Chadli Bendjedid University to devote or organize special authorities that work on evaluating the gathered data of experimental studies. This guarantee objectivity and provide experts' evaluation rather than students' evaluation.

Conclusions

The current study investigated the effect of developing CT skills on 3rd year English students' argumentative essay writing. On the basis of the APA 6th edition, the study was composed of five major chapters. It was designed to answer the previously mentioned questions. For this reason, we developed a pretest posttest design in which two groups were tested, trained i.e., the experimental group, then both of them were tested again. Finally the data were compared and the answers were provided.

The results of the study revealed that the students in the experimental group who were exposed to the treatment achieved better results in the CT test and the argumentative essay test than of the control group. Furthermore, the intra-groups analysis proved that the experimental group benefited from the treatment. The t test validated that the differences between and within the groups were statistically significant and not a mere chance finding. Via the Glass Delta we measured the magnitude of that difference to figure out the effect of the intervention, the calculations revealed a large effect. To conclude, the present study contributed a growing body

of evidence that resulted in proving that developing CT skills affected and improved 3rd year English students' argumentative essay writing.

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Appendices

Appendix A

The WGCTA-FS Pretest

Inference: indicating the inferences with which is true, probably true, false and probably false

-Statement Studies have shown that people who live in England are more likely to own their own homes than people living in Scotland, although there is little difference in the rate of home ownership amongst people who have the same level of educational achievement. The average level of educational achievement is significantly higher in England than Scotland.

Inference 1 People with high educational achievements are in a better position to buy their own homes than people with low educational achievements (…….)

Inference 2 There is a lower rate of home ownership in Scotland among people with relatively high educational achievements than among people in England with much lower educational achievements. (…….)

Inference 3 People with higher levels of educational achievement are more likely to own their own homes, since they earn more money than those with lower educational achievement levels. (…….)

Recognizing the Assumption: identify whether the assumption has been made while answering yes or no

-Statement we need to save money so we'd better take a holiday in the UK.

Assumption 1 Holidays in the UK are cheaper than holidays elsewhere. (…….)

Assumption 2 Transport costs make international holidays more expensive than those in the UK (…….)

Assumption 3 It is possible to take a holiday within the UK. (…….)

Deduction: identify whether the conclusion logically derives from the statement answering yes or no

-Statement it sometimes snows in January. Schools are always closed when it snows. Therefore:

Deduction 1 Schools are never closed on days when it is not snowing. (…….)

Deduction 2 Schools are sometimes closed in January. (…….)

Deduction 3 Sometimes schools are open in January (…….)

Interpretation: identify whether the conclusion logically derives from the evidence provided answering yes or no

-Statement A study of carbon dioxide (CO2) emissions within the EU from 1990 to 2010 shows that the volume of CO2 emissions fell consistently, from 24bn tons per year in 1990 to 16bn tons per year in 2010.

Interpretation 1 The reductions in CO2 emissions demonstrate that energy efficiency initiatives have been successful (…….)

Interpretation 2 The amount of CO2 emitted within the EU in 1992 was less that 24bn tons. (…….)

Interpretation 3 CO2 emissions in 2011 were lower than in 1990. (…….)

Evaluation of Arguments: identify the strength of the given arguments answering with strong or weak argument

-Statement should the voting age in the UK be lowered to 16?

Argument 1 Yes; voting provides an opportunity for young people to feel like adults. (…….)

Argument 2 Yes; young people will be affected in the future by decisions made today. (…….)

Argument 3 No; 16-year-olds are unduly influenced by celebrities. (…….)

Appendix B

The Argumentative Essay Pretest

"4.5 billion years ago, the Universe witnessed the creation of planet Earth; the home of homosapiens and millions of other creatures which differ from us in both form and shape. Human beings today are spending enormous amount of money to save life from any possible danger due to the high predictions which indicate that in the near future, our Earth won't be able to sustain life as we know it today. SpaceX for instance, works on a project to terraform Mars as our new home and make turning humans into a multi-planetary species. Despite that, many scientists claim that there would be no second home for humans as this pale blue dot. Neil Tyson argue that if humanity can turn other planet into something like Earth then humanity definitely has the power to turn Earth back into Earth."

write a short argumentative essay in which you support the idea of prioritizing protecting any saving Earth from any sort of threat over terraforming Mars.

Make sure to:

- State the opposite position to support your claim.
- Do no copy/ paste from the internet, make sure it is your work otherwise it will be excluded.

Appendix C

The Treatment

Arguments' Structure Activities

A fact generally refers to something that is true, a fact is something that can be proven as true.

An opinion refers to personal belief, it relates to how someone feels about something. Others may agree or disagree with an opinion but they cannot prove or disprove it.

Recognizing facts and opinion:

Example:

Fact: The Hiragana is one of the types of the Japanese language.

Opinion: The Japanese language is very easy to learn.

From these statements, which one is a fact and which one is an opinion.

Driving at high speed is dangerous in public roads.....

English is better than any other languages.....

Dogs have fur.....

Dogs' fur is beautiful.....

Napoleon Bonaparte won many battles.....

Napoleon Bonaparte was a greedy man.....

Identify the sentence that states the opinion and the fact from this passage.

Abraham Lincoln was the 16th president of the United States of America. He was responsible for the emancipation proclamation which is a document that abolished slavery, American considered him a kind presidents. He used to give very good speeches, he was an eloquent president. Abraham Lincoln was assassinated in 1865.

Argument Structure Activities

The argument is divided into two parts:

The evidence that support the conclusion and the conclusion that can be implicitly stated but understood by the reader.

Recognize the evidence and the conclusion:

Example: premises, conclusion

Identical twins often have different IQ test scores. Yet such twins inherit the same genes. So environment must play some part in determining IQ.

The poles ice is melting, global warming is happening.

The corona virus is effecting the whole world, many countries' economy is going down.

That person consumes a lot of sweet, he got diabetes.

The students' candidate who best reflect s mainstream opinion is very likely to win the next student election. The policies put forward by Sarah Rollings most closely match popular opinion.

A lot of vegan protein based food contains nuts. Harry should avoid these sort of food because of his allergy.

The ban on drinking in public places will hit profits in clubs and bars. Jack has a whole chain of bars around the country.

Appendix D

Critical Thinking Based Activities

Inference treatment

An inference is a conclusion achieved on the basis of evidence or from observed or supposed facts. However inferences may or may not be correct answers.

By the end of this treatment you will be able to:

1 Differentiate between the possible inferences of a given statement.

2 choose the logical and correct inference.

Each statement will be provided with 5 inferences from which you will choose:

True: if you think that the inference is definitely true.

Probably true: when the inference is more likely to be true than false.

More information required: if you believe that there is no enough data for you to decide.

False: if you believe that the inference is definitely false.

Probably false: when the inference is more likely to be false than true**.**

False: if you think the inference is definitely false**.**

Statement1: Although it is agreed that China is rapidly modernizing its army, there is some doubt surrounding the exact amount it is spending. The research institute 'PIPPI', submits that the annual Chinese defense spending has risen from almost $31 billion in 2000 to over $120 billion in 2010. This figure is almost double the official figure published by the Chinese

government, who fail to include other areas such as research and development in the official figure each year. In 2010, the United States government spent around $400 billion on military defense. Based on the current level of military growth, statistics suggest that China's defense spending could overtake America's by 2030. In addition to military spending, China's army continues to enjoy the largest number of people within the ranks of its army than any other country.

Inference1: The official figures published by the Chinese government in relation to their military spending are thought to be misleading.

(True, probably true, false, probably false, more information required)

Inference2: It is known that the Chinese government leave areas such as 'research' and 'development' from their official figures, however, this would also suggest that other areas of spending are also omitted from the official figure.

(True, probably true, false, probably false, more information required)

Inference3: The Chinese government omits several key areas from its official spending figures, in areas such as military spending, agriculture, human rights and law.

(True, probably true, false, probably false, more information required)

Inference4: If there are any anomalies between the published figures on military spending and the actual figure spent, this is merely a clerical error.

(True, probably true, false, probably false, more information required)

Inference5: In 2010 the United States of America spent less on its military defenses than the Chinese government.

(True, probably true, false, probably false, more information required)

Statement2: Turkey is a surprising addition to the list of rapidly developing economies; with a GDP increase of 8.5% in the year 2011 alone. However, such rapid growth leaves worries regarding possible side-effects. For instance, in 2011 Turkey's rate of inflation was well above that of its peers. Secondly, there is increasing concern regarding Turkey's growing dependency on foreign capital. A large portion of the Turkish banking system is part-owned by banks within the Eurozone. As the single currency falters, such a dependency raises questions about the stability of Turkish growth.

Inference1: There are concerns that Turkey's development is at risk of faltering in the years after 2011.

(True, probably true, false, probably false, more information required)

Inference 2: As Turkish banks are part-owned by those in the Eurozone, they may suffer if the European banks face financial difficulty.

(True, probably true, false, probably false, more information required)

Inference 3: The Turkish banks are part-owned by European banks as this provides greater variation to the market and extra finance to the economy

(True, probably true, false, probably false, more information required)

Inference 4: Turkish banks are part owned by European banks as this provides greater economic links with the Eurozone, helping their ascension into the European Union.

(True, probably true, false, probably false, more information required)

Inference 5: The Turkish economy was surprisingly stagnant in 2011.

(True, probably true, false, probably false, more information required)

Statement3: Some people think that prospective employees should include a photograph with

their application form. Such practice has traditionally been criticized for allowing more attractive individuals to get ahead in their career over 'plain' colleagues. However, one study demonstrates that this is, in fact, untrue. Ruffle, the creator of this study, attributes his findings to the 'dumb-blonde hypothesis'- that beautiful women are thought to be unintelligent. Ruffle submits that companies would be better advised adopting the selection model employed by the Belgian public sector, where CVs are anonymous and candidate names, gender and photographs are not allowed to be included on CVs. Such a model allows the candidate to be selected on factors relevant to the role applied for.

Inference1: The 'dumb-blonde hypothesis' says that more attractive women are less capable of being intelligent.

(True, probably true, false, probably false, more information required)

Inference2: The model of selecting future employees adopted by the Belgian public sector aims to reduce discrimination based on appearance and gender.

(True, probably true, false, probably false, more information required)

Inference3: The method of selecting future employees adopted by the Belgian public sector has helped to eliminate discrimination in the Belgian public sector.

(True, probably true, false, probably false, more information required)

Inference 4: The method of selecting future employees adopted by the Belgian public sector has had the effect of increasing discrimination based on appearance within the Belgian public sector.

(True, probably true, false, probably false, more information required)

Appendix E

Recognizing assumptions treatment

An assumption is a statement that is accepted as true or certain.

By the end of this course you will be able to:

Decide which assumption is logically justified based on the evidence in the statement.

Choose "Assumption made" if you that the assumption is logically justified, choose "Assumption not made" if it is not.

Statement: Charities don't have to charge VAT to customers, which means charity bookshops can charge lower prices than those charged by second-hand bookshops which are not registered as a charity.

Assumption 1: Customers prefer to pay lower prices. . **(Assumption made/Assumption not made).**

Assumption 2: VAT increases the price customers pay for things. . **(Assumption made/Assumption not made).**

Statement1: Monarchic nations, i.e. those with royal families, differ from republican nations in several ways. An example of this difference is that citizens of monarchic nations pay more tax than citizens of republican nations.

Assumption1: The governments of monarchic nations are responsible for setting tax rates on their citizens. **(Assumption made/Assumption not made)**

Assumption2: Republican nations do not have a royal family. **(Assumption made/Assumption not made)**

Assumption3: The only types of nation are monarchic and republican. **(Assumption made/Assumption not made)**

Assumption4: A monarchic nation cannot be a republican nation. **(Assumption made/Assumption not made)**

Statement2: In 2008, the President of the USA promised to prevent the country entering economic depression, but he failed because at the beginning of 2012, over 12 million USA citizens were unemployed.

Assumption1: Unemployment is an indicator of economic depression. **(Assumption made/Assumption not made)**

Assumption2: The number of USA citizens out of work ought to be less than 12 million. **(Assumption made/Assumption not made).**

Assumption3: Presidents should stick to their promises. **(Assumption made/Assumption not made).**

Statement3: Chilean students were right in 2012 to stage protests demanding that university education in Chile should be made free.

Assumption1: Some Universities outside of Chile are free. **(Assumption made/Assumption not made).**

Assumption2: Staging protests will influence the costs of Chilean university education.

(Assumption made/Assumption not made).

Assumption3: Chilean students cannot afford to pay fees for university education. **(Assumption made/Assumption not made).**

Assumption4: Chilean students want to attend university. **(Assumption made/Assumption not made).**

Appendix F

Deduction treatment

By the end of this course you will be able to:

1 Decide which conclusion follows the statement.

2 Select the conclusion based only on the information presented.

Beneath each statement select if the "conclusion follows" the statement or "conclusion doesn't follow ".

Statement 1: Facebook was launched on the American stock market in May 2012. However, statistics suggest that several previously high-performing companies, such as Pandora, Groupon and LinkedIn fell in value after they were launched on the American stock market. Therefore:

Conclusion1: It is possible that Facebook will also drop in value after May 2012. **(Conclusion follows/ conclusion doesn't follow)**

Conclusion2: Social networking sites perform badly once they become publicly listed on the stock market. **(Conclusion follows/ conclusion doesn't follow)**

Conclusion3: All companies decrease in value when first launched on the American stock market. **(Conclusion follow/ conclusion doesn't follows)**

Statement2: Sarah owns a new company. New companies are more likely to fail than well-established companies. Therefore:

Conclusion1: Sarah's company will fail. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion2: Sarah's company is more likely to fail than a well-established company. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion3: Well-established companies are more likely to succeed than new companies. **(Conclusion follows/ conclusion doesn't follow).**

Statement3: Statistics have shown that companies selling baked goods, such as cakes and pastries, are more likely to be successful if they are advertised as French or Belgian. Therefore:

Conclusion1: French and Belgian products are more expensive. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion2: French and Belgian baked goods must taste better. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion3: It is a sound business model to advertise baked goods as "French" or "Belgian" as this is more likely to result in successful sales. **(Conclusion follows/ conclusion doesn't follow).**

Statement4: May 2012 had the highest level of rainfall on record for the preceding fifty years. Predictions of rainfall are rarely accurate. Therefore:

Conclusion1: It rained more than expected in May 2012. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion2: The rainfall in May 2012 was greater than in May 2011. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion3: May is usually dry. **(Conclusion follows/ conclusion doesn't follow).**

Statement 5: Coley is a company that produces scented candles, using only natural products. Coley is against testing on animals and does not use pesticides in any of its products. Therefore:

Conclusion1: The scent from Coley's candles is made from fruits and berries. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion2: Coley's products are unlikely to contain man-made setting agents. **(Conclusion follows/ conclusion doesn't follow).**

Conclusion3: Coley's products are likely to be more expensive. **(Conclusion follows/ conclusion doesn't follow).**

Appendix G

Interpreting information treatment

The following questions will consist of a passage of information, followed by a series of conclusions. You are instructed to assume all information in the passage is true. The task is to judge whether or not each of the proposed conclusions logically flows beyond a reasonable doubt from the information given in the paragraph.

If you think that a conclusion follows beyond a reasonable doubt (but perhaps not absolutely), select "Conclusion Follows". If you think the conclusion does not follow beyond a reasonable doubt based on the facts given, select "Conclusion Does Not Follow". Do not use general knowledge when answering, only use the information provided in the passage. Remember to judge each conclusion individually.

Statement1: The Tapoloa Club is a Hawaiian-themed night club in central London. Its most popular drink is the Volcano, which emits sparks and flames. The Tapoloa Club also offers a range of cocktails in perverse containers such as pineapples and coconuts, such as the 'Coconut Express' and the 'Pineapple Pick-Up' respectively. Therefore:

Conclusion1: The 'Coconut Express' is the second most popular drink sold by the Tapoloa Club. **(Conclusion follow/conclusion doesn't follow)**

Conclusion2: All themed clubs in London sell unusual drinks. **(Conclusion follow/conclusion doesn't follow)**

Conclusion3: The "Coconut Express" is contained in a pineapple, and the "Pineapple Pick-Up" is contained in a coconut. **(Conclusion follow/conclusion doesn't follow)**

Statement2: The British National Library has the largest collection of publicly-owned books in the United Kingdom. Therefore:

Conclusion1: There might be a larger collection of books in the United Kingdom. **(Conclusion follow/conclusion doesn't follow)**

Conclusion2: There might be a larger collection of publicly-owned books in the United Kingdom. **(Conclusion follow/conclusion doesn't follow)**

Conclusion3: The British National Library is in the United Kingdom. **(Conclusion follow/conclusion doesn't follow)**

Statement3: Hannah has been a solicitor for three years. She works for a law firm in central London and has hopes of being promoted. To be promoted in Hannah's firm, employees must have at least four years' experience practicing as a solicitor. Therefore:

Conclusion1: Hannah cannot be promoted because she doesn't have enough experience. **(Conclusion follow/conclusion doesn't follow)**

Conclusion2: We cannot know whether Hannah can be promoted or not. **(Conclusion follow/conclusion doesn't follow)**

Conclusion3: The average income of an MBA graduate from a top business school is over double that of the average income of a person holding only an undergraduate degree. **(Conclusion follow/conclusion doesn't follow)**

Appendix H

Evaluating arguments treatment

A weak argument is an ill formed argument. It has a false premise, if the premise happens to be true, it fails to support the conclusion.

A strong argument is inductive (working from particular to general) that succeeds in providing logical support to its conclusion.

When making important decisions, it is useful to be able to distinguish between a strong argument and a weak argument. A strong argument is both important and directly related to the question. A weak argument is not directly related to the question, or is of minor importance. A weak argument may also be related to a trivial aspect of the question, or confuses correlation with causation (incorrectly assuming that because two things are related, they cause each other to happen).

In this series of questions, each question is followed by a series of arguments. For this section you must regard each argument as true, regardless of whether it is weak or strong.

If you consider an argument to be strong, select "Strong Argument", or if you consider an argument to be weak, select "Weak Argument". Judge each question and argument individually. Try not to take into account individual opinion or general knowledge since each argument is considered to be true

Statement1: Should companies downsize their workforces to decrease expenses and maximize profits?

Argument1: Yes, downsizing will protect the company from bankruptcy in hard economic times.

Argument2: Yes, companies have no obligation to employ more people than it can handle.

Argument3: No, downsizing leads to demoralization of the workforce and causes a drop in employee productivity

Statement2: Should university-level education be free to all students?

Argument1: No. Too much education can lead to over-qualification, and therefore unemployment.

Argument2: Yes, having a highly qualified workforce ensures high levels of employee productivity in organizations.

Argument3: No, research has shown that students that are not required to pay tuition fees; tend to slack off more and learn less during their degree.

Statement3: Should all members of the European Union join the Eurozone and adopt the euro?

Argument1: No, countries may find it difficult to adapt to a new currency.

Argument2: Yes, the function of the European Union is to form a single currency union.

Argument3: Yes, greater economic unity between countries improves foreign relations between those member countries, which in turn make each country stronger.

Argument4: No, instability of one Eurozone country could cause the whole Eurozone to become unstable, disrupting the economies of all countries that use the euro.

Statement4: Should governments be engaging in space exploration research?

Argument1: No, the money spent on these programs could be used to increase funding for education and healthcare, which would lead to increasing the quality of life for a country's people.

Argument2: No, countries have collectively spent trillions of dollars on space exploration research already.

Argument3: Yes, space exploration has led to numerous discoveries and ushered in the space age.

Argument4: Yes, the findings of these space exploration research and development programs have been successfully applied to industry, boosting the economies of the host country.

Appendix I

Logical fallacies treatment

Logical fallacies:

Denying the antecedent fallacy

The bystander effect

The argument from authority/ Appeal to authority

The argument from ignorance

The strawman fallacy

The ad hominem fallacy

The just the world fallacy

The red herring fallacy

Types of fallacies in writing:

Manipulation through language: use vague or undefined words (word ambiguity), use loaded words that convey bias

Example: I think it is ridiculous based on some reason

The sentence contains emotive language which is considered as non-neutral

Manipulation through emotions: seek to persuade by arousing fear, pity, citing fake or inappropriate authority, seek to prejudice others against an idea, and attacks a person's character on matters irrelevant to the issue

Example: supposed English is totally erased from the curriculum, then what is our knowledge for? What do we have to do in the future?

The writer tried to support her argument by using personal reason involving the appeal of fear and pity. It is considered unscientific and biased

Manipulation through distraction: diverts attention to the issues, attack minor points in an arguments, and repeat the same conclusion in different words

Example: it is unfair for the children that they cannot have English in their primary school education. Why English? Why not other subjects?

Red hiring fallacy (the red hiring fish was used to distract dogs in a wolf hunting competition)

He tried to draw the debate away from the original issue by including new topic so the discussion has shifted from (why it is wrong to delete English from the curriculum) into there are any other subjects which deserve to be deleted

Inductive fallacy: draws conclusion from insufficient sampling, use claims that contradict each other, biased questions, present unreasonable and unwarranted claims that one event would lead to chain reaction.

Example: but when young learners study how new language in this case English and their mother language also still under development, it causes young learners to prefer English than their mother language. It also gives impact on the culture preference too. Young learners prefer western culture than their own culture the fallacy presented from a hasted generalization unsupported by adequate data

Identify the fallacy /manipulation in the following statement:

1 How do I know the adult film industry is the third largest industry in the United States? Derek Shlongmiester, the adult film star of over 50 years, said it was. That's how I know.

2 The last three times I have had a cold I took large doses of vitamin C. On each occasion, the cold cleared up within a few days. So vitamin C helped me recover from colds.

3 Mr. Lee's views on Japanese culture are wrong. This is because his parents were killed by the Japanese army during World War II and that made him anti-Japanese all his life.

4 If Catholicism is right, then no women should be allowed to be priests. Catholicism is wrong. Therefore, some women should be allowed to be priests.

5 Prosecuting attorney to the jury: “Does it make sense to release this murderer so that he can just go and commit the same atrocities again?”

6 There’s a lot of talk these days about getting the pesticides out of our fruits and vegetables. But many of these foods are essential to our health. Carrots are an excellent source of vitamin A, broccoli is rich in iron, and oranges and grapefruits have lots of vitamin C.

7 The position open in the accounting department should be given to Frank. He’s got six hungry children to feed and his wife needs an operation to save her eyesight.

8 If you give a man a gun, he may kill someone. If he has no gun, then he will not kill anyone.

9 Scientist: Evolution explains how animals developed, adapted and diversified over millions of years.

10 Opponent: If we evolved from monkeys, why are there still monkeys? And why don't we have three arms? Wouldn't that give me a competitive advantage?

Appendix J

The WGCTA-FS Posttest

Inference: indicating the inferences with which is true, probably true, false and probably false

-Statement Studies have shown that people who live in England are more likely to own their own homes than people living in Scotland, although there is little difference in the rate of home ownership amongst people who have the same level of educational achievement. The average level of educational achievement is significantly higher in England than Scotland.

Inference 1 People with high educational achievements are in a better position to buy their own homes than people with low educational achievements (…….)

Inference 2 There is a lower rate of home ownership in Scotland among people with relatively high educational achievements than among people in England with much lower educational achievements. (…….)

Inference 3 People with higher levels of educational achievement are more likely to own their own homes, since they earn more money than those with lower educational achievement levels. (…….)

Recognizing the Assumption: identify whether the assumption has been made while answering yes or no

-Statement we need to save money so we'd better take a holiday in the UK.

Assumption 1 Holidays in the UK are cheaper than holidays elsewhere. (…….)

Assumption 2 Transport costs make international holidays more expensive than those in the UK (…….)

Assumption 3 It is possible to take a holiday within the UK. (…….)

Deduction: identify whether the conclusion logically derives from the statement answering yes or no

-Statement it sometimes snows in January. Schools are always closed when it snows. Therefore:

Deduction 1 Schools are never closed on days when it is not snowing. (…….)

Deduction 2 Schools are sometimes closed in January. (…….)

Deduction 3 Sometimes schools are open in January (…….)

Interpretation: identify whether the conclusion logically derives from the evidence provided answering yes or no

-Statement A study of carbon dioxide (CO2) emissions within the EU from 1990 to 2010 shows that the volume of CO2 emissions fell consistently, from 24bn tons per year in 1990 to 16bn tons per year in 2010.

Interpretation 1 The reductions in CO2 emissions demonstrate that energy efficiency initiatives have been successful (…….)

Interpretation 2 The amount of CO2 emitted within the EU in 1992 was less that 24bn tons. (…….)

Interpretation 3 CO2 emissions in 2011 were lower than in 1990. (…….)

Evaluation of Arguments: identify the strength of the given arguments answering with strong or weak argument

-Statement should the voting age in the UK be lowered to 16?

Argument 1 Yes; voting provides an opportunity for young people to feel like adults. (…….)

Argument 2 Yes; young people will be affected in the future by decisions made today. (…….)

Argument 3 No; 16-year-olds are unduly influenced by celebrities. (…….)

Appendix K

The Argumentative Essay Posttest

4.5 billion years ago, the Universe witnessed the creation of planet Earth; the home of homosapiens and millions of other creatures which differ from us in both form and shape. Human beings today are spending enormous amount of money to save life from any possible danger due to the high predictions which indicate that in the near future, our Earth won't be able to sustain life as we know it today. SpaceX for instance, works on a project to terraform Mars as our new home and turning humans into a multi-planetary species. Even though many scientists argue that Earth is heading toward a very critical stage that will make our life a living hell; others believe that there would be no a second home like Earth and humanity must save the planet in order to survive.

Make sure to:

- State the opposite position to support your claim.
- Do no copy/ paste from the internet, make sure it is your work otherwise it will be excluded.

Appendix L

Argumentative Essay Grading Rubric

L 1

Argumentative Essay Grading Rubric. Saint Paul College (n.d.)

Argumentative Essay Grading Rubric					Points earned
	Beginning	Developing	Proficiency	Mastery	
Thesis/ Claim 10 points	Reader cannot determine thesis and purpose or thesis has no arguable claim.	Thesis may be obvious or Somewhat vague.	Contains an arguable claim, Thesis is fairly clear.	Contains an arguable claim and challenges the reader's thinking.	
Support/ Reasoning 10 points	Writes egocentric thoughts and beliefs about the topic; neglects the rhetorical elements. Offers undeveloped, or cryptic support for the ideas.	Writer includes 1 rhetorical element in the development of ideas. Offers obvious and broad support Details are inappropriate -y repetitive.	Writer includes 2 rhetorical elements in the development of ideas. Offers solid but less original reasoning, not explicit.	Writer includes all 3 rhetorical elements (logos, pathos, and ethos) in the development of ideas. Assumptions are explicit. Details are relevant and convincingly interpreted.	
Opposing Viewpoints 10 Points	Refutation missing or vague. Obvious lack of sound, logical argument throughout.	Refutation paragraph vague. Examples are not sound, logical argument	Author acknowledges the opposing view, but does not present sound counterpoint.	Author acknowledges the opposing view and argues it logically.	
Structure & Organization	Work lacks structure; lacks a	Body lacks a clear	Body mostly flows from	Body flows from thesis;	

10 points	clear thesis or conclusion, body seems haphazard; transitions are not present.	direction; supporting evidence loosely tied to thesis; conclusion has no sense of closure.	the thesis; transitions are awkward at times; appropriate conclusion.	transitions guide the reader smoothly through the text; conclusion effectively wraps up the essay.	
Sources/ Documentation 10 points	Neglects sources. (Probably uses source material without acknowledgement.)	Uses relevant sources but lacks in variety of sources Quotations and paraphrases may be too long and/or inconsistently referenced.	Uses sources to support, extend, and inform, but not substitute writer's own development of ideas.	Uses sources to support, extend, and inform, but not substitute writer's own development of ideas.	
Grammar/ Mechanics 10 points	Numerous errors distract the reader and skew the writer's meaning	Repeated weaknesses in mechanics and usage. Pattern of flaws. Meaning is still clear.	Occasional minor errors do not distract the reader or Interfere with meaning.	Essentially free from mechanical, grammatical, punctuation, and spelling errors.	
					Total

Appendix M

CT in Writing Grading Rubric

M 1

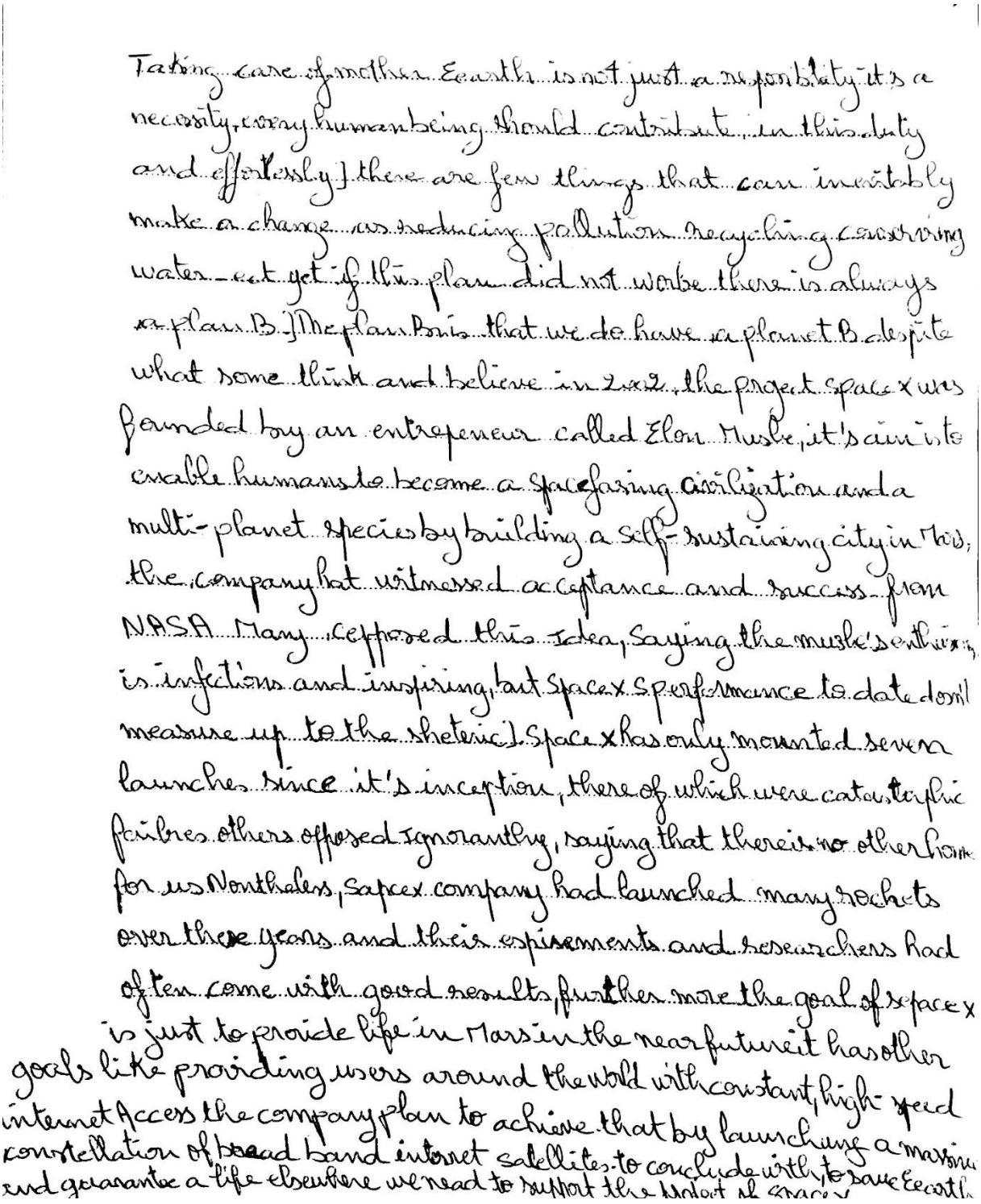
NEIU's Critical Thinking Rubric. Washington State University's Critical Thinking Project (2006)

Quality Criteria	No/Limited Proficiency (1 point)	Some Proficiency (2 points)	Proficiency (3 points)	High Proficiency (4 points)	Rating (1,2, 3,4pts)
1. Identifies & explains issues.	Fails to identify the main issue. Represents it inaccurately or inappropriately.	Identifies main issues but not in a sufficient and clear way.	Identifies the main issues but briefly and does not cover it all.	Clearly identifies and explains main issues in details.	
2. Recognizes stakeholders and CONTEXTS (i.e., cultural/social, educational, technological, political, scientific, economic, ethical, personal experience).	Fails to accurately identify and explain any empirical or theoretical contexts for the issues. (OR) Presents problems as having no connections to other conditions or contexts.	Shows some general understanding of the influences of empirical and theoretical contexts on stakeholders, but does not identify any specific ones.	Correctly identifies the empirical and most theoretical contexts relevant to the main stakeholders.	Correctly identifies the empirical and theoretical contexts relevant to the main stakeholders, and identifies minor stakeholders and contexts showing the tensions or conflicts of interest among them.	
3. Frames personal responses and acknowledges other perspectives.	Fails to formulate a point of view and fails to consider other perspectives.	Formulates a vague personal point of view and/or vague alternative	Formulates a clear point of view, considers other	Formulates a clear personal point of view and addresses relevant	

4. Identifies & evaluates assumptions.	Fails to identify and evaluate any important assumptions.	Identifies important assumptions, but does not evaluate them.	Identifies and evaluates assumptions but briefly.	Identifies and carefully evaluates the important assumptions.
5. Identifies & evaluates evidences.	Fails to correctly identify information and evidence, fails to evaluate its credibility.	Identifies information and evidences but fails to highlight its relative importance and credibility.	Identifies important evidence, highlights its relative importance, and makes an attempt at linking evidence to theoretical concepts.	Identifies and rigorously evaluates important evidence, successfully link it to theoretical concepts, provides alternative information.
6. Identifies & evaluates implications.	Fails to identify implications, conclusions of the issue.	Suggests some implications, of the issue.	Briefly identifies any implications or conclusion of the issue.	Thoroughly evaluates implications, or conclusions of the issue.
		points of view.	perspectives .	perspectives successfully.

Appendix N

Experimental group Student's Argumentative Essay Pretest



Taking care of mother Earth is not just a responsibility it's a necessity, every human being should contribute in this duty and effortlessly. There are few things that can inevitably make a change as reducing pollution recycling conserving water - ect yet if this plan did not work there is always a plan B. The plan B is that we do have a planet B despite what some think and believe in 2002, the project Space X was founded by an entrepeneur called Elon Musk, it's aim is to enable humans to become a spacefaring civilization and a multi-planet species by building a self-sustaining city in Mars, the company hat witnessed acceptance and success from N.A.S.A Many opposed this idea, saying the musk's enthusiasm is infectious and inspiring, but Space X's performance to date don't measure up to the rhetoric. Space X has only mounted seven launches since it's inception, there of which were catastrophic failures others opposed ignorantly, saying that there is no other home for us Nonetheless, Sapcex company had launched many rockets over these years and their espisements and researchers had often come with good results, furthermore the goal of spacex is just to provide life in Mars in the near future it has other goals like providing users around the wold with constant, high-speed internet Access the company plan to achieve that by launching a massive constellation of broad band internet satellites. to conclude with, to save Earth and guarantee a life elsewhere we need to support the project of spacex

Appendix O

Control Group Student's Argumentative Essay Pretest

Our planet earth may face alot of dangers in the futer, in order for humanity to be saved, we should protect earth instead of looking for a new planet to live on.

Personaly, (Im) our planet could be easily be saved if all humans help each other. Humans are mostly the main cause of this. Also, Our planet has alot of resources that humanity could rely on it. terraforming Mars is just almost useless, there is a very low possibility to success so we just have to focus on our planet. living in a new planet is extremly hard and can be impassible for humans as planet Mars is a very rough planet.

At the end, Our planet is very precious and we must know its value and protect it before it is too late.

Appendix P

Control Group Student's Argumentative Essay Posttest

New Home

Earth is the unique planet in the solar system that supports life for all human beings. It has infinite values not only for humanity but also for the atmosphere as a whole. I believe that terraforming Mars is theoretically conceivable with current progress in technology and the perseverance of enough time and resources. Some researchers recently claimed that SpaceX plans to start colonizing Mars in 2022.since we continue to explore a new planet in our solar system and beyond in a matter of habitation or colonization. Mars will be the best option to do so.

Various reasons prove how important is our motherland for us .Scientist should fix problems on Earth instead of thinking to colonise another planet .first The Earth has an atmosphere that is most necessary for the life and Earth's atmosphere has oxygen gas which is one of the basic needs for the living organisms. Additionally it is general fact that water is the basic need of life. It also contains oxygen that is another basic requirement of life besides to that it is needed at every step of life whether it's a human being, an animal or a plant. Moreover the Sun plays a main role to have life on earth. Because is the main source of energy, heat, and light for all the human beings.

Nonetheless, through the use of technologically, terraforming the Red Planet is seen as a future possibility. We have already done too much destruction to our own planet and By studying our solar system and their current natural state, Mars is the best alternative of earth since the days and seasons are comparable to those of Earth, because the rotational period as well as the tilt of the rotational axis relative to the ecliptic plane are similar. In addition to that discovering a new planet would give much more opportunities for people to break their comfront zone .Also dedicating the amount of money to restore earth will be enough

There is no doubt that if we have not figured out how to deal with solving problems on Earth, there is no guarantee that the same fate would not occur to Mars colonists. I assume that if humans will arrive on Mars, they enjoy discovering the new place .also it is easy for the to communicate with earth since the technology level is so high and there is no doubt that the connection with earth will be easy for them Also looking for community that will be able to quit the earth as soo as the project is comlpeted will help the Space exploration companies to use it as motivation to work hard on it assume that there are some people who love to make their life more adventurous by discovering an new place to live in .

looking for a new human colony on distant planets being our salvation after we get done trashing our own planet It has helped us to understand how we got here in the first place and what we must do to survive long-term as a species. Although the colonists will need to decide whether to stay in their new home yet they should put in mind if we could do something does not mean we should.

Appendix Q

Experimental Group Student's Argumentative Essay Posttest

Terraforming Mars is an idea that may be a possibility to save humankind in the future when the Earth is no longer suitable for life. The problem with the idea of terraforming Mars is that Mars is not Earth. Just like Chimpanzees are closely related to humans, they are not Homo sapiens because they are different species. The same concept also applies for Earth and Mars. They both are planets that seem to have some similarities but Mars still differs in small technical matters that are crucial for sustaining life like the Earth does. The atmosphere on Mars is less dense than it is on Earth, which then becomes a problem for protecting the surface of the planet from the toxic forces from the sun and from outer space. The atmosphere of Mars is one reason why terraforming is a very challenging plan.

The other challenge with terraforming Mars into Earth is due to the lack of resources. Humans need at least energy and oxygen for survival. Energy could be found from any substances that are edible for humans. Oxygen is created by the exhale of plant respiration. Since plants are involved in the matter, they also need resources in order to survive. They need at least water and carbon dioxide to survive. Humans need what plants produce and vice versa. There are only a few areas on Mars that would be suitable for plant growth; for example, the soil at the north pole of Mars could be suitable for growing plants, and a water source for humans. but. The lack of resources on Mars is another reason why terraforming the planet is not going to be easy..

A good reason to terraform Mars is that the temperature is quite similar to Earth's temperatures. On average, the temperature on Mars is 80 degrees, which is an average summer temperature on Earth. With a consistent temperature, plant growth formation could be suitable and plausible. The only thing to keep in mind is that the poles on Mars are really

cold. In the winter, the poles on Mars can drop to negative 195 degrees. If humans were to find or create a habitat on Mars that would be suitable for their needs, temperature-wise, the equator of the planet would be most reliable. The temperature on Mars would make it plausible to terraform the planet.

Even terraforming another planet is a challenging task for humanity as I mentioned, yet future conditions on Earth won't be flexible due to the damages and the wiser choice is to terraform the red Planet. Humans life won't be as todays', because of the hostile environment, humans will create an artificial environment to survive plus Mars position from the sun compared to earth is much safer and this process will start a new era for us.