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An Investigation into Promoting Critical Thinking through

Messenger-Assisted Cooperative Projects: The Case of Third

Year Students of English at Biskra University

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Declaration

I hereby declare that all information in this dissertation has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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Dedication

To my parents

The reason of what I become today

Thank you for your support and care

To my sisters

Thanks for being my first teachers

To my friends

Thanks for your prayers

To the great scholars who taught me through their writings

To whoever might find this work interesting

Acknowledgements

Abstract

Critical thinking is a cornerstone in advanced stages of learning especially in tertiary education. Consequently, University students are urged to develop this skill in order to accommodate with their learning environment. This dissertation examined the effectiveness of implementing messenger-assisted cooperative projects on promoting third year EFL learners' critical thinking skills. It also sought to discover the capacity of messenger interactions in reflecting firstly learners' critical thinking skills and secondly in demonstrating the effect of the treatment on enhancing their critical thinking skills. The current research employed a mixed methods approach through applying a sequential explanatory design. The sample for this study was ten third year EFL learners from Biskra University. Data were collected using tests and documents and analyzed through descriptive statistics, inferential statistics, and content analysis. The preliminary results revealed the gap in learners' critical thinking skills; however the findings proved the effectiveness of messenger-assisted cooperative projects in improving learners' critical thinking skills. On the other hand, learners' questioning powers were limited and thus, they were unable to reflect their critical thinking skills. Additionally, no significant positive correlation between the extent of learners' questions and the improvement in critical thinking skills was reported ($r = .4321$, $df = 2$, one-tailed, $p = .09$). Accordingly, messenger interactions failed to demonstrate the effect of the treatment on promoting critical thinking skills. Finally, the researcher concluded with a number of recommendations to further the research on the basis of the current study. Substantially, future research might explore if the conclusions drawn from the sample investigated apply to other sources as well.

Keywords: cooperative learning*, critical thinking skills, messenger-assisted cooperative projects, third year EFL learners, project-based learning, technology

List of Acronyms and Abbreviations

EFL: English as a Foreign Language

CT: Critical Thinking

PjbL: Project based Learning

CL: Cooperative Learning

CPjbL: Cooperative Project based Learning

FDL: Field Dependent Learners

FIL: Field Independent Learners

HOTS: Higher Order Thinking Skills

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Chapter Four : Data Analysis and Discussion

General Introduction

Einstein once said: "education is not the learning of facts, but the training of the mind to think". Teaching should not pivot around accumulating knowledge, but rather it must surpass this by teaching learners to think and most importantly to think critically. Hence, it entails an endorsement of teaching and learning methods that reinforce critical thinking. The field of teaching and learning noticed several gradual changes; from behaviorism, cognitivism, constructivism, to progressivism or what is known as social constructivism. This latter emphasizes learning by doing, problem solving and critical thinking.

Among these, critical thinking is a cornerstone especially for advanced stages of learning because in early ages, education tends to focus on developing lower order thinking, however; later on, like the case of tertiary education, the focus shifts to higher order thinking. Thus, there is an urgent need for tertiary students to develop this skill and for teachers to foster its implementation by adopting the appropriate pedagogical practices.

For this reason, project-based learning is supported by many researchers like Goodman (2010) for being a powerful pedagogy that fosters collaboration, communication, creativity and most importantly critical thinking. The Buck Institute for Education in California defines project-based learning as a teaching method based on group work in which students collaborate to gain knowledge through investigating and responding to complex questions, challenges, or/and problems. As a result, students are supposed to learn and use different skills including critical thinking. Additionally, one criterion that characterizes project-based learning is the possibility of its association with other learning approaches and another is its distinguishable nature as a team-work. Thus, building project-based learning on a cooperative learning ground can add value on its tenets (Chen, 2004; Requies, Agirre, Barrio, & Graells, 2018)

Nowadays, technology, namely social media like Facebook, blogs, and messenger, has become embedded in our everyday life. As a result, its incorporation within education is a privilege due to its positive effects on promoting students' collaboration, learning outcomes, and higher-order thinking skills. Accordingly, technology-assisted learning is supported by many researchers (Johnson, Tinnerman, and Grimes (2010); Chang (2014); and Pratama and Kartikawati (2017)). Therefore, this study will be conducted to investigate the role of using messenger-assisted cooperative projects in promoting EFL learners' critical thinking skills.

1. Statement of the Problem

Critical thinking is considered one of the highly valued skills in the twenty first century, whether in real life or in academic contexts like educational institutions. Consequently, researchers are using different methods and strategies in order to develop it such as problem-based scenarios, out of class critical thinking assignments, everyday examples of critical thinking, service learning, classroom discussions, analysis of written text, higher-order questioning, and many others. Chief among these is project-based learning cooperative learning. The benefit of these didactic methods is mentioned either implicitly by philosophers like John Dewey, Jerome Bruner, Jean Piaget, Lev Semionovitch Vygotsky, and Charles Sanders Pierce, who advocate the role of learning in real life context in stimulating intellectual cognitive processes, or explicitly through research studies such as Rochmahwati (2015), Cash (2017), Sadeghi (2012), and Devi, Musthafa, and Gustine (2015). On the other hand, authors like Jalinus, Syahril, and Nabawi (2018) emphasize the efficacy of combining project-based learning and cooperative learning to improve higher order thinking skills. Still, other researchers like Pratama and kartikawati (2017) and Sulisworo, Diamah, Toifur, and Suryadi (2018) advocate technology as a supportive tool for both project-based learning and cooperative learning.

However, when conducting a preliminary study using a students' focus group and a teacher's interview, critical thinking appeared to be neglected to a certain extent by tertiary students and teachers at Biskra University as opposed to the other macro skills (writing, reading,

speaking, and listening) because it is claimed to be difficult and time consuming; despite the fact that it is a driving force in research methodology course where learners should use this skill in conducting research and bridging the gap between theory and practice. Moreover, the methods used in teaching this course are lecturing and the presentation of students' exposés related to the content of the syllabus which covers an introduction to research, research process, defining the research problem, referencing, academic writing, and finally, components, format, and structure of a research proposal. Yet, learners are not satisfied with these methods of teaching because they consider this course as important especially for their master dissertation, and because it is taught for four years (from second year till master degree). Thus, they wish that an extra value is added to practice, group work, and the integration of technology and social media in the classroom; however, students do not really welcome the implementation of social media like group messenger in learning. Concerning this latter, they have certain conditions that have to be ensured like the presence of a teacher in the group and the freedom to choose members of the group, so that its use would become meaningful and beneficial.

To meet learners' expectations, firstly, project-based learning is viewed as a leading method in learning by doing and team working especially if merged with cooperative learning and secondly, technology-assisted learning can be supportive for the application of such method. Further, despite the fact that learners have defined reservations, still they sustain the use of messenger in their learning, especially when they have a group work assignment. Yet, teachers insist on the necessity of sensitizing them about when and how they should use it. As a result, Messenger-assisted cooperative projects is suggested as a learning teaching method to promote learners' critical thinking skills.

2. Statement of the Purpose

The intent of this two-phase study is to investigate the role of using messenger-assisted cooperative research projects in a research methodology classroom to promote EFL learners' critical thinking skills. In the first phase, data will be gathered in order to discover whether or

not messenger-assisted cooperative projects promote EFL learners' critical thinking skills. In the second phase, data will be gathered, firstly, to explore whether or not messenger interactions are reflective of learners' critical thinking skills and, secondly, to secondly to be compared with data from the first phase in order to unveil whether or not messenger interactions are reflective of the effect of messenger-assisted cooperative projects on promoting critical thinking skills.

2. Research Questions

The present research study seeks to answer the following questions:

1. Does implementing messenger-assisted cooperative projects promote EFL learners' critical thinking skills?

2. How is communication between EFL learners in messenger, while conducting their research projects, reflective of their critical thinking skills?

3. To what extent messenger interactions reflect the effect of messenger-assisted cooperative projects on promoting critical thinking skills when compared with EFL learners' test results?

4. Research Hypotheses

On the light of the research questions, the research on investigating the role of messenger-assisted cooperative projects on promoting EFL learners critical thinking skills will be guided by the following hypotheses:

1. Implementing messenger-assisted cooperative research projects promotes EFL learners' critical thinking skills.

2. Messenger communication between EFL learners while conducting their research projects is reflective of their critical thinking skills.

3. Messenger interactions reflect the effect of messenger-assisted cooperative research projects on promoting EFL learners' critical thinking skills when compared with EFL learners' test results.

5. Aims and Objectives

The aim of this study is:

- To examine the effectiveness of implementing messenger-assisted cooperative projects on improving EFL learners' critical thinking skills and to discover the capacity of messenger interactions in reflecting firstly learners' critical thinking skills and secondly in demonstrating the effect of the treatment on their critical thinking skills.

This research will be guided by the following objectives:

1. To evaluate the role of messenger-assisted cooperative projects on promoting learners' critical thinking skills.

2. To determine the capability of messenger interactions in reflecting learners' critical thinking skills.

3. To compare between messenger interactions and test results in order to analyze the capability of messenger interactions in demonstrating the effect of the treatment on learners' critical thinking skills.

6. Population and Sampling

The target population for this study is third year EFL students (360 student as reported by head of the department) at Biskra University. The sampling technique used is purposive sampling because it allows the researcher to choose specific people with particular characteristics in order to be participants in his/her study. Since it is a case study, generalization of the results is not a goal for the researchers. Hence, the selected sample is 10 participants.

7. Research Methodology

This research is carried out through a mixed methods approach because it adopts the advantages of quantitative and qualitative approaches. Stemming from a pragmatist paradigm, the researchers adopting this approach have the opportunity to freely choose the methods, techniques and procedures that serve their purposes. Accordingly, the selected design

"explanatory sequential design", which allows the researcher to test a certain theory or concept to obtain quantitative data, and then, to pursue the study with qualitative method, enabled us to implement qualitative as well as quantitative data collection methods and data analysis procedures. Consequently, the first phase from this design is quantitative while the second phase is qualitative. In the former, data is collected through a "home-grown" critical thinking pretest and posttest based on activities that aim to assess critical thinking competences, whereas in the latter data is collected through documents represented in participants' messenger interactions. To analyze the results of the quantitative phase, descriptive statistics and inferential statistics are selected. Concerning the qualitative phase, data is analyzed through content analysis. In the last phase, data from the first and second phases will be mixed and analyzed through Pearson's correlation.

8. Significance of the Study

This study will shed light on one of the most important 21st century skills: critical thinking. When compared to other language skills, critical thinking is not given sufficient attention and importance by EFL students at Biskra University. As a result, the expected research findings will sensitize them about the importance of developing this skill especially when considering their state as future researchers. In addition, integrating messenger-assisted cooperative projects in teaching EFL learners will have numerous advantages for both learners and teachers. For instance, it will bridge the gap between theory and practice especially in the course of research methodology. Secondly, it will improve student-student and teacher-student cooperation and communication in the learning process. Besides, it will change teachers and students' roles; the classroom becomes learner-centered and the teacher acts as a facilitator or instructor. Moreover, it will enhance the learning outcomes including learners' skills and test results. Furthermore, it will give students the opportunity to practice critical reading and critical writing. Finally, teachers can apply this method of learning in other courses for different

objectives like improving several related skills such as communication, collaboration, autonomy, creativity, writing and speaking, or assessing students' understanding...etc.

9. Structure of the Dissertation

The following represents an outline of the study's organization:

Chapter one and two provide a theoretical background for the topic investigated in this study by reviewing literature on the most important notions related to critical thinking in the first chapter and to messenger assisted cooperative projects in the second one.

Chapter three explains the methods used for conducting the research and for the analysis of data used in this study. It also describes the population and the sampling technique, the procedures and instruments used, and accounts for some of the ethical issues.

Chapter four summarizes and describes the results of the study. It provides as well a discussion of these results.

Chapter One: Critical Thinking

Introduction

1.5. Critical Thinking: Historical Overview

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1. Critical Thinking

Introduction

The present chapter sets the ground for better understanding of critical thinking. Its aim is to demystify the concept of critical thinking through tracking the history and meaning of the term and examining its various components. It also evaluates a number of the strategies used to improve this skill, namely reading, writing, and questioning. In addition, it emphasizes two of the important ways in assessing critical thinking strictly speaking critical thinking tests and critical thinking scoring rubrics.

1.1. Critical Thinking: Historical Overview

Critical thinking (CT) is not a new concept. Its origin dates back to 2500 years ago when Socrates, the Greek philosopher, developed his method of questioning, which was followed by other philosophers like Plato and Aristotle. Since then, many scholars along history were and still interested in critical thinking wherein each one adopted it and adapted it according to his own paradigm.

In 1992, Garrison viewed CT as a dialogue between two worlds: the private world of reflection and the shared world of collaboration leading to corroboration of knowledge.

 In 1993, Dewey assumed that the best way of thinking is, as he termed it, reflective thinking which involves two phases; "a state of doubt, hesitation, perplexity, mental difficulty in which thinking originates" and "an act of searching, inquiring to find material that will resolve the doubt, settle and dispose of perplexity" (p. 12).

 In 1995, Halonen viewed CT as a mystified concept; consequently, she defined the term according to three general approaches: Trait Approaches, Emergent Approaches, and State Approaches. The first approaches are linked with traditions in intelligence research which suggests that CT varies according to intellectual inheritance. The second approaches are derived from the work of Piaget and other traditions in developmental psychology advocating that CT

abilities develop through children's interaction with the physical world. The last approaches stem from cognitive psychology traditions and it considers critical thinking as discrete acts of behavior.

In 1996, Ennis expanded on the definition of CT to include CT dispositions which are, according to him, hidden tendencies to do something in certain conditions. He referred to Perkins, Jay, and Tishman 1993's "triadic theory of critical thinking dispositions" where he argued that one of its components (inclination) is essential, whereas the other two (sensitivity and ability) are not. To clarify this last argument, he provided the example of a person who could be disposed to "clarify and seek understanding without being sensitive to situations calling for clarification" or "without having the ability to ask pointed questions and to build complex conceptualizations" (p.168). As a result of his interest in CT dispositions, he developed his own theory of CT dispositions which are:

1. "To get it right to the extent possible": it involves caring about the correctness of your claims and ideas, seeking justifications for your claims, and evaluating your points of view and those of others.

2. "To represent a position honestly and clearly": it includes presenting clear and precise information, offering reasons, and asking for justifications.

3. "To care about the dignity and worth of every person": it means considering the feelings and level of understanding of others (p.171).

In 1988, Kurfiss identified the kind of questions that entail the person's implication of CT. He described them as questions with non-definite answers and poor significant information. Consequently, they demand logical justified answers attained through careful research applying all available information. He added that claims are always questioned and distinct opinions are neutrally investigated.

In 2002, Bailin argued that CT is a set of "mental procedural moves which can be improved through practice" by citing the proposition of Friedler et al. (1990) which involves

"defining the problem; stating a hypothesis; designing an experiment; observing; collecting; analyzing and interpreting data, applying the results; and making predictions based on the results" (p. 364). He also questioned the transferability of CT and whether or not to separate between the various kinds of knowledge in different areas and the thinking process in itself.

In 2004, Allen referred to CT as smart thinking and related it to the process of communicating ideas whether orally or in a written form. He explained it as the person's ability to have a schema in his mind which in turn enables him to express and communicate meaningful, valid, as well as convincing ideas. In addition, reasoning is emphasized as the core process of critical thinking because it involves presenting reasons to convince others about our opinions and thus, explaining relationships between our ideas.

In 2006, Paul and Elder described CT as an art of self-analysis and evaluation of thinking with self-improvement as a goal. In 2008, Browne and Keeley stated that the key criteria a person needs to think critically is firstly, to possess knowledge of a set of critical questions, secondly, to be able to ask as well as to respond to them appropriately, and thirdly, to be willing to use them. In 2009, More and Parker believed that CT revolves around proving your claims through thoughtful application of evidence.

It seems that CT was the concern of many researchers along the years. According to the previous definitions, a comprehensive definition might be suggested. It can be agreed that CT is a process of self and others' questioning of claims, opinions, and ideas that is triggered by an inner stimulus of disequilibrium and then communicated to the outer world through interaction and collaboration in order to reach answers established on the basis of thorough inquiry. Moreover, it can be improved through practicing cognitive abilities; namely, questioning, evaluation, analysis, researching, intrinsic motivation and reasoning. However, this process encompasses these abilities towards one's dispositions which stems from his intrinsicality. Considering that there is no clear consensus about the nature of CT, one may question whether

an agreement is made- of course for those who consider it as a set of skills-about the competences that a critical thinker must possess?

1.2. Critical Thinking Competences

One of the fundamental views on CT is based on cognitive psychology and holds that it is a matter of practicing cognitive abilities. This latter statement implies that CT embodies a set of skills. These are the person's thinking abilities which differ from one author's views to another.

For instance, in his book "critical thinking", Fisher (2011) tackled some of these principal skills which are (a) identifying reasons and conclusions, (b) identifying and evaluating assumptions, (c) clarifying and interpreting expressions and ideas, (d) judging the acceptability of claims, (e) evaluating arguments, (f) analyzing, evaluating, and producing explanations, (g) analyzing, evaluating, and making decisions, (h) drawing inferences, and (i) producing arguments.

Prior to this, Spencer and Gillis (2008,p 89), in their writings about CT, refered to Appleby's "six skills of critical thinker" which are

- retention (to be able to remember);

- comprehension (to be able to understand);

- application (to be able to use the learned information to solve problems);

- analysis (to be able to examine and understand how the component parts are organized);

- and evaluation (to be able to critique information in order to assess its validity).

Appleby's skills are originally derived from Bloom's Taxonomy of Educational objectives which, according to Kuebli, Haevey, and Korn (2008,p. 142), are

- remembring: the fundamental abilities of recognition and recall memory;

- comprehension: the ability to summarize or paraphrase others' ideas;

- analysis: the ability to examine the individual components and understand its

  relationships to each other;

- reasoning: the ability to infer and to reach conclusions from evidence;

- evaluation: the ability to use evidence in order to appraise claims or ideas;

- and synthesizing: the ability to create which implies being able to "recognize or

  refashion the knowledge we start with into something novel and fresh".

Yet, the authors here commented that these skills are not represented following the same order

used by Bloom. According to Bloom (1956), the components of the taxonomy are knowledge,

comprehension, application, analysis, synthesis, and evaluation.

 Facionne (1989) reported the results of the Delphi Report in which experts from psychology,

education, social sciences, and phisical sciences participated. He stated that the experts viewed

that CT includes both skills dimention and dispositions dimention. A consensus was made

between the experts on the following list of cognitive skills:

1. Interpretation: categorization, decoding significance, clarifying meaning.

2. Analysis: examining ideas, identifying arguments, analyzing arguments.

3. Evaluation: assessing claims, assessing arguments.

4. Inference: querying evidence, conjecturing alternatives, drawing conclusions.

5. Explanation: stating results, justifying procedures, presenting arguments.

6. Self-Regulation : self-examination and self-correction (p.7).

Facionne found that the experts' proposed CT dispositions can be summarised to include

"critical spirit, a probing inquisitiveness, a keenness of mind, a zealous dedication to reason, and

a hunger or eagerness for reliable information" (p.12).

It appears that Kuebli, Haevey, and Korn (2008)'s presentation of CT skills amalgamates

most of the previously mentioned skills. For example, when comparing between these and

Fisher's (2011) skills of critical thinking, we find that points (a) and (h) represent reasoning;

points (b), (d), (e), and (i) can be summarized to evaluation; point (c) describes comprehension, point (g) expresses analysis and evaluation; and point (f) stands for analysis evaluation and comprehension. However, when comparing between Kuebli, Haevey, and Korn (2008)'s skills and those of Facionne (1989), self regulation and CT dispositions are ecxeptional skills when compared to the other authors' models. As a result, it might be concluded that some skills are redundant and others like remembering and synthesizing are dissmissed. On the other hand, eventhough Appleby's six skills stem from Bloom's skills, still they lack one important skill which is synthesizing. Accordingly, the researchers' s combination of Bloom's taxonomy and Appleby' s skills germinated a powerful model for critical thinking that accumuate the strengths of both. Yet, even novelty is effective, a reference to ancient views by considering other skills like self regulation and the dispositions dimention of critical thinking is advisable.

1.3. Critical Thinking Instruction

The literature on teaching or improving CT suggested variety of methods and strategies: real-world cases, open ended discussions, and inquiry-oriented experiments, a model including clarification, judgement, and a set of other strategies (Fahim & Eslamdoost, 2014); activities: research, reading, discussions, debates (Cambridge papers,2019)…etc. Rather, reading, writing, and questioning were the mostly researched and they proved their efficacy (Olson (1984), Alexander, Commander, Greenberg & Ward (2010); AlSharadgah (2014); Tabackova (2014); Nejmaoui (2018)). These latter methods, when related to critical thinking, are interelated; reading and writing are cyclical and questioning is a driving force for both skills.

1.3.1. Critical thinking and reading. There are two kinds of readers: the one who reads extensively and the one who reads intensively. The former reads for pleasure and does not attempt to uncover what is not stated whereas the latter, which represents our concern, involves himself in the text; asks questions; writes comments; and sometimes develops essays, reviews, and reflections. This kind of readers, who is able to create a whole discussion with the text, is a critical thinker.

Prior to delving into the complex skills of thinking critically, it is essential to arrive at a general idea about the text. This can be achieved through "active reading" which proceeds following these steps:

1. Previewing: elements of the text such as the author's name, the place of publication, and the title may hint the content of the text.

2. Skimming: the first and last paragraph contain the thesis statement and writer's position, and methods for supporting it.

3. Reading carefully: using some strategies such as highlighting or underlining the topic sentences and annotating in the margin according to the reader's purpose, for example, one wishes to know how the writer organizes his thoughts.

4. Reread: the second reading serves the process of taking notes through summarizing and paraphrasing so that the reader is able to understand the content. (Barnet & Bedau, 2014).

After reaching a general idea about the text, the reader needs to extend his knowledge by opening the door for his own schema and higher-level thinking skills interference. Cambridge papers (2019) suggested a three-stage model for reading critically. The first stage "understanding text" encourages readers to read for understanding and to extract the author' arguments and opinions. The second stage "engaging with text" requires relating the new text and the reader's prior knowledge as well as other texts, evaluating the author's arguments, and examining and considering implications. The third stage "externalizing text" involves using "voicing and

reflecting" on the reader's understanding from the text through "discussions, inner speech, writing about the text, taking notes, and synthesizing from various texts" (p.11).

One kind of texts that might be efficient for readers to practice their CT skills is APA-style papers. When reading and critiquing these papers, students must use "a critical eye". For instance, when referring only to the abstract, they should be able to recognize whether or not the study is related to their research topic. In addition, they need to demonstrate their ability in noticing the appropriateness of the analysis for the type of data. Finally, when reading the discussion section, students are required to critically analyze the conclusions and to discover the gaps (Dunn & Smith, 2008).

It might be clear that active reading is not a complex process as it does not involve higher CT skills. Consequently, it can be recommended for teachers who wish to foster critical thinking skills in their students to begin reading courses with active reading because it merely requires basic CT skills. One reason for beginning instruction with the foundation skills is that, as argued by Sherryl, Zinn, & Baker (2008), it is essential to refer to the cognitive level of students because higher or complex thinking skills cannot be built on a weak basis. Thus, it is paramount to move smoothly from easy foundation skills like understanding to difficult higher skills like evaluating and examining, then to complex skills like voicing and reflection. As a result, it can be deduced that active reading is concerned with foundation skills like remembering which involves, for instance, recalling some previous knowledge about the author, his style, and the publisher; and comprehension which includes, for example paraphrasing or summarizing the text's main ideas; however, "close reading" as referred to by Paul and Elder (2006) is related to more complex skills of analysis, evaluation, and synthesis which involves, recalling previous knowledge, comparing texts, discussions, and reflective writing. Thus, teachers in higher education might use reading and critiquing APA-style papers as a strategy for practicing higher-order thinking skills.

1.3.2. Critical thinking and writing. As critical reading involves reflective writing, critical writing can be viewed as a continuum of critical reading if not complementary. Additionally, critical reading follows two stages active reading and close reading. Accordingly, we can assume that critical writing also proceeds through stages requiring certain critical thinking skills.

Olson (1984) used "Bloom's Taxonomy of Critical Thinking" as a point of departure in designing writing lessons that integrate CT. She was surprised that Bloom's categories in the cognitive domain "recapitulate the writing process and vice versa" (p.32). Consequently, Olson generated writing tasks based on stages grounded on Bloom's Taxonomy. These stages are:

1. Prewriting: generating ideas.

2. Precomposing: organizing ideas.

3. Writing: transforming ideas into a written form.

4. Sharing: giving and receiving feedback.

5. Revising: reflecting and rethinking about written ideas.

6. Editing: proofreading for mistakes.

7. Evaluating: assessing the final written product.

Conversly, the author did not specify which thinking skills are requiered in each stage, rather she viewed writing and thinking as "recursive processes" (Olson, 1984.p.32).

Tabackova (2014),in her paper, offered a discussion of some specific strategies of how to move from critical reading to CT which were used in the course of American Literature designed for students specializing in English Language and Literature. These strategies can be summarized in the form of eight instructional steps:

1. Group students.
2. Give students pieces of papers containing separate parts of text, a poem for example, then ask the to rearrange it in thr right order.

3. Make students listen to the text to discover the right order.

4. Ask students low-level questions related to comprehension.

5. Move the discussion to application and analysis questions (ask them to correlate between the structure and the meaning of text; interpreting symbols and the author's style in the poem for example).

6. Move the iscussion to evaluation questions (encourage students to express their view about the text).

7. Move the discussion to creativity questions (ask them to give a title and explain their discision for instance).

Distinct from this latter view which has literary writing as its concern, another perspective (Cambridge papers, 2019) was prcisely for academic writing. This view suggested that one way for teachers to improve CT through writing is to develop students' sub-skills such as summarising, comparing and contrasting, deductive and inductive reasoning of ideas, linking ideas in an argument, and writing reports.

However, Barnet & Bedau (2014) were selective and chose a kind of academic writing "argumentative writing". They explained the way of analyzing an argument which we tried to summarize in the form of questions to be answered wherein each one determines what should be written in each paragraph of the analysis. These steps are:

- The introductory paragraph: what is the author's purpose (to persuade or to report), methods (kind of arguments used: quoting authorities,statistics, examples,assumptions,…), and thesis if it exists ?

- The first body paragraph: what is the main idea of the author's work?

- The second body paragraph: what is your own evaluation or judgement of the author's work?

- The third body paragraph: how are you going to discuss the author's arguments? From the simplest to the most difficult? From those you judge as being valid to those you thik are not or the reverse? And what are the arguments that the author neglected and you think that they are significant?

- The concluding paragraph: in what way I agree/disagree with the author and what is my opinion about the work as a piece of argumentative writing?

Another kind of writing, perhaps a more academic one, is writing an APA-style report. It forces students to apply different types of critical thinking skills. For example, the abstract requires students to extract the most important elements of their study and report them within limited number of words. Besides, they must conduct a critical literature review which necessitates selecting the studies that are relevant to their research, ordering these logically, and connecting between the different pieces of the review. Moreover, testing the hypothesis demands thinking critically about what methods are suitable. Furthermore, the results section drives them to think about the design and the type of data so that they can communicate clearly their findings to readers. Finally, in the discussion section, students are expected to think about the contribution they made in relation to the literature they reviewed (Dunn & Smith, 2008).

According to what was mentioned previously, we can conclude with the following notes. Firstlly, unlike reading, writing and thinking are cyclical processes; the stages that writing follows can involve more than one thinking skill. Again, they are interdependent which implies that expertise in writing demands expertise in CT and vise versa. Besides, considering that there are methods uniquely designed to think critically about certain kinds of writing, distinguishing the type of writing is initial to starting the process of critical writing. Yet, considering that, generally, the kind of writing required in tertiary education is academic writing, writing APA-style reports can be effective in promoting CT. Finally, creating a discussion with yourself when writing is effective especially when you ask the right questions about the text.

1.3.4. Asking the right questions. Questioning has proved its significance in trigering one's mind to think critically about what he is reading or writing (Alexander, Commander, Greenberg, & Ward (2010), Kipper & Ruutmann (2010); Fahim & Bagheri (2012); Etemadzadech, Seifi, & Rohbakhsh (2012), Davoudi (2015); Sulaiman (2018); Zulkifli, Halim, Yahya, Meyden (2020)). This tequnique's roots are related to Socrates, the Greek philosopher, who believed that "discplined practice of thoughtful questioning enabled the student to examine ideas logically and to determine the validity of those ideas" (Designing effective projects, 2007, p.1). Though it exists 25000 years ago, it is still researchable nowadays; yet, with certain innovation or with total diversion; nevertheless, the cornerstone "asking questions" is still there.

In their article, Fahim and Bagheri (2012) introduced Paul' s Taxonomy of questions and Bloom's Taxonomy of questions as two models for categorizing questions along with Gunter, Estes, and Mintz's (2010) types of questions that a teacher can ask to foster CT. The researchers provided the following categorization:

Bloom's Taxonomy contains six types of questioning for six cognitive levels:

- Remembering questions: they ask students to recall what they have learned,

- Understanding questions: they ask students to explain what they have learned,

- Applying questions: they ask students to use new learning in other familiar situations,

- Analyzing questions: they ask students to break what they have learned into its parts and explore the relationships among them,

- Evaluative questions: they ask students to render a judgment,

- Creating questions: they ask students to generate new ways of thinking about issues and subjects,

Paul's Taxonomy categorizes Socratic questions into six types as:

1. Questions for clarification: Why do you say that?   How does this relate to our discussion?

2. Questions that probe assumptions: What could we assume instead? How can you verify or disapprove that assumption?

3. Questions that probe reasons and evidence: What would be an example? What is....analogous to? What do you think causes this to happen.? Why?

4. Questions about Viewpoints and Perspectives: What would be an alternative? Would you explain why it is necessary or beneficial, and who benefits? Why is it the best? What are the strengths and weaknesses of...? How are...and ...similar? What is a counterargument for...?

5. Questions that probe implications and consequences: What generalizations can you make? What are the consequences of that assumption?What are you implying? How does...affect...? How does...tie in with what we learned before? (Fahim and Bagheri, 2012, p.1124).

After that, they discussed the potential of this categorization of questions in fostering CT when integrated into four calssroom activities: free discussions, active reading, analytical writing, and dynamic assessment. They concluded that it is beneficial in promoting higher-order thinking.

On the other hand, Burden and Byrd (2010) (as cited in Kipper & Ruutmann, 2010) were more precise by offering examples of key words or phrases in each category of Bloom's Taxonomy. These examples can be summarized in the following table :

Table 3.1

Examples for Bloom's Levels of Questions

Levels of questions	Examples of key words and phrases
Comprehension	Describe, give an example, rephrase, summarize, explain, interpret, paraphrase, what is the main idea ?
Application	Classify, select, prepare, operate, solve,

	use, demonstrate, relate
Analysis	Outline, analyze, subdivide, infer, what are the causes? what is the order ? what are the reasons ?
Synthesis	Plan, construct, create, produce, design,rewrite, devise, combine
Evaluation	Judge, criticize, support, appraize, justify, discriminate, which is better ? why ? do you agree ? why ?

They maintained that the first three levels require low level questions because they emphasize primarily the recall and moderate use of information, whereas the upper three levels require high level questions that deal with abstract and complex thinking because this sequencing; from easiest to more complex helps students to "connect [and understand] the important concepts" (p. 42). Moreover, the authors emphasized the importance of shifting teachers' attitudes towards asking higher- level questions as opposed to the common practice of asking low-level questions; even though the former "do not guarantee higher-level responses" (p. 41), but definitely they open the door for CT. Furthermore, they stated that

> Questioning is one of the missing pieces in teacher education. Teachers often ask close ended questions that don't allow the students to demonstrate their level of knowledge or lack of knowledge. The quality of response is always affected by the quality of the question. Questions are critical elements for teachers to use to stimulate student thinking. (p. 42)

In another study (Alexander et al., 2010), a quasi-experimental design was used in order to test the hypothesis of whether participants would demonstrate higher CT scores in an online

discussion with the four-questions technique described by Dietz, Usher, and Lanter (2009) that was designed specifically for promoting critical thinking. These questions are:

1. "Identify one important concept, research finding, theory, or idea in psychology that you learned while completing this activity." (analyzing)

2. "Why do you believe that this concept, research finding, theory, or idea in psychology is important?" (reflecting)

3. "Apply what you have learned from this activity to some aspect of your life." (relating)

4. "What question(s) has the activity raised for you? What are you still wondering about?" (questioning) (Dietz et al.(2009) as cited in Alexander et al., 2010, p. 410).

The instruments that were used to test the hypothesis were a CT rubric and a CT rating scale which showed the effectiveness of the method.

In their book " Asking the right questions", Brown and Keely (2010,p.20) asserted that the skills and attitudes required for reading and listening critically are constructed through a set of critical questions. These questions are:

1. What are th issues and conclusions?

2. What are the reasons?

3. Which words or phrases are ambiguous?

4. What are the assumptions?

5. Are there any falassies in te reasoning?

6. How good is the evidence?

7. Are there rival causes?

8. Are the statistics descriptive?

9. What significant information is ommited?

10. What reasonable conclusions are possible?

In a recent article, Zulkifli et al. (2020) used Recipprocal Peer Tutoring (RPT) in facebook to support students in imprving their CT during the learning process. The study was carried through online discussions through facebook guided by peer questioning strategy. They stressed that students can learn to be critical thinkers starting from "shallow learning" (asking prior knowledge and comprehension questions) and progressively to deep learning (deducing conclusions, connecting ideas, and conflicting arguments).

As it appears, literature on the role of questioning in improving CT approves its significance. It was suggested, either explicitely or implicitely, that the questions should follow an order of increasing difficulty; from low-level to higher-level questions. However, some questions such as those of Brown and Keely (2010) and Dietz et al. (2009) are designed specifically for certain skills, reading and listening in the former, or for certain courses, psychology in the latter. As a result, teachers might be oriented to select the suitable model of questioning according to their objectives. Yet, the literature on the role of students' questioning is poor since the majority of the studies, as reported in a systematic review of 60 studies on questioning as a high-level cognitive strategy, focused on teacher questioning.

1.4. Assessing Critical Thinking

An important part of instruction is assessment for learning. This process "creates feedback for students and teachers in order to improve learning and guide their next steps" (Cambridge Assessment International Education, 2019, p.1). CT is considered a difficult skill to be assessed because, when intending to do so, one struggles to assess its different components since a clear definition has not yet been provided (Apple, Serolikoff, Reis-Bergan, & Barron, 2008). Consequently, efforts were made in order to construct valid and reliable instruments that are capable of yielding representative results. Some of these instruments are standardized CT tests and CT scoring rubrics.

     1.4.1. Standardized critical thinking tests. The literature on CT assessment provides teachers and researchers with numerous CT tests whose validity, reliability, and practicality were tested and whose format, content, and objectives are varied. The following table is based on Halonen (2008) collection of "objective measures of critical thinking" (p.72-75) represents an illustration of a number of these tests along with a description of their format and objectives:

Table 1.4

Standardized Critical Thinking Tests

Test	Format	Objectives
Watson-Glaser Critical Thinking Appraisal (1980)	Multiple-choice	Assessing inference, assumption identification, deduction, interpretation, and argument evaluation
Cornel critical thinking test, Forms X and Z (1985)	Multiple-choice	Form X: assessing grades 4-14 induction, credibility, observation, deduction, and assumption identification Form Z: assessing college students and adults' induction, credibility, prediction, experimental planning, fallacies, deduction, definition, and assumption identification
Ennis-Weir Critical Thinking Essay Test (1985)	Essay test	Assessing the ability to get the point, see the reasons and assumptions, stating one's point, offering good reasons, seeing other possibilities, and responding to and avoiding equivocation, irrelevance, circularity, overgeneralization, credibility, and the use of emotive language in persuasion
Assessment of Reasoning and Communication (1986)	Open-ended Producing three short essays and three short speeches	Assessing college -level and probably other levels' social reasoning, scientific reasoning, and artistic reasoning
Critical Thinking Interview (1988)	One –to-one interview	Assessing college students and adults' displayed knowledge and reasoning on a topic of interviewee's choice with an emphasis on clarity, focus, credibility, sources, familiarity with the topic, assumption identification, and appropriate use of reasoning strategies
Critical Thinking Test (1989)	Multiple-choice items based on text readings	Assessing college students' conclusions identification, validity of reasons, representativeness of data, predictions' making, ability to notice alternatives, and ability to provide hypotheses
The California Critical Thinking Skills Test (1990)	Multiple-choice	Assessing college-level, adults and professionals' interpretation, argument analysis, appraisal deduction, mind bender puzzles, and induction
The California Critical Thinking Dispositions Inventory (1992)	Multiple-choice	Assessing college-level critical thinking dispositions
Cambridge Thinking Skills Assessment (1996)	Two parts: part one (multiple-choice, 15 items, 30 min); part two (essay test, one hour)	Part one: assessing postsecondary students' argument assessment Part two: assessing critical evaluation of an argument and further argumentation

1.4.2. Critical thinking rubrics. Several CT rubrics were designed in order to measure students' performance, generally, by dividing CT into a set of skills, defining these, then assigning scores or scales to every sub-skill where the student can have two kinds of scores; a sub score and a general score. Examples of CT rubrics and there features are as follows:

- US- Buck Institute for Education Rubric: helps teachers in guiding their students in grades 3-5 and 6-12 to use an effective process for innovation and to be effective critical thinkers in various phases of a project. The sub-skills representing its focus are analyzing driving question and begining inquiry, gathering and evaluating information, using evidence and criteria , justifying choices, and considering alternatives and implications.

- The United States-Holistic Critical Thinking Scoring Rubric: "is a rating tool that can be used to assess the quality of thinking in a spoken presentation or a written report/text" (p.48). It is a four-level scale rubric which evaluates the interpretation of evidence, statements, graphics, questions, etc, the identification of the most important arguments, the evaluation of the major alternative points of view, the drawing of unwarented conclusions, judicious, non-fallacious conclusions, the justification of key results, te explanation of assumptions, and the fair-mindedness.

- The Critical Thinking Value Rubric: developed by the Association of American Colleges and Universities to help university teachers in evaluating their students' learning and not for grading purposes. It has four domains evaluated on a four-level scale. These domains are: evidence, influence of context and assumptions, student's position (perspective, thesis/hypothesis), conclusions and related outcomes (implications and consequences) (Madeleine, n.d)

- Kansas University Critical Thinking Scoring Rubrik: is a three-scale rubric; emmerging, eveloping; and mastering. Each scale is rated usig two numbers (1 and 2 for the first, 3 and 4 for the second, 5 and 6 for the third). The rubric aims to assess seven sub-skills which are: summarizing problem, question, or issue, considering context and assumptions, Communicating own perspective, hypothesis, or position, analyzing, supporting data and evidence, using other perspectives and positions, assessing conclusions, implications, and consequences, communicating effectively (Center for teaching, learning, & technology, 2006).

Standardized tests and rubrics are valuable methods for assessing CT; however, they should be used with caution because they are designed to target different objectives, and to test CT in diverse content. For example, a test which is designed to assess CT through writing an essay cannot be applicable to test CT through speaking or reading since the criteria for assessment vary from one skill to another. Again, some of them are designed for specific level. For instance, a rubric designed for tertiary students cannot be used for assessing secondary students' CT because the criteria for assessment and the content itself might be difficult for them. Consequently, researchers (Liu, Frankel, & Roohr, 2014) recommended that, in order for "next-generation assessment to become applicable in variety of contexts, diversity of material in different item (map, audio, video, graph…) and linguistic style formats (letter to editor, formal debate, public speech…) should be considered. They also stressed the importance of insuring the validity for all test-takers such as those with disabilities or those who are not fluent in the target language or culture. Accordingly, they suggested designing assessments with various delivery modes.

Conclusion

This chapter has presented a background to critical thinking besides various models of critical thinking skills by different authors have been compared and evaluated. Furthermore, it has illustrated variety of critical thinking tests and critical thinking scoring rubrics. Finally, it appears that critical thinking has a wealthy history as it is viewed differently according to numerous researchers. In addition, there exist countless strategies that serve its development; yet, reading, writing, and questioning proved their significance and their possible fruitful amalgamation. Further, assessment of critical thinking skills is not an easy task; however researchers were able to develop various tests as well as scoring rubrics that demonstrated their validity and reliability.

The following chapter will be devoted to discussing the potential of messenger assisted cooperative projects in promoting critical thinking skills.

Chapter Two: Messenger-Assisted Cooperative Projects

Introduction

3.1.   Project-Based Learning

    2.1.1. Project-based learning: origins and definition

    2.1.2. Project-based learning: models

2.2. Cooperative Learning

    2.2.1. Cooperative learning: an overview

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Conclusion

2. Messenger-Assisted Cooperative Projects

Introduction

The aim of this chapter is to afford background information about the core pedagogies of messenger-cooperative projects respectively project-based learning, cooperative learning, and technology assisted learning. Firstly, the chapter provides an overview of the origins and definition of project-based learning, also it enumerates and compares between its various models. Secondly, it introduces the concept of cooperative learning referring to its roots in a number of psychological theories, then it sets the ground for its implementation through mentioning a number of principles. In addition, it investigates the possibility of combining project-based learning with cooperative learning in order to promote critical thinking. Moreover, the chapter examines the role of incorporating technology specifically social media as a supportive tool for cooperative project-based learning. Finally, a review of the expected challenges that might hinder the implementation of messenger-assisted cooperative projects is clearly highlighted.

2.1. Project-Based Learning

      2.1.1. Project-based learning: origins and definition. Project-based learning (PjbL) is an ambiguous concept with debatable origins; yet researchers tried to surf in the literature in order to unveil this perplexity. For instance Capraro, Capraro and Morgan (2013), when reviewing its history, found that it is rooted in numerous disciplines and related to a number of authors. They reported that the method is borrowed from agriculture and industrial arts education. Then, influenced by his teacher "Dewey's pragmatism and experiential learning", Kilpatrick adopted the concept and wrote his article "the project method" in which the approach earned its pedagogical and psychological principles. Unlike Capraro et.al, Jensen (2012) attributed the origins of PjbL to certain pedagogic traditions which are Jerome Bruner "learning by discovery", Maria Montessori "playing is learning", William Kilpatrick "whole hearted learning", Carl Rogers "student centered learning", and the Harvard method "case based learning". On the other hand, Condliffe, Quint, Visher, Bangser Drohojowska, Saco, and Nelson (2017) accredited Kilpatrick as the father of the method.

      As a result, it can be agreed that PjbL is grounded in several fields and philosophies; however, Kilpatrick is assumed to be the establisher of the method as a pedagogy and psychology of teaching and learning.

      PjbL was defined by several authors and used, sometimes, interchangeably with other learning approaches. The Educational Technology Division (2006) described it as "a model for classroom activity that shifts away from usual classroom practices of short, isolated, teacher-centered lessons… [to] long-term, interdisciplinary, student-centered", and authentic activities (p.3). On the other hand, it was viewed by High Quality Project-Based Learning as "an important instructional approach that enables students to master academic skills and content knowledge" (n.d, para.1). Contrary to the previous views which referred to PjbL as a "model" or an "instructional approach", Patton and Robin' s (2012) regarded it as a process of "designing, planning, and carrying out an extended project" in order to culminate in an end-product that

should be publically displayed. They, also, related it to inquiry-based learning and problem-based learning (p.13). Similarly, Montecel (n.d), believed that PjbL is a "student-centered pedagogy" that engages students actively through real-world inquiry. Like Patton and Robin, Montecel associated it with other pedagogies; namely, problem-based learning and challenge-based learning.

Accordingly, we can conclude with the following characteristics to be a basis for defining PjbL: (a) PjbL is a pedagogical instructional model for teaching and learning; (b) PjbL can be associated with other approaches like student-centered learning, and problem-based learning, challenge-based learning according to its objective (solving a problem, answering a question…); (c) PjbL is carried through steps like planning, designing, and presenting; (d) PjbL terminate in a final product and it is an authentic activity.

2.1.2. Project-Based Learning: Models. Implementing PjbL is a challenge for teachers. Consequently, the literature suggests diverse models in order to reach the highest learning outcomes. The following is a list of some of these models along with the steps or key principles they involve.

Grant's Model (2002): it represents common features across various implementations of PjbL. These features are: an introduction, a task (a guiding question), a process, resources, guidance and scaffolding (e.g. teacher conferences and project templates), collaboration, and reflection.

Stroller's Model (2012): it is a 10 step model of developing a project in a language classroom. These steps are: (1) agree on a theme; (2) determine the final outcome; (3) structure the project; (4) prepare students for language demands of step five; (5) gather information; (6) prepare students for language demands of step seven; (7) compile and analyze information; (8) prepare students for language demands of step nine; (9) present final product; (10) evaluate the project.

Søndergaard's Model (2016): it is composed of core principles of Aalborg University (AAUU) PjbL. These principles are: problem orientation (the basicity of the problem for the learning process), project organization (in terms of goals schedule, and learning objectives), courses supporting the project (core theories and methods), team-based approach (collaboration with group members or with external partners such as sharing knowledge, making decisions, and feedback), exemplarity (transferability of the learning outcomes), and responsibility for own learning (freedom of choosing the projects and responsibility of collaborating, planning, and project results).

Larmer et.al's (as cited in Dias & Brantley-Dias, (2017) Model: it includes seven project design elements. These elements are: "(1) a challenging problem or question; (2) sustained inquiry; (3) authenticity; (4) student voice and choice; (5) reflection; (6) critique and revision; (7) a public product" (p.2).

Aldabbus's Model (2018): it outlined eight steps to be followed in PjbL. These steps are: (1) choose significant content to attract learners' attention; (2) introduce the topic through interesting ways like activating prior knowledge in order to encourage eagerness about the topic; (3) encourage students to come up with a driving question to help them stay focused on the project area; (4) give students freedom of voice and choice (project design, materials used, sources of information, and ways of presenting the final product) in order to promote creativity and autonomy; (5) make sure that they have the sufficient time to practice 21st century skills (communication, using technology, critical thinking, and problem solving); (6) encourage them to share information; (7) provide feedback or encourage peer feedback in order to revise and modify their work; (8) ask them to present their final product to make them proud of themselves.

Note that the mentioned models are merely an illustration of numerous ones; nevertheless, they can be abbreviated to one model considering the existing similarities and differences. Hence, the suggested model might be of higher quality since it is based on steps

from the previous models. To distinguish the model from other models, we named it "the

Hybrid model". This model is composed of 12 instructions to be followed by teachers in PjbL.

These instructions are:

1. Prepare students for the project skills (language skills and 21st century skills)

2. Choose an authentic activity (problem solving or challenging question) that must
   be significant for your students.

3. Introduce the activity for your students using attractive methods.

4. Determine the aims and objectives of the project (concerning the process or the
   product) as well as the deadline of the presentation.

5. Decide the level of freedom that you want to give to your students (whether to give
   them the leading question or encourage them to form one).

6. Give them the freedom of choosing the process of inquiry, design of the project,
   choice of materials and resources, and ways of presenting the end-product.

7. Encourage internal and external collaboration (sharing information, making
   decisions, and giving feedback).

8. Keep observing your student's work through the whole project to keep them on the
   right track.

9. Evaluate the product, the process, and the transferability of the skills.

10. Ask them to present their work publically.

11. Ask them to reflect and assess each other's work as well as their own work.

12. After assessment, encourage them to revise and correct their mistakes.

3.2.   Cooperative Learning

3.2.1.   Cooperative learning: an overview. When reviewing the definitions and the principles of PjbL, one criterion was the possibility of its association with other learning approaches and another is its distinguishable nature as a team-work. Thus, this approach is known as one form of cooperative learning (CL) because they share the same characteristics (Cooperative and project-based learning, 2017).

Jacobs, McCafferty, and Iddings (2006) offered an overview about foundational psychological theories of cooperative learning; namely, social psychology, developmental psychology, cognitive psychology, and motivational theories in psychology. Consequently, a number of theories, methods and perspectives can be extracted.

In social psychology, Alport (1954) investigated the ways that assist people belonging to different racial groups to live in harmony; he concluded with three dynamics: equality of status, common goals, officially sanctioned collaboration. In 1978, Aronson, Balney, Stephan, Skies, and Snap created "Jigsaw Learning Technique"_ an application of "Alport's dynamics"_ which is based on sharing information between members of the group to achieve a common goal. In 1994, Johnson and Johnson developed an approach called "Learning Together" to increase the feeling of "positive interdependence" when learning in groups.

In developmental psychology, the authors referred to Piaget and Vygotsky. The former emphasized the interactive nature of classroom environments in the growth of the child's consciousness. The latter explained the social basis of CL and the role of social interaction in developing the child's mental functioning (Doolittle, 1995).

In cognitive psychology, they mentioned the dyadic MURDER script (Mood, Understand, Recall, Detect, Elaborate, and Review) by Hythecker, Dansereau, and Rocklin (1988) which entails that a pair of students read a text divided into sections then, the pair stop and one summarizes the main points of the section while the other checks the summary, after

that, they both elaborate on the ideas through opinions, examples, and making connections to previous readings. Another technique is called the "cooperative controversy" by Johnson, Johnson, and Holuebec (2002). It aims at promoting students' ability to recognize different perspectives through asking them to, firstly, represent opposing sides in a debate, secondly, provide their own view, and finally, arrive at an agreement with group members.

According to the authors, motivational theories in psychology approve positive interdependence in CL as an alternative source of positive reinforcement. In addition, these theories (Slavin, 1995) support heterogeneity of groups and the way in which all members contribute in their team's score.

Since PjbL is a form of CL, these theories, methods, and perspectives seem to be applicable in PjbL. As a result, we can conclude with some principles of CL that might be embedded in PjbL. Firstly, CL is based on sharing information to reach a common objective. Secondly, it encourages positive interdependence as a source of motivation. In addition, it develops learner's cognitive skills. Moreover, it emphasizes the heterogeneity of the group. Finally, it is implemented through various methods such as the dyadic MURDER script and the cooperative controversy.

2.2.2. Cooperative Learning: Principles of implementation. Urging students to cooperate in a project work is not an easy task. Thus, plenty of considerations must be thoroughly thought of in order for this to succeed. Jacobs (2006) listed three principal aspects of implementing CL. These principles are: (1) "forming groups, (2) functioning as a group, and (3) cooperative learning principles and group activity" (p. 30).

Forming groups involves decisions. Firstly, CL is flexible in terms of its timing and it can be combined with other learning approaches; thus, the teacher should decide the way of its implementation. Secondly, the common number of group members is four; however, a pair is sometimes considered the ideal size. Again, group members can be teacher's decision, students'

decision, randomly, or based on "commonality" (i.e. shared preferences, issues, belonging to the same group in assignment for another course). Moreover, arrangement of the groups is important for the teacher or for the group members. For example, students sitting close to each other are more likely to communicate. Similarly, sitting in front of the teacher helps him observing the groups. Furthermore, the duration of the group work might be short or long; rather, the ideal duration is six weeks.

Functioning as a group includes the aspects that contribute to the success of CL. These aspects are interdependence, collaborative skills, and teacher role in the group. Firstly, interdependence encourages the group to work together. Secondly, the teacher should emphasize collaborative skills such as giving reasons, disagreeing politely, making suggestions, praising others, and encouraging participation. Thirdly, the teacher should act as a "facilitator, guide on the side, than teacher-fronted instruction, a sage on stage" (p.38).

CL principles and group activity represent types of positive interdependence which is perfectly explained by Jacobs as "sink or swim together" or "one for all and all for one" (p.39). These kinds should be reinforced by the teacher as the author suggests:

- Positive goal interdependence: the team shares the same goal.

- Positive role interdependence: each member of the team has a role.

- Positive resource interdependence: each member has a portion of the information.

- Positive identity interdependence: e.g. the team invents a group name, motto, or flag.

- Positive fantasy interdependence: the team imagines that they are different people or in a different place.

- Positive outside challenge interdependence: the groups compete against each other.

- Positive reward interdependence: extrinsic or intrinsic motivation and linking the individual's grade to the team's grade still debatable.

Building PjbL on a CL ground can add value on its tenets (Chen, 2004; Requies, Agirre, Barrio, & Graells, 2018). In an invesigation about the effects of cooperative project-based learning (CPjbL) and students' field dependency/independency on developing Web pages, Chen found that "by working with a partner, [field dependent learners (FD)] could achieve a better academic performance than [field independent learners (FID)]" (p. 371). In another study (Requies et al., 2018), assessed the development and evolution of PjbL as an active methodology implemented on the course "Unit Operations in Environmental Engineering. The study yielded two important results; working on projects in small teams (CL) improved each group member's "self–learning capabilities". Moreover, when comparing traditional learning methodologies with the new active methodology, academic marks enhanced. Thus, fusing Pjbl with CL can give rise to a powerful approach: CPjbL. You may notice that these studies mentioned the effectiveness of the approach in improving academic achievement and autonomy. Consequently, you may speculate the efficacy of the approach in elaborating other leading edge skills such as critical thinking.

2.3. Cooperative Project-Based Learning and Critical Thinking:

Considering that CT is a foundational skill for 21st century success, the Buck Institute for Education (BIE) believed that PjbL is a powerful pedagogy that helps students to learn how to be critical thinkers. Goodman (2010) advocated the positive effect of not only PjbL, but also CL in promoting CT. According to him, CL is an important strategy in building CT skills that today's workplace needs. He reported that many research studies demonstrated that PjbL can improve students' mastery of 21st-century skills such as critical thinking. Accordingly, we sought to review the literature on the effects of using a combination of the two methods "CPjbL" to promote CT. Yet, majority of research was dedicated purely to either the impact of PjbL on improving CT or to the effect of CL on fostering CT with little attention to CPjbL.

PjbL proved its effectiveness in improving CT. In 2015, Rochmahwati focused on fostering students' CT through PjbL in a TEFL class. The study revealed that the activities

which promote CT in PjbL are firstly, classroom discussion wherein students reflect, give feedback, ask good questions, and evaluate the information they receive and secondly, recorded micro teaching which provides them with the opportunity to analyze what is recorded. In 2017, Nicholas' research aimed at finding the best pedagogical practice for promoting college students' CT skills. The student survey he used indicated that PjbL can provide students with effective techniques for improving CT skills. In 2020, Akhmad, Masrukhi, and Indiatmoko sought to analyze the effectiveness of "Science Technology Engineering Mathematics (STEM)-integrated PjbL model" to improve creative thinking abilities of elementary school students. The researchers employed quantitative approach with a control group pretest posttest design. The results showed that the experimental class's creative thinking skills reached 85% while the creative thinking skills of the control class reached 56.52%.

On the other hand, CL implementation for improving CT also yielded significant results. In 2012, Sadeghi' aim was to investigate the effects of CL on CT in an Iranian University within an EFL context. The results indicated that subscales of CT including critical analysis, credibility of evidence, and critical evaluation in the experimental group were much higher than those of the control group. In another study by Devi, Musthafa, and Gustine (2015), the role of CL in facilitating CT through reading was investigated. The study concluded that CL seemed to facilitate CT through reading and fostered students' CT dispositions. These dispositions are: open mindedness, considering others' points of view, taking and changing position when evidences are sufficient, presenting position honestly and clearly, taking into account others' feelings and level of understanding, and viewing situations from different perspectives. In addition, they reported that CL features that contributed in developing CT are student-student interaction, group purposes, structured positive interdependence, and sharing thoughts through discussions.

Conversely, few studies tackled the effect of using a combination of both methods to foster CT. A research study conducted by Jalinus, Syahril, and Nabawi (2018) tended to reveal

the efficacy of CPjbL model in enhancing cognitive competences up to the level of higher order thinking skills (HOTS). The study was carried out using experimental method through two groups pretest posttest design. The results showed that blending PjbL with CL gave birth to an effective model "CPjbL" which proved its positive impact on enhancing students' ability in the cognitive domain up to the HOTS level wherein they became able to analyze, evaluate, and create.

To conclude, we can appraise the role of CPjbL in enhancing CT even though there exist a shortage in evidence concerning the number of studies conducted. One reason is that its foundational methods "PjbL and CL" have already demonstrated their validity. Thus, we might foresee their efficiency when merged together. Yet, you may wonder what results could be reached if a powerful pedagogy like CPjbL is supported by technology.

2.3.1. Cooperative project-based learning and critical thinking: role of technology. In his book "Language Learning with Technology", Stanley (2013) advocated the incorporation of technology with its various forms _be it software, hardware, or the internet_ in education as being an inspiration for creativity and a source of opportunities to learners by engaging them in real language use through speaking and writing in or out of the classroom. Consequently, we tried to track its advantages in improving CT focusing on its integration within CPjbL with an emphasis on social media. However, the results of the present literature review' search did not meet our expectation because the area seems to be insufficiently investigated.

An investigation on the effect of mobile learning over CT skills using an experimental method aimed at measuring CT dispositions through California Critical Thinking Dispositions Inventory Scale and a questionnaire. After a treatment of group discussion using questioning, collaboration, and sharing information through MMS, SMS, and MSN Messenger, creativity improved significantly: pre experience test mean was 2.81 while post experience test mean was 3.30 (Cavus & Uzunboylu, 2009).

In another study conducted in an Algerian context, Amziane and Guendouzi (2015) were more general by examining the uses of Information and Communication Technologies (ICT) in Algerian EFL course from the perspective of CT. The researchers advocated and suggested to seriously embed ICT in Algerian schools through engaging in the theoretical and practical levels of this field. Similarly, they recommended including research skills and critical use of information to overcome the "copy and paste" practices of university students.

The emphasis of other studies was specifically on the effect of social media on CT. Some researchers such as Wright, Borg, and Lauri (2015) did not precise the kind of media; rather they discussed the interplay between the theory of CT and Media Education. They suggested how the media_ precisely weblog_ can be used in teaching and learning contexts to promote CT through creating excellent opportunities for students to discuss, reflect, analyze, and evaluate different perspectives and construct their own meanings through peer feedback in the blog.

However, others (Pattanapichet and Wichadee, 2015; Bagarukaryo, Baguma, Namubiru, & Brown, 2019) preferred to be selective. The former employed an experimental method through a control group pretest posttest design. After the experiment, they reported that the results were significant and students' attitudes were positive towards the questioning technique and posting in Facebook. The latter conducted a literature review to examine how WhatsApp Enabled Learning can facilitate the development of HOTS. The results showed that WhatsApp has a great potential to support the development of HOTS.

Yet, some authors did not only tackle the effect of media on CT, but they broadened their investigation to include its integration as a supportive tool for other learning approaches such as CL or PjbL. Sulisworo, Diamah, Toifur, and Suryadi (2018) aimed at determining the influence of social media usage _in this case Line@_ on CL environment to improve CT skills. The method used was quasi experimental with a pretest posttest controlled group design. The experimental group results improved as compared with the control group results.

Another study (Saifudin, Yakob, & Saad, 2016) aimed at exploring the influence and the active usage of Facebook on learning capabilities and effective thinking. The researchers used action research as a methodology and collected data through survey questionnaires, interviews, students' observations, reflections, and literatures. After a treatment represented in assignments and projects, the results indicated that the assignments and projects were excellent but they did not reflect their CT especially when expressing their opinions or arguments in Facebook. In addition, Facebook could build students' CT if being guided seriously.

Notice that critical thinking was investigated in relation to technology in general and more specifically in our case to social media. Researchers agreed on the potential of technology and media education in promoting CT. Moreover, the literature advocated technology-assisted learning such as incorporating social media as supportive tool for PjbL or CL; yet, it was recommended that its use must be carefully guided. For instance, designing pedagogy for the integration of technology in education. Finally, the literature on the effect of technology-assisted CPjbL on promoting CT and more precisely messenger-assisted CPjbL was not satisfactory. As a result, we sought in our research to fill in this gap by investigating the role of Messenger-Assisted Cooperative Projects on promoting CT skills.

2.4. Challenges of Implementation:

By reviewing the literature, we noticed the existence of a number of obstacles that hinder each one of the foundational approaches of the proposed method. Consequently, we predict that implementing messenger-assisted cooperative projects might face some or all of those challenges. Conversely, merging the three pedagogies might be a solution to overcome these difficulties; each approach may fill in the gaps of the others.

Many research studies investigated the challenges of implementing CL. One study compared between teaching through cooperative learning techniques such as Students Teams-Achievement Divisions, Jigsaw II, Number Head Together, and Learning Together and

traditional teaching methods. The researcher employed a qualitative approach with on-site observations, interviews, and reflections instructions. The researcher found that the difficulties of the teacher in Cooperative Learning are:

- Some of the groups did not work cooperatively very well; especially some students work individually,

- It is difficult to control students' chaos and maintain classroom management especially if the class is large and the groups are numerous and heterogeneous.

- Preparing the teaching materials and designing activities is not an easy task

- Training the students to adapt to cooperative learning situations and to encourage students to participate in their group activities.

- Finding effective methods for assessing students' performance.

- If a group member is absent, the group discussions, cooperative atmosphere and group performances are negatively affected.

- Students usually communicate with their group members in mother tongue more than in target language (Wang, 2007).

Having nearly the same aim of the previous study, Ghaith (2018) approached the same problem differently. He used a mixed-methods approach to analyze the perceptions of a selected group of experienced teachers of English as a foreign language of the challenges and potentials of using various cooperative learning methods. Participants spent three days in a "refresher in-service program" where they completed a "semantic differential scale" and recorded their perceptions of "the congruence, cost, difficulty, and importance, as well as to express their views regarding the challenges and potentials of using cooperative learning in their respective classrooms" (p. 385). The researchers found that the challenges are related to "proper implementation, knowledge of cooperative learning procedures, and classroom management

skills as well as the contextual variables of crowded curricula, noise, time on task, and school support and subjective norms" (p. 400).

Moges (2019) reported instructors' opinions about the challenges and difficulties of implementing CL. They indicated that the main challenges and difficulties are the large number of students in one class, uncomfortable seating arrangement of students, lack of clear guidelines to practice CL, the problem of group organization and the instructors' lack of CL training and their preference of the traditional method of teaching, lack of enough support from college administration (deans and department heads) and lack of effective and efficient instructional materials make (e.g. chairs and tables in classrooms were not easily moveable).

Cintang, Setyowati, and Hadayani (2018) examined the challenges teachers encounter in implementing PjbL. The obstacles they found are summarized as follows: (1) students' capability; (2) indiscipline; (3) time constraint; (4) equipment availability; (5) student's inequality. In addition, the researchers added that most teachers and even experienced teachers will face difficulties and challenges when trying to implement project-based learning.

On the other hand, Vasiliene-Vasiliauskien, Butvilienne, and Butvilas (2016) focused on challenges encountered by students. The major issues of implementation are students' motivation and willingness, knowledge about the ways of exploring and investigating the cases, knowledge that students have from previous experience, managerial skills, and limits of the learning contexts.

We tried to investigate the challenges of implementing technology as a supportive tool for PjbL or CL, unfortunately research concerning this area is very limited. Consequently, we reported the challenges of its use in general (i.e. without a direct link to CL or PjbL). In 2012, Zaidieh summarized some of the challenges of using social networking as an educational tool. The challenges are privacy, taking up time and miscommunication.

Again, another study (Adu-Manu, 2013) investigated the challenges and opportunities of implementing Social Network Technologies in four private universities in the Greater Accra Region. The survey results revealed that there are several challenges teachers face in the implementation of social network platforms such as safety and privacy issues, misuse of time, lack of non-verbal language lead to miscommunication, uncertainty resulting from lack of exposure to Social Network Technologies, incompetence in multimedia tools' usage, teaching innovation create dissatisfaction among teachers since most of them prefer the traditional methods for teaching, lecturers with disability are unable to access Social Network Technologies system, and higher cost of licensing the Social Network Technologies and purchase of sophisticated devices.

In 2015, Al-Mashaqbeh aimed at researching the challenges faced by the higher education students in the use of Facebook, as one of the social media tools, to enhance their learning. The finding of this study indicated that the main challenges faced in the use of Facebook applications as a learning tool are the security concern, insufficient time for managing activities and lack of internet connection.

To conclude, it can be viewed that there are several challenges of implementing each one of the foundational approaches of messenger-assisted cooperative learning. Firstly, these difficulties might be confronted by teachers as well as students. Similarly, they can be internal or external. Internal factors are related to students' motivation and willingness, knowledge, safety and privacy issues, learning styles, and teachers' preferred teaching methods. External factors are linked to classroom atmosphere (noise, unreliable materials, large number of students per class) and organizational factors (time management, lack of teacher training, unavailable pedagogy for its implementation, and lack of support from administration, and cost of materials). Yet, some of these obstacles might be prevailed through merging the different approaches. For instance, students can work in groups through different social media applications like Facebook and Messenger which may overcame the impact of the bad classroom atmosphere. This is one

predicted potential messenger-assisted cooperative projects that made us wonder about its efficacy as a pedagogical practice.

Conclusion

This chapter has introduced the concepts of project-based learning and cooperative learning along with models and principles of implementation. Besides, it has attempted to investigate the possibility of merging the two pedagogies. Similarly, it has analyzed the role of integrating technology peculiarly social media to assist cooperative project based learning. Finally, it seems that blending the three approaches is profitable; nevertheless, there are a number of obstacles of implementation related to each one of these approaches. Consequently, it is predicted that strengths of each approach will eliminate the weaknesses of the other; the approaches are interdependent.

The following chapter will present theoretical as well as practical framework for the methodology used in this dissertation. Firstly, it will offer an explanation of the selected paradigm, approach, design, data collection methods, data analysis procedures, and sampling techniques, as well as some of the ethical issues. Secondly, it will describe the different procedures followed and instruments used to collect data.

Chapter Three: Methodology

Introduction

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     3.2.2. Qualitative data collection

3.3. Data Analysis Procedures

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Conclusion

3. Methodology:

Introduction

The research questions were outlined in the general introduction along with an overview of the methodology used for investigation. This chapter provides further details of the methodology and fieldwork undertaken to collect and to analyze data in order to find answers for the research questions which serve together as a background for finding solutions to the proposed problem; the effect of using messenger-assisted cooperative projects to promote EFL learners' critical thinking skills. This study is based on a pragmatic paradigm that advocates implementing a mixed methods approach as well as amalgamating quantitative and qualitative data collection methods and data analysis procedures. Consequently, test and documents are selected to collect data for this research. Additionally, descriptive statistics, inferential statistics, and content analysis are used to analyze the obtained data. Moreover, the chapter sheds the light on some of the ethical issues and concludes with the instruments utilized and the procedures followed by the researcher in the present study.

3.1. Research Paradigm and Approach:

This research is carried out through a mixed methods approach because it adopts the advantages of quantitative and qualitative approaches. The reason is that this approach emerged from a pragmatist paradigm; a "worldview" that is "not committed to any one system of philosophy and reality" (Creswell, 2009, p. 9). Thus, it implies that researchers have the freedom of choosing the methods, techniques and procedures that serves their purposes which means that pragmatism gives the researcher the chance to use "pluralistic approaches" and consequently the implementation of various data collection methods and data analysis procedures (Creswell, 2009, p.10-11). The design used for this study is explanatory sequential mixed methods in which a certain theory or concept is tested to obtain quantitative data, and then, the study is perused with qualitative method "involving detailed exploration with few cases or individuals" (p.14). In this two-phase design, the qualitative results account for the quantitative results. Following

Creswell ideas, this study seeks to answer quantitative as well as qualitative questions. As a result, it will proceed through two phases; the first phase will make use of a quantitative data collection method with the whole sample, while in the second phase, qualitative data collection method will be applied with cases selected from the whole sample. The following figure represents a visual model that explains the selected design.

An Explanatory Sequential Design

Quan itative Data Collection (quan) → Quantitative Data Analysis (quan) → Case Selection → Qualitative Data Analysis (QUAL) → Interpretation – based on quan and QUAL results

+

Qualitative Data Collection
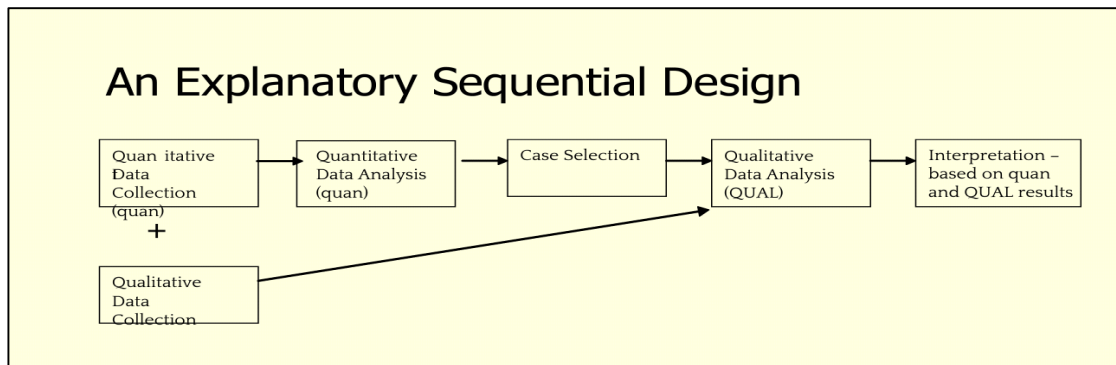
Figure 3.1. Creswell. (2007). A Visual Model of an Explanatory Sequential Design

3.2.Data Collection Methods:

The researcher decided to use two data collection methods; one is quantitative and the other is qualitative. Quantitative data is gathered through a pretest and a posttest, whereas qualitative data is gathered through reviewing documents.

3.2.1. Quantitative data collection. When attempting to collect numerical data, tests can be one of the compelling choices a researcher would take. Considering that they are a "powerful method of data collection, an impressive array of tests for gathering data of a numerical rather than verbal kind" (Cohen, Manion & Morrison, 2007), the researcher used "home-grown" critical thinking pretest and posttest based on activities that aim to measure critical thinking competences. The tests' answers are assessed according to a researcher-produced critical thinking scoring rubric that contains the critical thinking competences assessed independently from each other. Firstly, the choice of writing-based activities is based on the fact that the participants are instructed to write a literature review in which they are supposed to apply critical thinking competences. Thus, the test should be, on one hand, "domain referenced" (Gripps, 1994 as cited in Cohen et al., 2007) in which specifying the content is given value, and on the other, criterion-referenced wherein the focus lies on participants' achievement of certain criteria. Secondly, these competences are assessed apart from each other to track down any specific progress and to discover which ones represent a challenge to participants and also, dependently to uncover the overall progress of critical thinking skill because

> if the scoring of a test is specific then this enables variety in reporting to be addressed, for example, results may be reported item by item, section by section, or whole test by whole test. This degree of flexibility might be useful for the researcher, as it will enable particular strengths and weaknesses in groups of students to be exposed (Cohen et al., 2007, p.430).

3.2.2. Qualitative data collection. As for gathering qualitative data, we have selected documents represented in messenger interactions of the research participants. Marshall (2006) advocated supplementing other data collection tools with collecting and analyzing documents which might be produced in the course of daily events or constructed particularly for the imminent research (which is our case). He stated that "the use of documents often entails a specialized analytic approach called content analysis. The raw material for content analysis [which explains its choice for analyzing data] may be any form of communication" (p. 108). Accordingly, messenger interactions are a form of communication which entails that we can consider them as documents. One of the reasons for using this method is "to determine if implementation of the program reflects program plans" which may help the researcher in comparing between what was planned and what actually happened (U.S Department of Health and Human Services (U.S DHHS), 2018). In our case, it is beneficial to see if critical thinking skills are reflected in their messenger interactions. According to U.S DHHS, document review may reveal problems that cannot be noticed through other means even though it is time consuming.

3.3. Data Analysis Procedures:

Because the study is based on a mixture of qualitative and quantitative approaches, the procedures used for analysis are of two kinds: qualitative and quantitative. Accordingly, qualitative data is analyzed through content analysis while quantitative data is analyzed through descriptive statistics and inferential statistics.

3.3.1. Quantitative data analysis. To analyze the quantitative data represented in pretest and posttest results, we selected to use statistics. According to Howitt and Cramer (2011), "statistics are used to describe our data but also assess what reliance we can place on information based on samples" (p.3). Howitt and Cramer (2005) differentiated between categorical data and score data and emphasized different statistical procedures to describe and summarize each one of these types. Since we have score data, the suggested ways for analysis are frequency tables as a first step. These tables might be ambiguous especially when having many scores. Even though, they can be adjusted through histograms for instance. The vital role of descriptive statistics and inferential statistics in analyzing score data is undeniable wherein the former help us in understanding our data through using measures of central tendency (mode, mean, and median) and measures of variability (range, variance and standard deviation), while the latter "is about the confidence with which we can generalize from a sample to the entire population" (Howitt and Cramer, 2011, p.4).
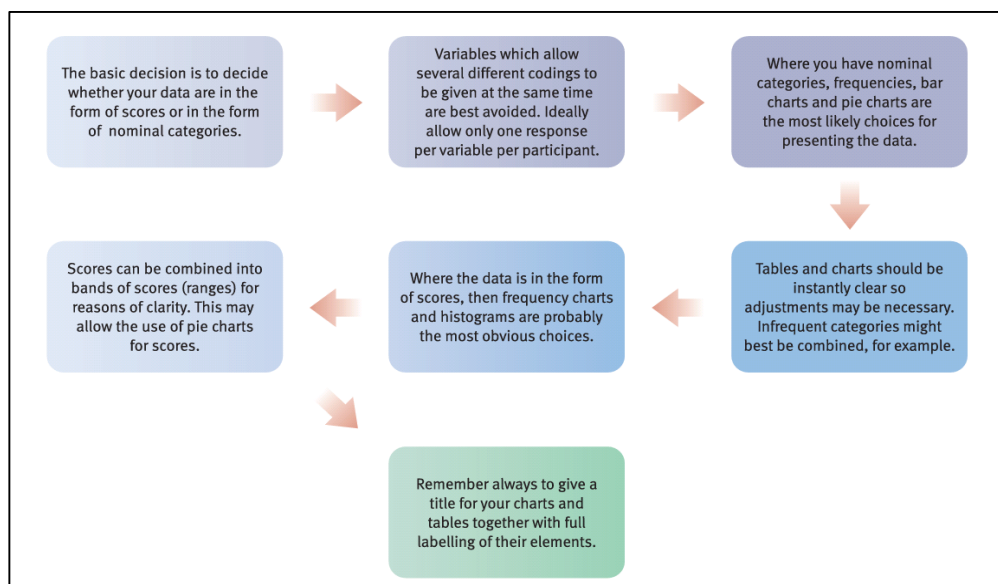
Figure 3.2. Howitt and Cramer (2011). Conceptual Steps of how to Describe Variables using Tables and Diagrams
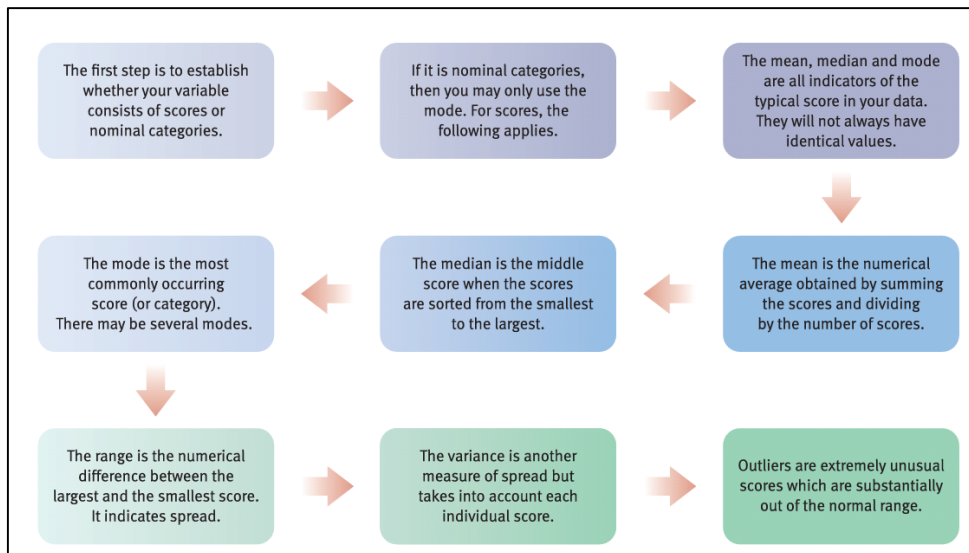
Figure 3.3. Howitt and Cramer (2011). Conceptual Steps for Understanding how to Describe your Variables Numerically

Accordingly, descriptive statistics offers many options for the researchers to choose from the best ways to summarize and describe data gathered whatever its kind is categorical or numerical.

According to Chelli (2016), "descriptive statistics are the basis for inferential statistics" (p.43). In reference to this, inferential statistics as opposed to descriptive statistics make inferences and predictions based on the data gathered. "This includes, for example, hypothesis testing, correlations, difference testing, and the testing of statistical significance" (p.45).
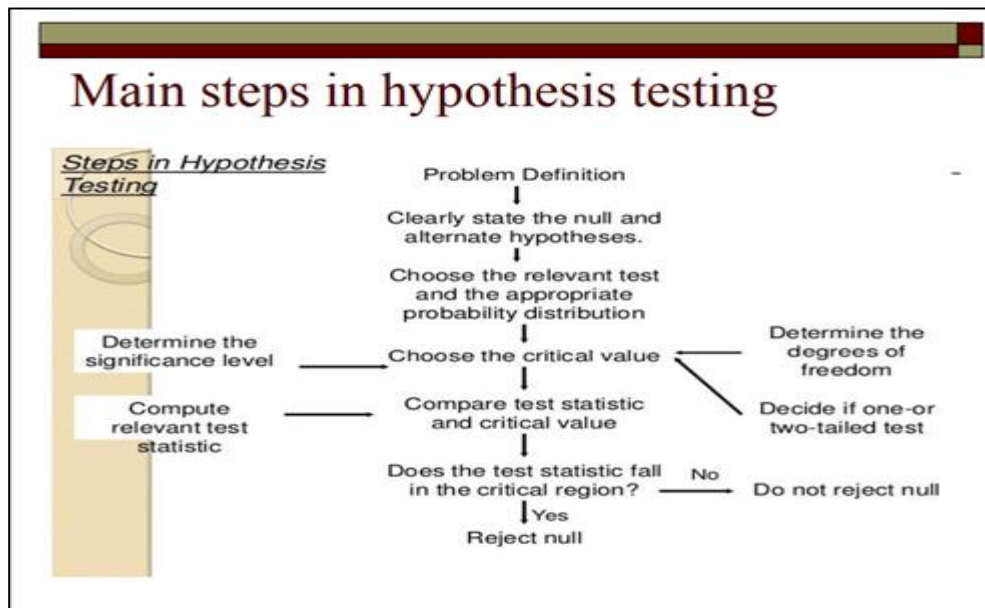
Figure 3.4. Chelli (n.d) Main Steps in Hypothesis Testing

Because we have used one sample pretest posttest design for the quantitative phase of our study, the relevant test choice is the paired samples t-test. One reason is that "Paired-samples t-tests (dependent t-tests) are for the research design where we want to compare two sets of scores obtained from the same group (before and after the treatment)" (p.46).

3.3.2. Qualitative data analysis. Content analysis of messenger interactions is used in order to discover the frequencies of participants' critical thinking questions' usage that are used designed for their messenger-assisted cooperative project interactions. According to Writing@CSU (2004), this tool firstly, determines the existence of certain words or concepts within texts, then the meaning and the relationship between these concepts are quantified and analyzed by the researchers in order to make inferences about them. The researchers choice of this method is based on some authors' views like Kothari (2004) who stated that content analysis is "based on analyzing the content of documentary materials […] and all other verbal materials which can be either spoken or printed" (p.110). Accordingly, messages are one kind of verbal materials which implies that this method is applicable to them. Weber (as cited in Mackey& Grass, 2005, p. 76) suggests that the highest quality content-analytic studies use both

quantitative and qualitative analysis of texts (texts defined as any form of written communication). It can be deduced that content analysis is worthwhile because it allows for quantitative and qualitative analysis and consequently, qualitative and quantitative data which is a merit for our mixed methods research study especially when merging the data at the interpretation stage. Content analysis follow certain steps. The first one is coding the text or breaking it down into categories on a variety of levels (word, interpretation of a word, phrase, sentence, or theme). The second step is to select the appropriate method for analysis: conceptual or relational. In our research, we have chosen conceptual analysis which involves the following steps:

1. Choosing a concept or concepts for examination

2. Deciding whether to code for existence or frequency of a concept.

3. Quantifying and tallying the occurrence of the selected concept (the concept might be explicit which is easy or implicit which involves a degree of subjectivity as it is based on judgment

4. Decide on how you will distinguish among concepts

5. Develop rules for coding your texts

6. Decide what to do with "irrelevant" information

7. Code the texts on the basis of selective reduction

8. Analyze your results (Writing@CSU, 2004)

The following figure represents the coding process:
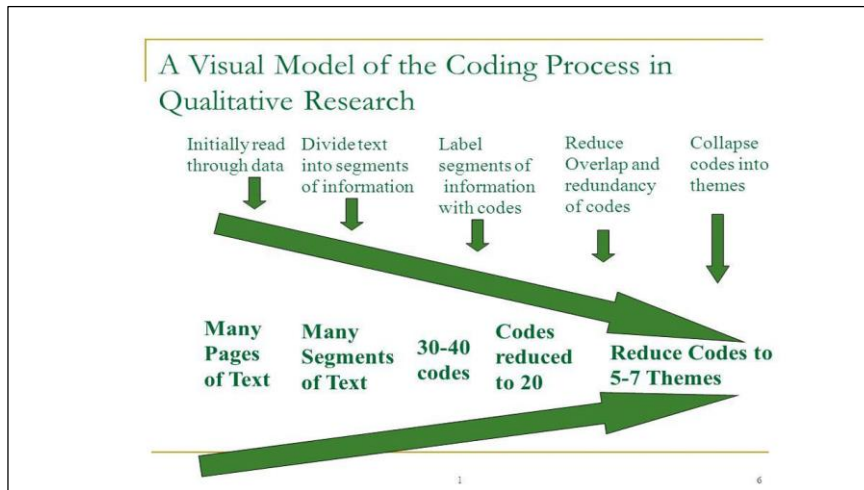
Figure 3.5. Chelli (n.d). A model of the Coding Process

3.3.3. The mixing stage analysis. The third research question sought to discover if learners' messenger interactions are reflective of the effect of the treatment on the expected improvement in CT skills. Scatterplot and Pearson's correlation are used to discover that there is a positive significant relationship between the frequency of CT questions and the difference in collective (group) test scores. According to Howitt and Cramer (2000), scatterplots are the best choice for a visual representation of the relationship between two variables. Scatterplots are used to show the nature of these relationships. There exist three kinds of correlation: positive, negative, and zero correlation. Positive correlation involves two variables that are statistically corresponding where an increase or decrease in one variable creates a similar change in the other. Negative correlation involves two variables that are statistically opposite where an increase in one variable creates a decrease in the other. Zero correlation involves two variables that are not statistically connected where a change in one variable does not trigger a corresponding change in the other. Scatterplots are the suitable choice for visually examining the nature of the relationship between two variables; however, numerical indices like Pearson's correlation are essential to measure the strength of the relationship. Pearson's correlation can vary from a maximum negative value of -1 to a maximum positive value of 1. A value of -1 describes a perfect negative relationship while a value of 1 describes a perfect positive relationship. A value of 0 or close to 0 may indicate no relationship. A negative ($-$) value

denotes a negative relationship on the scatterplot; and a positive (+) value denotes a positive relationship on the scatterplot. Stronger relationships between variables are determined by larger numerical values (Howitt and Cramer, 2000). Discovering the nature and strength of the relationship between variables is not sufficient to reject or accept a hypothesis; consequently, significance testing of the correlation coefficient is essential. In order to calculate the statistical significance of the correlation coefficient, the following steps are recommended: (1) calculate the degrees of freedom (n-2); choose between one-tailed and two-tailed hypotheses tests; (3) choose the level of significance; (4) consult the table of critical values and find critical value associated with what was previously selected. After finding the critical value, compare it with the correlation coefficient to test the significance of your findings.

3.4. Population and Sampling:

The target population for this study will be third year EFL students during the academic year 2019/2020 (360 student as reported by the Head of the department) at Biskra University because firstly, they have been studying research methodology for a whole year, secondly, they did not have significant practice in this course according to the preliminary study results, and thirdly, they are easily approachable since their time planning is appropriate for the researcher. The sampling technique will be used is purposive sampling. According to Kothari (2004), "this sampling method involves purposive or deliberate selection of particular units of the universe for constituting a sample which represents the universe" (p.15). Thus, the participants will be selected should have certain characteristics like willingness to participate in the study and commitment to work. The sample consists of ten students because it is a mere case study; hence, generalization of the results is not its goal. Marczyk, DeMatteo and Festinger (2005) state that: "case studies involve an in-depth examination of a single person or a few people". They are unlike experimental research which aims at "drawing sample-to-population inferences, and generalizing to other samples"; case-study approach emphasizes on "individuality and describing the individual as comprehensively as possible" (p.147).

3.5. Ethical Issues:

Oxford dictionary defined ethics as the "standards that govern the conduct of a person, especially a member of a profession". In our case, as belonging to the field of social science research, we should be aware of the moral issues concerning those involved in or affected by our studies which in turn put us in a dilemma of balancing between the research demands and the participants' rights. This dilemma is called the costs/benefits ratio (Cohen, Manion, and Morrison, 2000). Other ethical dilemmas mentioned by the writers are privacy, anonymity, and confidentiality.

3.5.1. Sources of ethical issues. According to Cohen et al. (2000), these issues might be triggered by any stage of the research. For example, the nature of research, the context, the procedures, methods of data collection, the nature of the participants, type of data collected, and what is to be done with the data.

3.5.2. Ethical dilemmas. These are represented by the following elements:

3.5.2.1. The costs/benefits ratio. Before engaging into conducting research, benefits of research against costs to participants must be considered. Cohen et al. (2000) stated some of the benefits of research to society in one hand and to the participants on the other hand. The former "may take the form of crucial findings leading to significant advances in theoretical and applied knowledge" and the latter "could take the form of satisfaction in having made a contribution to science and a greater personal understanding of the research area under scrutiny". However, the costs to participants may involve abuse to "dignity, embarrassment, loss of trust in social relations, loss of autonomy and self-determination, and lowered self-esteem" (p.50).

3.5.2.2. Privacy. Dienner and Crandall (1978) as cited in Cohen et al. (2000), identified privacy from three different perspectives. These are: the sensitivity of the information being given, the setting being observed, and dissemination of information. We tried to explain these in terms of questions: to what extent is the information collected by the researcher is personal and

threatening? Is the research setting private or public? Can we establish a link between personal information and participants' identity?

3.5.2.3. Anonymity. Cohen et al. described anonymity as the process of protecting the participants' identity by avoiding linking the information they provide to their identity. Thus, names of participants or any other personal information that may identify them must not be used. For example, the researcher may use instead a code number because in social science research the interest lies in the behavior of the participant not the participant himself.

3.5.2.4. Confidentiality. Confidentiality was explained by Cohen et al. as the way in which the researchers are able to link between the information and the informant, they keep their participants' identities. It is suggested that researchers, at the access stage or at the point of collecting data, should make their position clear to the participants by explicitly explaining the meaning and limits of confidentiality related to the research study they are undertaking.

Following the authors' explanations and suggestions concerning ethical issues and dilemmas in social science research, we tried to bring some rightness to our investigation through following an illustration they have provided which represents an ethical code for researchers. It seems that we have insured all the obligations related to our participants through using firstly, a contract of commitment in research. This contract reveals the identity of the researchers, the aim and nature of the research, and explains to participants their rights and responsibilities. It also contains a detailed explanation of the research process and the way data will be collected. In addition, it ensures the participants' dignity by restricting their way of communicating with each other. Moreover, the contract guarantees the privacy and anonymity of participants. And secondly, an instructional session where we contacted the participants to explain the aim of the research, its process, and its benefits for the participants as well as to receive and answer their questions concerning any ambiguities. Furthermore, the researchers informed the participants about their freedom in terminating their involvement wherein eight participants withdrew after having the pretest. Concerning the research in general, we tried to

avoid ethical issues related to data collection methods and the nature of research itself by conducting our research on the basis of choices grounded in research methodology literature. Furthermore, the possibility of   consulting teachers is available all the time.

Box 2.9
An ethical code: an illustration

1   It is important for the researcher to reveal fully his or her identity and background.
2   The purpose and procedures of the research should be fully explained to the subjects at the outset.
3   The research and its ethical consequences should be seen from the subjects' and institution's point of view.
4   Ascertain whether the research benefits the subjects in any way (beneficence).
5   Where necessary, ensure the research does not harm the subjects in any way (non-maleficence).
6   Possible controversial findings need to be anticipated and where they ensue, handled with great sensitivity.
7   The research should be as objective as possible. This will require careful thought being given to the design, conduct and reporting of research.
8   Informed consent should be sought from all participants. All agreements reached at this stage should be honoured.
9   Sometimes it is desirable to obtain informed consent in writing.
10   Subjects should have the option to refuse to take part and know this; and the right to terminate their involvement at any time and know this also.
11   Arrangements should be made during initial contacts to provide feedback for those requesting it. It may take the form of a written résumé of findings.
12   The dignity, privacy and interests of the participants should be respected. Subsequent privacy of the subjects after the research is completed should be guaranteed (non-traceability).
13   Deceit should only be used when absolutely necessary.
14   When ethical dilemmas arise, the researcher may need to consult other researchers or teachers.

Source Adapted from Reynolds, 1979

Figure 3.6. Cohen et.al (2000). An Ethical Code

3.6. Procedure:

This research is conducted according to the following steps:

- A sample was selected and devised into four groups (two groups of three members and two groups of two members) according to students' free choice.

- The researcher opened a messenger group with the supervisor and asks the participants to join it. Participants' questions about the process of the project and researcher's instructions are communicated through this group. The presence of the supervisor is for authority matters and to help the researcher in answering participants' questions.

- One session was scheduled in order to provide the participants with explanation about the meaning of critical thinking, the different critical thinking competences, and the research

project requirements. Then, instructions were given about how the project should be conducted.

- Each group was asked to open a messenger group where they discuss only what is related to the project. Thus, there are four messenger groups.

- Participants were provided with a critical thinking questions sheet and asked to use it whenever needed while discussing.

- Participants signed a contract of commitment in research prepared by the researcher.

- To ensure students' conformity with the project work i.e., not discussing other irrelevant or inappropriate topics, the researcher is a member of each group. Moreover, the researcher represents on one hand an authoritative power and on the other hand plays the role of facilitator and instructor.

- To ensure participants' understanding of the project (see appendix 4), a project planner is provided.

- Participants are asked to answer the critical thinking pretest.

- The time required for finishing the project is six weeks following this agenda:

Table 3.1

The project agenda

Timing	Tasks
First week	Choosing a topic.
Second week	Gathering research studies
Third week	Reading and filtering the research studies.
Fourth week	Drafting the literature review.
Fifth week	Drafting the literature review
Sixth week	Revising, editing and proofreading.

- After finishing the project, participants are asked to answer the posttest.

3.7. Instruments:

    3.7.1. The pretest. In order to collect information about participants' level concerning CT skills, the researcher asked the participants to answer a self-constructed CT pretest (see appendix 1). This latter is composed of six activities wherein each one of these aimed at testing one of the CT skills, mainly remembering, comprehension, analyzing, reasoning, evaluation, and synthesizing (creativity). The purpose behind this pretest is to have an idea about participants' current level to be compared later with their level after the treatment.

    3.7.2. The treatment. In an attempt to discover the role of messenger assisted cooperative projects on CT skills, the researcher asked the participants to create messenger groups in order to discuss their projects. The project required from the groups was to write a literature review for a research proposal. Firstly, the researchers explained, in the instructional session, the way of writing a literature review and provided them with a handout (see appendix 7) that contained the explanation and the steps of conducting a literature review as well as a project planner (see appendix 4) to keep them on the track. Then, each group member has individual as well as collective tasks to accomplish.

Table 3.2

Collective and individual tasks

Individual tasks	Collecting and sharing research articles related to the problem Summarizing the articles
Collective tasks	Finding a research problem Evaluating these articles Sharing and evaluating the summaries Organizing the body paragraphs Writing the introduction and the conclusion

 The objective from the treatment is urging the participants to use their CT skills through reading APA papers (research articles), writing APA paper (literature review), and evaluating these

papers through asking CT questions. This latter is simplified by providing the participants with CT questions' sheet (see appendix 6) in order to use it whenever needed.

3.7.3. The posttest. To discover if there is a progress in participants' CT skills, the researcher designed another CT posttest (see appendix 2). This test is similar to the pretest in its structure i.e. it seeks to test the same skills using the same kind of questions; however, the content is different.

3.7.4. The critical thinking scoring rubric. To evaluate participants' answers of the pretest and the posttest, the researcher designed a critical thinking scoring rubric. This rubric is composed of six rating criteria: remembering, comprehension, analysis reasoning, evaluation, and synthesis. Each rating criterion is defined according to certain characteristics that change in accordance with a rating scale of three points: exceed, meet, and fail. If the participant's answer exceeds the level, the score is 3. However, if the answer meets the level, the score is 2. On the other hand, if the participant fails in answering the question, the score is 1. Accordingly, the participant has two kinds of scores, one is for each of the criteria and the other is the sum of the scores of the rating criteria that represents the CT score.

Conclusion

The present chapter aimed at providing a theoretical background about the methodology adopted throughout this study by explaining the research paradigm, approach, design, data collection methods and data analysis procedures, as well as an examination of the ethical issues. This chapter has been an opportunity to discover the advantages of mixed methods approach as being intersect for qualitative and quantitative approaches. In addition to the theoretical framework, a description of the practical framework has been presented by determining the procedure and the instruments used for collecting data for this study.

The next chapter will present a description of the results obtained, an interpretation, and a discussion of these results. Besides, it will state the limitations and implications of this study and open the door for further research.

Chapter four: Data Analysis and Discussion

4.1. Data Analysis:

    4.1.1. Analyzing the quantitative data

        4.1.1.1. Descriptive statistics

        4.1.1.2. Inferential statistics.

    4.1.2. Analyzing the qualitative data.

        4.1.2.1. Conceptual analysis results.

    4.1.3. Mixing quantitative and qualitative results. In order

    4.1.3. Mixing quantitative and qualitative results

        4.1.3.1. Individual and collective results

        4.1.3.2. Correlation results.

4.2. Discussion:

    4.2.1. Discussing quantitative results

    4.2.2. Discussing qualitative results.

    4.2.3. Discussing the mixing stage results.

4. Data Analysis and Discussion

Introduction

Chapter three identified and rationalized the methodology selected to investigate the research problem of this study; the effect of using messenger-assisted cooperative projects to promote EFL learners' critical thinking skills. The present chapter reports the findings of the data gathering stage. The data collected are analyzed in relation to the research questions posed in this dissertation:

In addition, the chapter provides a discussion of the results on the light of the existing literature.

4.1. Data Analysis:

To investigate the questions, two data gathering methods were utilized; tests and documents. Content analysis, descriptive statistics and inferential statistics were used to analyze and display the qualitative and quantitative data gathered.

4.1.1. Analyzing the quantitative data. In order to address the first research question 'Does implementing messenger-assisted cooperative research projects promote EFL learners' critical thinking skills?', critical thinking pretest and posttest were addressed to students. For better understanding, the tests' results were displayed and analyzed using descriptive and inferential statistics using manual methods and Excel.

4.1.1.1. Descriptive statistics. A description and summary of the numerical data obtained from the pre and posttests is provided using descriptive statistics. The following statistical analysis serves also as a basis for inferential statistics used afterwards.

Table 4.1

The Pretest and the Posttest Measures of Central Tendency and Measures of Variability

| Sample size | Test | | Measures of central tendency | | | | | Measures of variability | | |
		Min	Max	Mode	Median	Mean	Range	Variance	Standard deviation
n=10	The pretest	5	13	10 11	10.5	10.3	8	5.12	2.26
	The posttest	12	16	14 15	14.5	14.3	4	2.01	1.41

Table 4.1 describes the numerical data obtained from the pretest and posttest through providing the measures of central tendency and the measures of variability of each data set. As it is shown in the table, notable differences in minimum and maximum scores between the pretest and the posttest (pretest min=5, posttest max=13; posttest min=12, posttest max=16) with a decrease of range between the lowest and highest score from eight to four after the treatment. On the other hand, students scored better on average in the posttest (14.3>10.3) and was followed by a parallel improvement in median scores (14.5>10.5). In addition, the most occurring scores in the pretest were 10 and 11, while in the posttest, the majority of students scored higher i.e. 14 and 15. Furthermore, the variance and the standard deviation of the posttest are larger than those of the pretest which means that data are more spread out from the mean. Accordingly, the posttest scores are less consistent than the pretest scores.

From these statistics, we can see that there is an overall improvement of CT skills. However, we cannot ensure this increase the statistical significance of this increase. This latter entails testing the statistical significance and testing the hypothesis.

4.1.1.2. Inferential statistics. In order to make inferences about our sample like discovering the significance of our results and testing our hypothesis, inferential statistics are used.

- Testing the statistical significance:

Step 1: Choose a test statistic depending on the type of your research. Because we applied a pretest posttest design (a repeated measures design), the suitable choice is paired samples t-test (Duncan and Cramer, 2000).

Step 2: Calculate the t-ratio using the following steps proposed by Chelli (2017).

1. List the raw scores by group.

2. Subtract each Y score from each X score (d).

3. Square each d and sum.

Table 4.2

Students' Pretest and Posttest Scores, Differences between Scores and Differences

Squared

Students	Pretest score (X)	Posttest score (Y)	d	d^2
1A	13	16	-3	9
2A	11	16	-5	25
3A	13	12	1	1
1B	5	12	-7	49
2B	11	15	-4	16
3B	9	14	-5	25
1C	10	14	-4	16
2C	10	15	-5	25
1D	10	15	-5	25
2D	11	14	-3	9

4. Use the following formula to calculate the t-ratio.

$$t = \frac{\frac{\Sigma d}{N}}{\sqrt{\frac{\Sigma d^2 - \frac{(\Sigma d)^2}{N}}{N(N-1)}}}$$

d = difference between matched scores   N = number of pairs of scores

t = 2.8

5. Calculate degrees of freedom (df)

df = N (number of pairs) - 1

df = 10-1= 9

6. Find the probability value (p) associated with the obtained t-ratio using the abbreviated table of Critical Values for t-test.

Degrees of freedom	One-tailed 0.05 level	Two-tailed 0.05 level	Degrees of freedom	One-tailed 0.05 level	Two-tailed 0.05 level
1	6.31	12.71	21	1.72	2.08
2	2.92	4.30	22	1.72	2.07
3	2.35	3.18	23	1.71	2.07
4	2.13	2.78	24	1.71	2.06
5	2.02	2.57	25	1.71	2.06
6	1.94	2.45	26	1.71	2.06
7	1.90	2.37	27	1.70	2.05
8	1.86	2.31	28	1.70	2.05
9	1.83	2.26	29	1.70	2.05
10	1.81	2.23	30	1.70	2.04
11	1.80	2.20	35	1.69	2.03
12	1.78	2.18	40	1.68	2.02
13	1.77	2.16	45	1.68	2.01
14	1.76	2.15	50	1.68	2.01
15	1.75	2.13	60	1.67	2.00
16	1.75	2.12	70	1.67	1.99
17	1.74	2.11	80	1.66	1.99
18	1.73	2.10	90	1.66	1.99
19	1.73	2.09	100	1.66	1.98
20	1.73	2.09	∞	1.65	1.96

Figure 4.1. Howitt and Cramer (2000). Table of Critical Values for the T-test

According to the figure above, for a significance level of α=0.05 and df=9, the one-tailed probability value (p) associated with the obtained t-ratio is p= 1.83.

Table 4.3

Significance level, degrees of freedom, t-ratio, and probability value

Significance level (α)	Degrees of freedom (df)	t-ratio	Probability value (p)
0.05	9	2.8	1.83

Step 7: Compare between the t-ratio and the p value. The t-value (ignoring sign) should be equal to or greater than the listed values in the second or third columns to be statistically significant at the stipulated level (Howitt and Cramer, 2000).

For p= 1.83 and t (10) = 2.8 $\Longrightarrow$ t value > p value $\Longrightarrow$ the result is statistically significant. This finding implies that the results might be due to chance in 5% of the cases.

- Hypothesis testing:

Step 1: choose the type of the hypothesis (two-tailed or one-tailed hypothesis).

The paired sample t-test has two competing hypotheses, the null and the alternative hypothesis. The alternative hypothesis can take one of several forms depending on the expected outcome. If the direction of the difference does not matter, a two-tailed hypothesis is used. Otherwise, a right tail or left tail hypothesis can be used to increase the power of the test. The null hypothesis remains the same for each type of hypotheses.

Table 4.4

The Difference between One-tailed and Two-tailed Hypotheses

One-tailed hypothesis		Two-tailed hypothesis
Null hypothesis	Right tailed hypothesis $\bar{X} \leq 0$ _____ Left tailed hypothesis $\bar{X} \geq 0$	Null hypothesis $\bar{X} = 0$
Alternative hypothesis	Right tailed hypothesis $\bar{X} > 0$ _____ Left tailed hypothesis $\bar{X} < 0$	Alternative hypothesis $\bar{X} \neq 0$

Since we hypothesized that implementing messenger-assisted cooperative research projects promotes EFL learners' CT skills which entails that the predicted effect is $\bar{X}_d > 0$, the type of hypothesis is right-tailed hypothesis.

Step 2: State the null (H_0) and the alternative (H_1) hypotheses.

H_0: there will be no difference between sample means before and after the treatment (messenger-assisted cooperative projects will have no effect on EFL learners' CT skills). Here the mean difference has to be equal to or less than zero ($\bar{X}_d \leq 0$).

H_1: there will be an increase in sample mean after the treatment (messenger-assisted cooperative projects will promote EFL learners' CT skills). Here the mean difference is greater than zero ($\bar{X}_d > 0$).

Step 3: determine the significance level.

It defines the probability that the null hypothesis will be rejected. The most commonly used determiner is $\alpha = .05$. It helps at specifying the size of the region where the null hypothesis should be rejected. Unlike two-tailed tests wherein the rejection region is divided into two tails, the rejection region in one-tailed tests is either in the left tail or in the right tail depending on the kind of hypothesis. The figure below better illustrates the rejection region for one-tailed and two-tailed and two-tailed hypotheses.
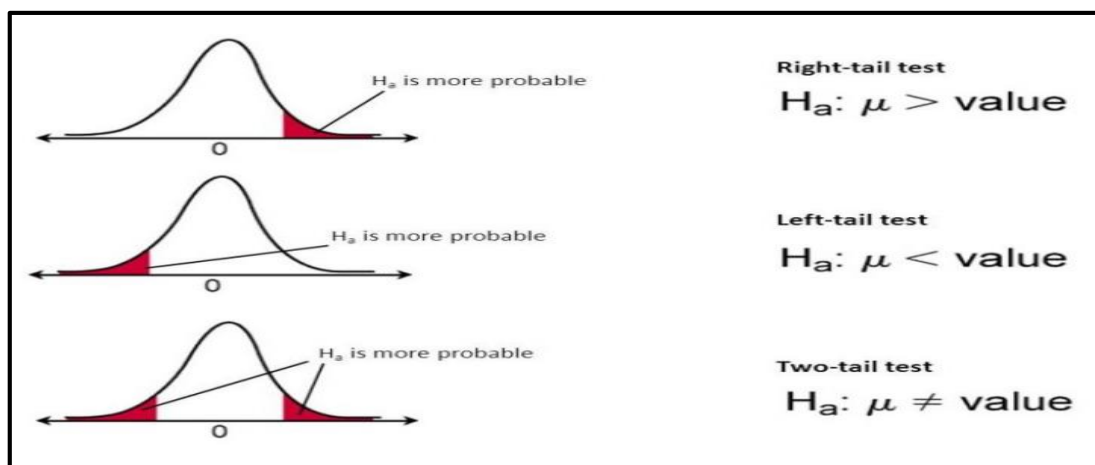
Figure 4.2. Genesis. (2018).Rejection Region for One-tailed and Two-tailed Hypotheses. Retrieved from https://www-fromthegenesis.com/difference -between-one-tail-and-two-tail-test/?amp-js-v=a2&amp-gsa=1&usqp=mq331AQFKAGwASA

Step 4: calculate the p-value

The p-value indicates the probability of achieving the results of the null hypothesis. A low p-value offers stronger support for the alternative hypothesis.

The p-value for our sample was already calculated and it is equal to 1.83

Step 5: draw your conclusion

In order to draw our conclusion, we need to compare between the p-value and t-ratio. The p-value is what separates the rejection region. Thus, the t-ratio should fall in the rejection region which implies that it should be larger than the p-value in order to reject the null hypothesis. The following bell curve is a better representation of our conclusion.
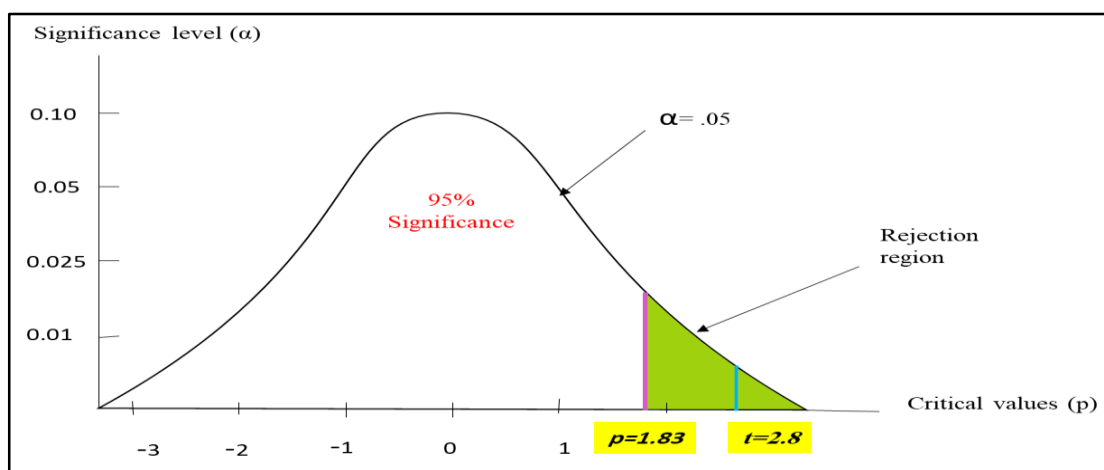
Figure 4.3. A Bell Curve Representing the Hypothesis Test

Figure 4.3 shows that with right tailed hypothesis, a p-value of 1.83 and significance level of .05, the t-ratio for our sample is located at the rejection region. Accordingly, the null hypothesis is rejected.

The results in this section shows that our study supports the alternative hypothesis that messenger-assisted cooperative projects will promote EFL learners' CT skills. These results will be extended and used in the mixing stage of our analysis.

4.1.2. Analyzing the qualitative data. In order to answer the second research question 'how is communication between EFL learners in messenger, while conducting their research projects, reflective of their critical thinking skills?', content analysis or more specifically conceptual analysis of messenger interactions was adopted. The intention from using conceptual analysis was to highlight students' explicit use of CT questions provided for them before beginning the project (see appendix 6); however, students did not use these questions at all. As an alternative, we tried to quantify the implicit existence of these questions and classify them according to the six CT competences.

4.1.2.1. Conceptual analysis results. After an extensive process of tallying, coding, and reduction of information, a representation of the frequencies of CT questions per each group classified according to the CT competencies was reached and depicted in the following figure.
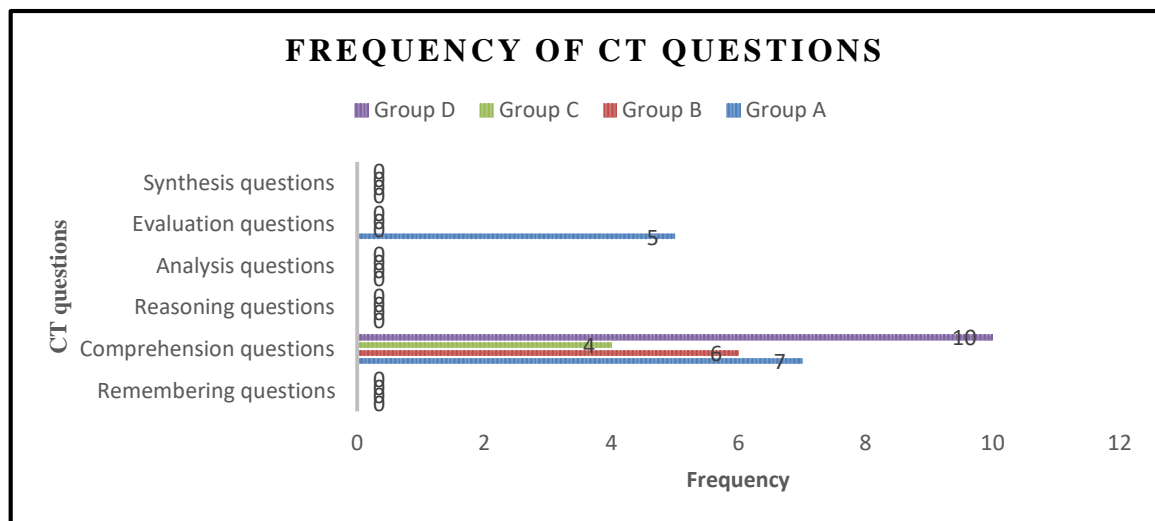
Figure 2.4. Frequency of CT Questions

Figure 4.4 reveals that all the groups asked comprehension questions during their messenger interactions. Only group A asked evaluation questions. However; the other kinds of CT questions were not addressed at all by any group. An example of these questions is portrayed in the following figure.
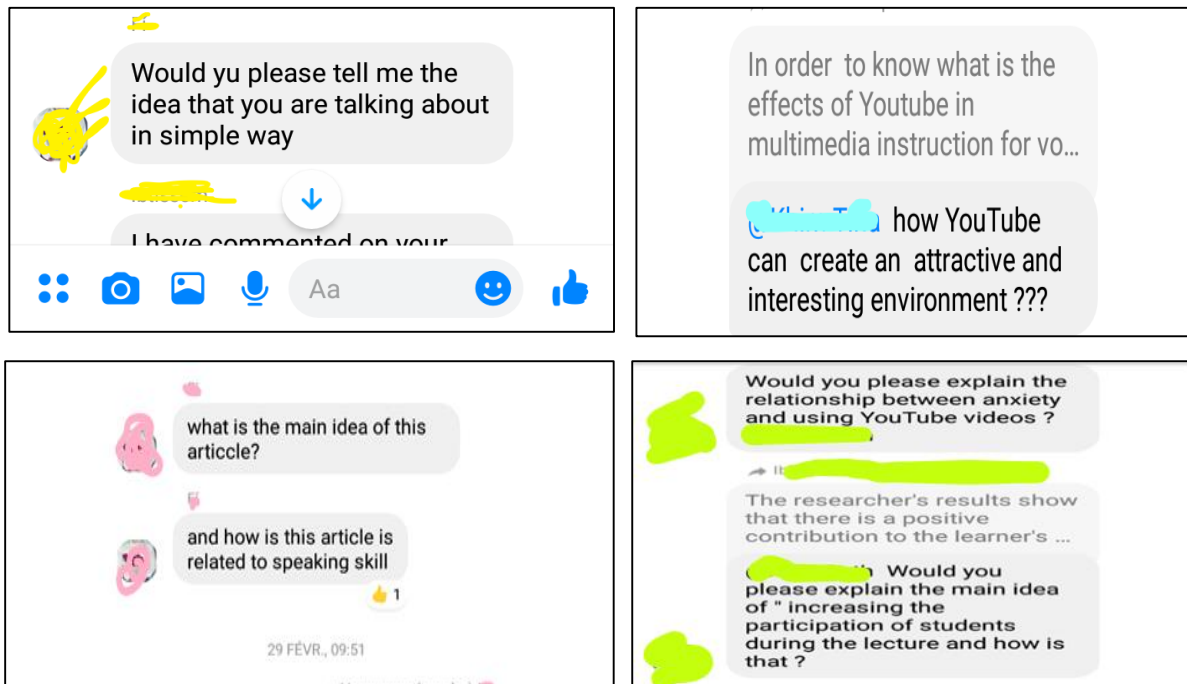
Figure 4.5. An Example of CT Questions Asked by Group Members

It is apparent from figure 4 that the majority of the questions are comprehension questions wherein reformulating information (paraphrasing) or explaining/stating the main ideas (paraphrasing or summarizing) were the main concern. Only minority of the questions-those asked by group A- are evaluation questions wherein the main concern was providing arguments to support claims.

The results thus obtained in this section reveals that communication between students while doing their projects does not really reflect their CT skills because they only depict one CT competency which is comprehension. Surprisingly, the kind of questions asked were only comprehension questions and few evaluation questions which raises challenges about the reasons behind the absence of other CT questions.

4.1.3. Mixing quantitative and qualitative results. In order to answer the third research question 'to what extent messenger interactions reflect the effect of messenger-assisted cooperative research projects on promoting critical thinking skills when compared with EFL learners' test results?', we tried to compare students' test scores with the frequencies of CT

questions. The objective here is to discover if there is a correlation between the change (increase/decrease) in CT scores of each CT competency and the frequency of CT questions.

    4.1.3.1. Individual and collective results. The table below provides individual (each student) as well as collective (each group) CT test scores related to each CT competency obtained by students before and after the treatment.

Table 4.5.

Individual and Collective CT Pretest and Posttest Scores Classified according to CT Competences

Students	Individual Pretest score						Individual Posttest score						Collective pretest score						Collective posttest score					
	Remembering	Comprehension	Analysis	Reasoning	Evaluation	Synthesis	Remembering	Comprehension	Analysis	Reasoning	Evaluation	Synthesis	Remembering	Comprehension	Analysis	Reasoning	Evaluation	Synthesis	Remembering	Comprehension	Analysis	Reasoning	Evaluation	Synthesis
1A	3	3	1	2	2	2	3	3	1	3	3	3	3	1.6	1.3	2	2.3	2	3	2	1	3	3	2.6
2A	3	2	1	1	2	2	3	3	1	3	3	3												
3A	3	0	2	3	3	2	3	0	1	3	3	2												
1B	3	1	0	0	1	0	3	1	1	2	3	2	3	2.3	0.3	0.3	1.6	0.6	3	2.3	1	2	3	2.3
2B	3	3	0	1	2	2	3	3	1	2	3	3												
3B	3	3	1	0	2	0	3	3	1	2	3	2												
1C	3	1	1	1	2	2	3	2	1	3	3	2	3	1	2	0.5	2	1.5	3	2	2	2.5	3	2
2C	3	1	3	0	2	1	3	2	3	2	3	2												
1D	3	1	1	3	1	1	3	3	1	3	3	2	3	1	1	2.5	1.5	1.5	3	2	1	3	3	2.5
2D	3	1	1	2	2	2	3	1	1	3	3	3												

Closer inspection of table 4.1 shows that there is a difference between individual as well as collective pretest and posttest scores of each CT competency. Nevertheless; it does not clearly highlight this difference. Consequently, we resorted to visual representations of the information provided in the table. The two following figures represents differences among individual and collective scores.
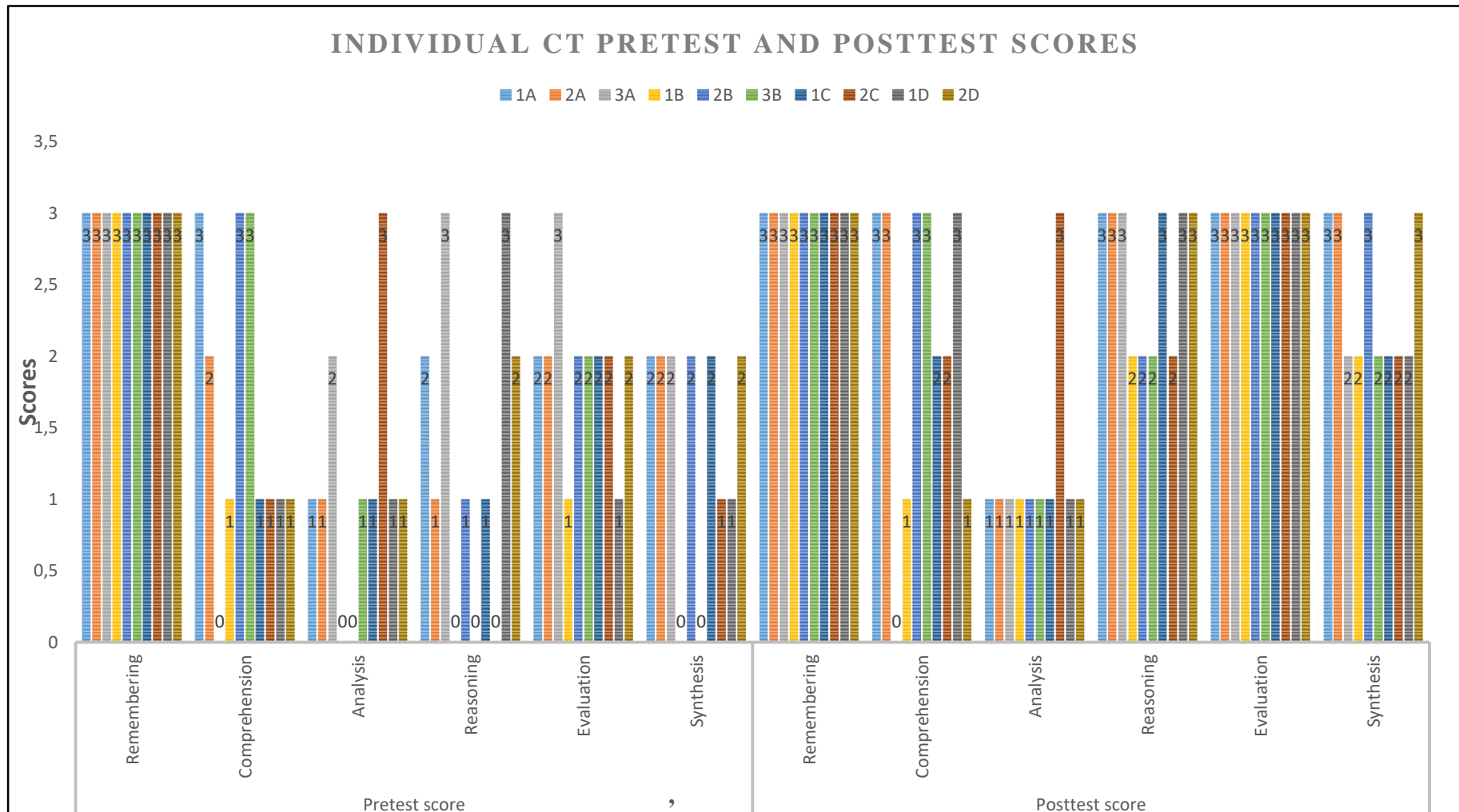
Figure 4.6. Individual CT Pretest and Posttest Scores

As can be seen from the chart above, an apparent increase in individual scores of some CT competences namely reasoning, evaluation, and synthesis was observed; however, no notable improvement was noticed concerning comprehension and analysis. On the other hand, it seems that students do not face any problems with remembering because they had full marks in the pretest as well as the posttest.
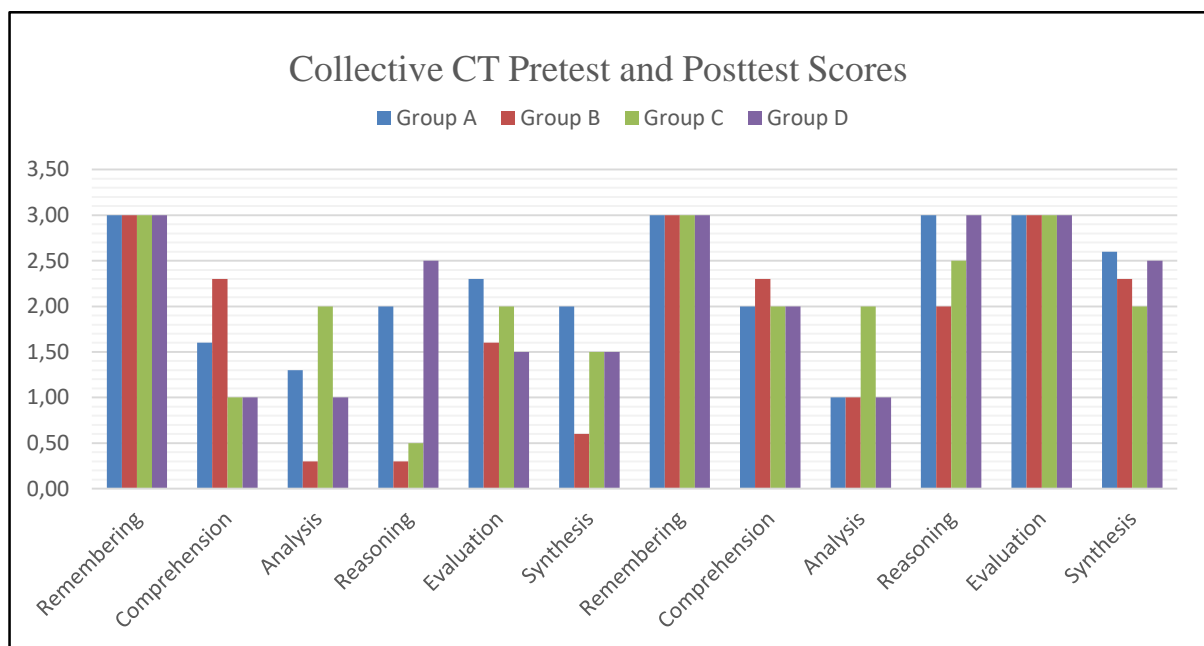
Figure 4.7. Collective CT Pretest and Posttest Scores

A comparison between figure 4.7 and figure 4.6 reveals that the improvement of individual scores was echoed on the collective scores i.e. a parallel increase of the same CT competences was observed.

Even though the results of the previous section reported an overall increase in the CT skill, extensive analysis of collective and individual results revealed learners' strengths and weaknesses concerning particular CT skills. Among the six skills, learners seem to have no problem in remembering; however, the weakness lies in the other skills. The proposed treatment appeared to be promising regarding reasoning, evaluation, and synthesis unlike comprehension and analysis wherein no improvement was reported. To discover the extent to which the effect of

the treatment is reflected in messenger interactions, an analysis of correlation between the difference in test scores and CT questions frequencies is provided as follows.

       4.1.3.2. Correlation results. The correlation between the two variables difference in collective test scores and the frequencies of CT questions was tested using Pearson's correlation. In order to discover the relationship between our variables, the following two questions must be answered (1) what is the direction of the correlation? (2) What is the strength of the relationship?

Table 4.6.

Frequencies of CT Questions and Differences between Collective scores

	Frequencies of CT questions				Difference between collective scores			
	Group A	Group B	Group C	Group D	Group A	Group B	Group C	Group D
Remembering	0	0	0	0	0	0	0	0
Comprehension	7	6	4	10	0.4	0	1	1
Analysis	0	0	0	0	-0.3	0.7	0	0
Reasoning	0	0	0	0	1	1.7	2	0.5
Evaluation	5	0	0	0	0.7	1.4	1	1.5
Synthesis	0	0	0	0	0.6	1.7	0.5	1

       The table above presents the frequencies of CT questions and the differences of collective scores of the four groups in our sample.

- Steps of Pearson's correlation (Howitt and Cramer, 2000) :

Step 1: state the null and alternative hypothesis.

H_0: No relation is expected between collective test scores and CT frequencies.

H_1: Collective test score are expected to be positively related to the frequencies of CT questions.

  Step 2: Use a scatterplot to present the relationship between the variables.
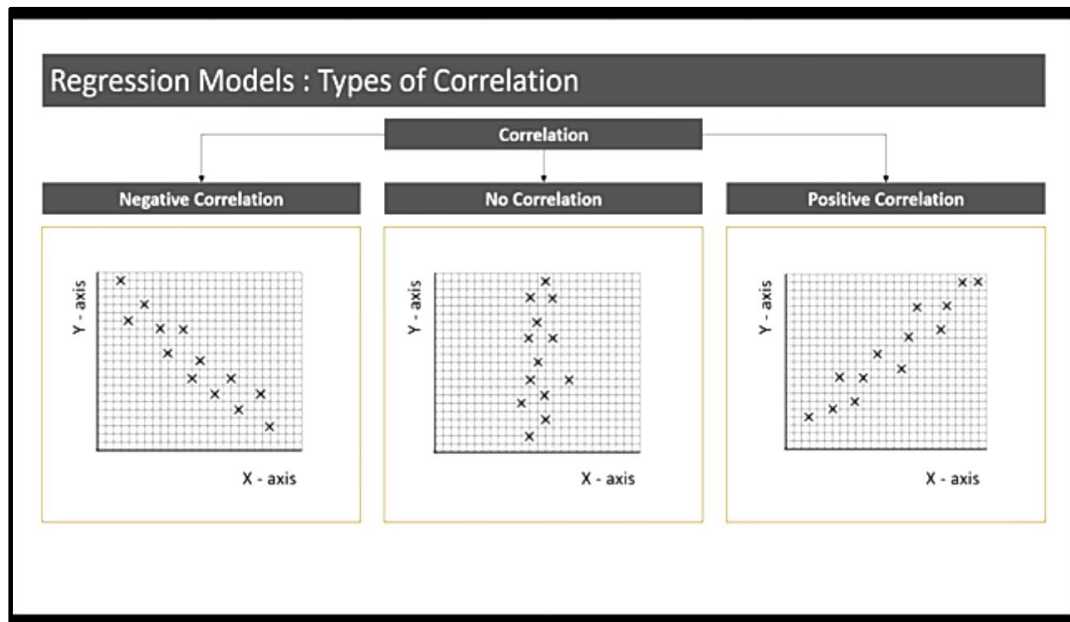
Figure 4.8. Easy ML. (2018). Types of Correlation and their Scatterplot Manifestations. Retrieved from https://www.youtube.com/watch?v=Vtn1zxAlE8&feature=share

Figure 4.8 shows the types of correlation which are positive, negative, and no correlation with examples of scatterplots corresponding to each one of these. In a positive relationship, the two variables move in the same direction and the scatter of points stretches across the scatterplot from the lower left corner to the right one. In negative correlation, the two variables change in opposite directions and the scatter of points extends from the upper left corner to the lower right one. In no correlation, the variables do not change in any constant proportion and the points in the scatterplot are scattered in a haphazard way.
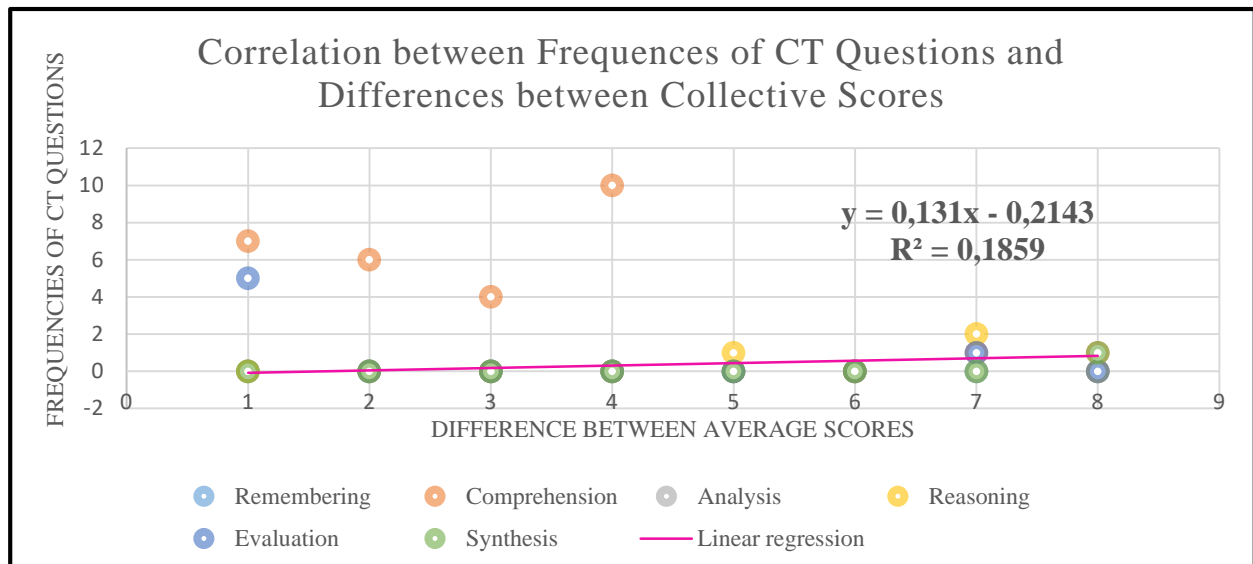
Figure 4.9. A Scatterplot Representing the Correlation between CT Questions and Differences between Collective Scores

As it is shown in the figure above, the correlation between the two variables is positive because the scatter of the points are moving in the same direction. However, observing the trend line does not give any information about the strength of the relationship. As a result, calculating correlation coefficient is needed to find the size of the relationship.

Step 3: calculate the correlation coefficient

If we now refer back to the scatterplot, the equation and the correlation coefficient squared R^2 are calculated and displayed on the graph using Microsoft Excel. Accordingly, the correlation coefficient $r = \sqrt{R^2} = \sqrt{.1859} = .4312$.

Table 4.7

Strength of Relationships between Variables and their Associated r Values

Values between .10 and .30	Weak relationship
Values between .40 and .60	Moderate relationship
Values between .70 and .90	Strong relationship

Note. Howitt and Cramer (2000). First steps in research and statistics.

According to the table above, the calculated correlation coefficient r = .4312 is located between .40 and .60 which means that there is a positive moderate relationship between the frequencies of CT questions and differences between collective test scores.

Step 4: hypothesis testing:

- State the null and alternative hypotheses:

    H_0: r = 0 H_1: r > 0

- Select a significance level

    The commonly used significance level is α = .05

- Calculate the degrees of freedom df

    df = n-2   df= 4-2= 2

- Use Pearson correlation critical values table to find the p-value

	Significance Level			
1-tailed	0.05	0.025	0.01	0.005
2-tailed	0.1	0.05	0.02	0.01
df				
1	0.988	0.997	0.9995	0.9999
2	0.9	0.95	0.98	0.99
3	0.805	0.878	0.934	0.959
4	0.729	0.811	0.882	0.917
5	0.669	0.754	0.833	0.874
6	0.622	0.707	0.789	0.834
7	0.582	0.666	0.75	0.798
8	0.549	0.632	0.716	0.765
9	0.521	0.602	0.685	0.735
10	0.497	0.576	0.658	0.708

Figure 4.10. Statology. (2019). Pearson Correlation Critical Values Table. Retrieved from https://www.statology.org/pearson-correlation-critical-values-table/

According to the critical values table in figure 4.10, for one-tailed hypothesis, the critical value p associated with the significance level α =.05, and degrees of freedom df =2 is p= .9.

- State decision rule:

    If r is greater than p, reject H_0.
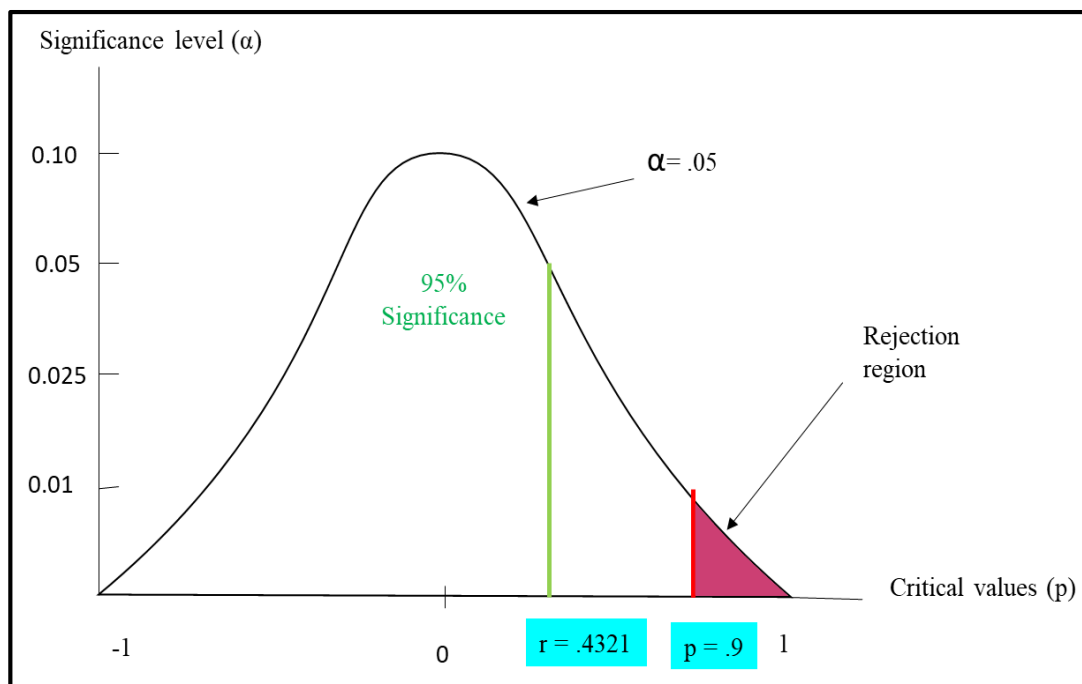
Figure 4.11. A Bell Shaped Distribution of Correlation

Figure 4.11 represents a bell shaped distribution for correlation. It is apparent from the bell curve that the r = .4312 < p = .9. Respectively, the Pearson correlation between the frequencies of CT questions and the differences between collective test scores indicated a non-significant positive relationship (r = .4321, df = 2, one-tailed, p = .09). Thus, the null hypothesis: no relation is expected between collective test scores and CT frequencies was supported in favor of the alternative.

In summary, the results from this study indicate that using Messenger-assisted cooperative projects is an effective procedure to promote EFL learners' CT skills. Descriptive and inferential statistics reported a significant increase between pretest and posttest collective as well as individual scores. However, analysis of individual results showed a divergence between the CT skills i.e. among the six skills, learners seemed to have no problem in remembering;

however, the weakness lies in the other skills. The proposed treatment appeared to be promising regarding reasoning, evaluation, and synthesis unlike comprehension and analysis wherein no improvement was reported. The results from content analysis were not promising because the frequency of CT questions that we used as a parameter to discover whether the communication between EFL learners while doing their projects is reflective or not of their CT skills was low. Consequently, we concluded that it is not really reflective of their CT skills. One surprising result was that the majority of questions were comprehension questions which urged us to wonder about the reasons behind the absence of the other kinds of CT questions. Finally, the results from the Pearson correlation proved that there is a moderate positive correlation between the frequencies of CT questions and the differences in collective test scores. Nevertheless, the correlation was not significant which diverted us from supporting the alternative hypothesis that collective test score are expected to be positively related to the frequencies of CT questions. Accordingly, messenger interactions does not reflect the effect of the treatment when compared with test scores.

4.2.Discussion:

Results from data analysis are discussed on the light of previous studies. Possible interpretations are provided and conclusions are drawn in the following section.

4.2.1. Discussing quantitative results. As mentioned in the reviewed literature in chapter one and two of this dissertation, prior studies have noted the effectiveness of CL and/or PjBL and the implementation of technology in improving CT skills. However, little was known about the utilization of technology as a supportive tool for CPjBL to promote CT skills. As a result, an initial objective of this study sought to determine the effect of Messenger-Assisted Cooperative Projects in promoting third year EFL learners' CT skills.

With respect to the first research question, it was found that messenger-assisted cooperative projects is an effective method in promoting CT skills. Even though this result has not previously been described, it broadly supports the work of other researchers in the areas of

CL, PjBL, and technology. Regarding the field of PjBL or CL, the importance and effectiveness of these methods in improving CT skills was admitted by several authors whether combined or not.

For instance, the Buck Institute for Education (BIE) believed that PjbL is a powerful pedagogy that helps students to learn how to be critical thinkers. Goodman (2010), on the other hand, advocated the positive effect of not only PjbL, but also CL in promoting CT. According to him, CL is an important strategy in building CT skills that today's workplace needs. Note that the researcher's focus here was on the importance of improving CT through CL for occupational purposes. Yet, the difference is that our study's concern is discovering its effect at the academic level.

This latter is consistent with Rochmahwati (2015) who focused on fostering students' CT through PjbL in a TEFEL class. The study stressed the activities that promote CT. Among these activities, discussion, providing feedback, and asking good questions are highlighted in the cooperative projects assigned to our research participants. The significant improvement of learners' CT skills after the treatment that involved the mentioned activities supports the researcher's findings. This also accords with Nicholas' (2017) student survey which indicated that PjbL can provide students with effective techniques for improving CT skills.

Unlike our study in which the six CT competences were examined in relation to messenger-assisted cooperative projects, Akhmad, Masrukhi, and Indiatmoko (2020) sought to analyze the effectiveness of "Science Technology Engineering Mathematics (STEM)-integrated PjbL model" to improve creative thinking abilities of elementary school students. The researchers employed a control group pretest posttest design. The findings concerning synthesis (creativity) in our pretest posttest design accords with their results which reported an increase in experimental class's creative thinking skills' results when compared with the control group results.

Increased scores in evaluation corroborates the findings of Sadeghi (2012) on one hand; however, findings concerning analysis are contradictory. His aim was to investigate the effects of CL on CT in an Iranian University within an EFL context. The results indicated that subscales of CT including critical analysis and critical evaluation in the experimental group were much higher than those of the control group.

Combining CL with PjBL in our study yielded positive results in promoting CT skills. These results reflect those of Jalinus, Syahril, and Nabawi (2018) who tended to reveal the efficacy of CPjbL model in enhancing cognitive competences up to the level of HOTS. The results showed that blending PjbL with CL gave birth to an effective model "CPjbL" which proved its positive impact on enhancing students' ability in the cognitive domain up to the HOTS level wherein they became able to analyze, evaluate, and create. Yet, the findings of the current study do not support Jalinus et.al's analysis outcomes i.e. learners' level increased only in evaluation and synthesis (creativity).

Messenger was used as a supportive tool for CPjBL in the present study. The improvement in CT skills shows its effectiveness. It seems that this result might not be formerly reported; however, similar studies implementing other technology tools were conducted.

For instance, an investigation on the effect of mobile learning over CT skills aimed at measuring CT dispositions. After a treatment of group discussion using questioning, collaboration, and sharing information through MMS, SMS, and MSN Messenger, creativity improved significantly: pre experience test mean was 2.81 while post experience test mean was 3.30 (Cavus & Uzunboylu, 2009). Another example is a literature review conducted by Bagarukaryo, Baguma, Namubiru, and Brown (2019) to examine how WhatsApp Enabled Learning can facilitate the development of HOTS. The results showed that WhatsApp has a great potential to support the development of HOTS.

A comparison between these two studies and the current study reveals the difference i.e. the aim of the former was to develop creativity while the objective of the latter was to improve HOTS. Unlike these studies and similar to the following study (Sulisworo, Diamah, Toifur, & Suryadi, 2018), our research intended to promote CT skills including not only HOTS, but also lower order thinking skills. Sulisworo et.al (2018) aimed at determining the influence of social media usage _in this case Line@_ on CL environment to improve CT skills using a pretest posttest controlled group design. The experimental group results improved as compared with the control group results.

4.2.2. Discussing qualitative results. The second research question aimed at discovering how is communication between EFL learners in messenger, while conducting their research projects, reflective of their critical thinking skills. This question was poorly investigated; however, the parameter-frequency of CT questions- that we used in our research to indicate this was addressed as a sub-question in one study (Şeker& Kömür, 2008) to explore the difference between the questions of students with higher and lower CT. It was observed that students from the higher CT score group asked more questions than the lower CT score group. Our findings contradict with their results because we found that the frequency of learners' CT questions in messenger interactions is very low when compared with their overall improvement in CT skills. On the other hand, questioning in general was investigated by a number of authors even though not directly related to CT.

Regarding the kinds of questions asked by our participants, it is encouraging to compare them with those asked by students in Singh, Shaikh, and Haydock (2018)'s workshops. In our research, the majority of questions were comprehension questions with few evaluation questions, while in their research the questions were confirmation and clarification questions. Considering that the purpose of confirmation is to evaluate one's own knowledge and the purpose of clarification is to understand what might be ambiguous, our results agree with theirs. These

findings also accords with Mahmud (2015)'s results that showed students' tendency to ask clarification, explanation, and judgments questions.

The findings concerning the kinds of questions asked by learners might be attributed to learners' level regarding CT skills. In a research study (Şeker& Kömür, 2008) aimed at discovering the relationship between CT skills and in-class questioning behaviors of English language teaching students, it was found that the students who were in the higher score group asked more comprehension and above level questions (questions include application inference, synthesis and evaluation skills) when compared to the questions (knowledge or remember) of the lower group. However, the results germinated from the third research question in the present dissertation do not support the findings from the second research question.

4.2.3. Discussing the mixing stage results. We hypothesized that there exist a significant positive relationship between the frequencies of CT questions and the differences in learners' collective test scores. Still, no significant correlation was found. Accordingly, messenger-interactions failed to depict the effect of the treatment on the appeared improvement of learners' CT skills. Thus, our findings suggest that there is no relation between learners' level regarding CT skills and the quantity or kind of questions they ask. It may be the case therefore that these variations between our results and what was found by other researchers are attributed to the existence of other reasons which prevent learners from asking questions or direct them towards asking specific kinds of questions.

Consequently, we attempted to discover what might be those reasons. However, the literature on factors influencing learner questioning was very limited. Mahmud (2015) investigated learners' tendency to ask questions. The findings showed that students' questioning was influenced by (1) psychological factors (being nervous, bored, lazy, or moody), (2) physical conditions (being healthy or not), (3) English language proficiency (language capabilities such as grammar, vocabulary, or pronunciations), (4) the lecturers (teachers sometimes were not

familiar, arrogant, and temperamental), and (6) the materials (interesting materials would be more likely to attract their attention to ask questions).

On the other hand, Singh, Shaikh, and Haydock (2018) investigated the factors that urged students to ask questions. They found that reversing the student/teacher power relations (reducing teacher's talk), outdoor physical environment, dialectical conflicts when students interacted with the physical stuff, and language factors (students were allowed to speak in their own language and to use non-academic language) motivated them to ask questions.

Jesus, Almeida, and Watts (2004) explored the relationship between students' questioning and learning styles. The authors compared the quality and quantity of questions asked by the students who were identified as a diverger, converger, assimilator, or accommodator, based on Kolb's (1984, 1985) experiential learning theory and learning styles. The study revealed that their questioning styles (quantity and quality of questions they ask) correspond with their orientations to learning. They discovered that although a student may have a clear preference for a particular learning style, he or she can still work across all modes of learning and move between many diverse types of questions if he or she has the capacity to integrate the four learning modes. However, if the student is at a lower stage of knowledge development, then he or she may not yet have the sophistication to ask a variety of questions.

Chin and Osborne (2008) examined and reviewed the existing research on students' questions. The findings suggest that classroom instruction that sees learning as active based around cooperative groups, uses inquiry-based laboratory work, provides a variety of opportunities for students to pose questions, and uses the reading of scientific research papers enhance students' ability to ask good quality questions. It is interesting to note that even we used a similar environment in our study, the learners still unwilling to ask questions.

Conclusion

The present chapter aimed at analyzing the findings of this dissertation successively according to the three stages of data collection (quantitative, qualitative, and the mixing stage). The data gathered were analyzed using descriptive statistics, inferential statistics, and conceptual analysis through frequencies. Additionally, a discussion of the results was proposed on the light of the existing research studies.

Implications, limitations, and suggestions for further research will be subsequently provided along with the general conclusion of this research study.

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General Conclusion

This dissertation has investigated the role of messenger-assisted cooperative projects in promoting third year EFL learners' CT skills as its primary concern. The study also sought to discover whether or not learners' messenger interactions are reflective of their CT skills and whether or not messenger interactions are reflective of the effect of the treatment- messenger assisted cooperative projects- on their CT skills.

The researcher employed a mixed methods approach with a sequential explanatory design. Quantitative and qualitative data were gathered through tests and documents. The results were analyzed using inferential statistics, descriptive statistics, and content analysis wherein frequencies were utilized.

The results of the current study supports the effectiveness of messenger-assisted cooperative projects as a method to improve learners' CT skills. Even though this result might not previously been described, it broadly supports the work of other researchers in the areas of CL, PjBL, and technology. Several research studies in these fields reported the significance of these methods-whether combined or not- in developing CT skills.

In addition, among the six skills, learners seemed to have no problem in remembering; however, the weakness lies in the other skills mainly, comprehension, analysis, reasoning, evaluation and synthesis. The proposed treatment appeared to be promising regarding reasoning, evaluation, and synthesis unlike comprehension and analysis wherein no improvement was reported. Regarding the kinds of CT skills investigated in the literature, it seems that studies have not focused on Kuebli, Haevey, and Korn (2008)'s Appleby's revised CT competences that we used in our study. Yet, we were able to identify the contradictory findings concerning analysis.

On the other hand, the findings revealed that communication between students while doing their projects does not really reflect their CT skills because the frequency of CT questions that we used as an indicator for this was very low and the kind of questions asked were generally comprehension questions. Research on the capability of the quantity and kinds of learners' questions to reflect their CT skills was limited. Nevertheless, the literature on the relation between CT and questioning suggests that learners with higher level in CT skills ask more questions than those with lower level. Besides, the questions asked by those with higher level in CT are higher order thinking questions, while the questions asked by those with lower level are lower order thinking questions. In addition, our findings concerning the kinds of questions asked by learners emphasize the previous research results.

Similarly, no significant positive correlation between differences in collective test scores and frequency of CT questions was found. Accordingly, the hypothesis suggesting that messenger interactions are reflective of the effect of the treatment when compared with the overall improvement in CT skills was rejected. Contrary to the literature, our findings suggest that there is no relation between learners' level regarding CT skills and the quantity or kinds of questions they ask. Consequently, we predicted the existence of other reasons which prevent learners from asking questions or direct them towards asking specific kinds of questions. Research on learner questioning was unsatisfactory. Yet, we were able to find a number of factors that might affect learner questioning either positively or negatively. These factors include the learning environment, the teacher, the material, psychological and physical condition, learning styles, student/teacher power relations, and the language factor.

Implications:

Findings from this study revealed the weakness that EFL learners are suffering from regarding their CT skills. Hence, teachers and policy makers in Algeria should devote efforts to develop this skill.

On the other hand, the suggested treatment-messenger assisted cooperative projects-proved its effectiveness in promoting learners' CT skills. The expected outcome of these projects was writing a literature review for a research proposal; however, this method could be used in other disciplines or other courses.

The results of the study unveiled the gap in learners' questioning powers which might be a result of several factors. Consequently, providing learners with motivating factors to enhance their questioning powers as one procedure to improve their CT skills is advisable.

Additionally, this method is appropriate for teachers adopting a learner-centered approach and can be applicable for improving other skills like communication, collaboration, autonomy, writing, speaking…etc.

Limitations:

Although our research has its merits, it clearly has some limitations. The most important limitation is the small sample size. Since our sample consists of ten participants, the statistical tests used normally require a larger sample size in order to be considered representative of the population so that the results can be generalized from sample to population and to find significant relationships as well.

The current study was also limited by a lack of prior studies on the problem under investigation. This was reflected negatively on the discussion of the results. It hindered our ability to interpret the results of the study.

Another limitation was the method used to collect the qualitative data and the parameter utilized as an indicator of CT skills. The use of content analysis was not satisfactory because the participants did not employ the CT questions provided for them to be coded later in the conceptual analysis.

Finally, it was difficult to manage four messenger groups at the same time. Even though participants were present in the instructional session and were provided with documents (the student handout, project planner, CT questions sheet) to facilitate their work, they kept asking several questions about the content and form of the product.

Suggestions for further research:

Further research might explore if the conclusions drawn from the sample investigated apply to other sources as well. In addition, none of the studies formulated results regarding the effect of the proposed treatment on developing CT skills; accordingly, further investigation on the current topic should be carried out.

Researchers adopting similar design and procedures used in our study are recommended to investigate learners' attitudes towards the treatment using questionnaires or interviews. Additionally, purposive sampling should focus on learning styles as one criterion to select the sample. Furthermore, researchers can benefit from analyzing the quality of projects' final product since there exist several studies examining the effect of writing on critical thinking.

This research has raised several questions that need investigation. These questions are: what is the relationship between the quantity and kinds of learners' questions and their CT skills? What is the relationship between learner questioning and other variables like learning styles? What are the factors affecting learner questioning? What are the reasons of learner questions?

We propose that future research should be undertaken to discover the effect of the proposed treatment on other skills. We also suggest that future studies should be undertaken in other contexts and other fields of study.

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Appendices

Appendix 1: The Critical Thinking Pretest

Student name :	Duration of the test : 2 hours

Activity one: Remembering

1. List the main components of an essay.

Activity two: Comprehension

Write what you have understood from the following statements:

"A text is not only a grammatical unit. It is rather a semantic unit."

Activity three: Analyzing

1. There are two basic methods for organizing comparison/contrast paragraphs; the block method and the point by point method. Compare between them.

Activity four: Reasoning

1. Complete the statement:

A text must be meaningful. When writing texts, cohesion is considered a necessary element. Therefore…

Activity five: Evaluation

1. *"An expository essay is a genre of writing which tends to explain, illustrate, clarify, or explicate something in a way that it becomes clear for readers. It could be an investigation, evaluation, or even argumentation about an idea for clarification."*

Do you agree on using an anecdote as a hook in an introduction for an expository essay? Support your opinion with arguments.

Activity six: Synthesizing

1. What can be combined to improve writing and reading at the same time?

Appendix 2: The Critical Thinking Posttest

Student Name:	Duration of the test: 2 hours

Activity one: Remembering

What are the linking words that you can use to express causation?

Activity two: Comprehension

According to your own understanding, what does the author mean by the following expression?

"Many writing teachers see their classroom goals as fostering L2 students' expressive abilities, encouraging them to find their own voices to produce writing that is fresh and spontaneous" (Hyland, 2003, p. 8).

Activity three: Analyzing

There are two kinds of writing: creative writing (like writing novels and poems) and academic writing (like writing dissertations and research articles). Compare between these two kinds.

Activity four: Reasoning

Read sentences (1) and (2) carefully, then write a third sentence representing what have you deduced from them.

(1) To be a competent writer, you should have knowledge in other domains. (2) Learning Vocabulary and grammar is essential for writing good compositions. (3) Accordingly……………………………………………….......................................

Activity five: Evaluation

"Brainstorming is the first step to start writing an essay".

Do you agree? Support your answer with arguments.

Activity six: Synthesizing

Students often write because they are obliged. For example, to submit their classroom assignments or to obtain a good score.

Suppose you are a teacher of a writing course. What can you suggest to motivate your learners to practice writing by themselves?

Appendix 3: The Critical Thinking Scoring Rubric

Rating Criteria	Sum of the Scores	Rating scale		
		Fails	Meets	Exceeds
Remembering		Could not recall all the components	Could recall all the components, but could not list them in order	Could recall all the components with precision Could list them in order
		1	2	3
Comprehension		Could not paraphrase accurately	Could paraphrase, though some aspects are incorrect or confusing and some key ideas are missing.	Could paraphrase correctly
		1	2	3
Analysis		State only the differences or only the similarities	Could not state all the similarities and differences	Could state all the similarities and differences with organization
		1	2	3

Reasoning		Uses general knowledge or personal opinion to reach a conclusion Does not use the statements provided and does not base the judgments on the facts presented	Uses the statements provided and base judgments on the facts presented; however, conclusions are influenced by personal opinions	Conclusions are based on the facts presented Do not use general knowledge Does not let opinions influence conclusions Stick to the statements and base judgments on the facts presented
		1	2	3
Evaluation		Could not provide arguments Repeats information	Could provide arguments; however, could not use reasonable judgment	Could use reasonable judgment Could Provide many arguments
		1	2	3
Synthesis		Unable to brainstorm ideas and alternatives Does not provide arguments	Able to brainstorm; alternatives identified are unrelated and unrealistic Employs data from the mentioned disciplines	Consistently able to brainstorm and identify related and realistic alternatives Employs data from other disciplines.
		1	2	3

Appendix 4: The Project Planner

Project Name: literature review

Project Summary: students are supposed to select a research problem and write a simple version of a literature review for a research proposal.

1. Project Purpose: to make students practice critical thinking skills.

2. Essential Questions:

    - Have you observed any problem that other students in your classroom are suffering from?

    - What are the difficulties that you or other students encounter in your field of study, courses, learning…?

    - Can you select the one that you are mostly interested in and propose a solution or read about it to find a solution?

    - What are the most relevant and interesting studies you found about your topic of investigation?

    - Can you write a summary of these studies and compare between them to find the gaps?

3. Product: write a literature review in a form of no less than six-paragraph essay in which you state generally the problem in the introductory paragraph. Then, write a summary of a research study in each paragraph; the summary must contain author's name, date of publication, research problem or aim, research methodology (approach, design, and data collection methods), and the main results.

4. Learning Goals: at the end of this project, you are supposed to build critical thinking skills such as remembering, comprehension, analysis, reasoning, evaluation, and synthesis.

5. Timeline: submission of the work will be after six weeks beginning from the day of the

    instructional session.

Assessment criteria: assessment of the identified learning goals will be according to an analysis of the content of your messenger interactions such as the extent to which you are asking critical questions.

Appendix 5: The Instructional Session Plan

Explanation about the research study: (10 minutes)
- What the research is about?
- What are the objectives of this research study?
- What are the benefits of this research study to the participants?

Explanation about critical thinking: (20 minutes)

- What is critical thinking? (5 minutes)

Critical thinking is a metacognitive process that consists of dispositions and skills leading to reflective judgment, increasing the chances of producing a logical solution to a problem or a valid conclusion to an argument.

Searching for hidden assumptions, noticing various facets, unraveling different strands, and evaluating what is most significant. It implies adopting a skeptical state of mind. To say that it implies a skeptical state of mind is by no means to say that it implies a self-satisfied fault finding state of mind. Quite the reverse: Because critical thinkers seek to draw intelligent conclusions, they are sufficiently open-minded that they can adopt a skeptical attitude toward their own ideas, toward their own assumptions, and toward the evidence they themselves tentatively offer, as well as toward the assumptions and evidence offered by others. When they reread a draft they have written, they read it with a skeptical frame of mind, seeking to improve the thinking that has gone into it.

- What are critical thinking skills? (15 minutes)

Critical thinking skills refer to the person's thinking competences. These skills range from the simplest to the complex ones; remembering, comprehension, analysis, reasoning, evaluation, and synthesizing.

1. Remembering: your ability to recall.
2. Comprehension: your ability to summarize or restate others' ideas in your own words and recognize when you can use your prior knowledge in new situations.
3. Analysis: your ability to take ideas apart, to examine the individual components, and understand their relationship to each other and to other ideas.
4. Reasoning: your ability to draw meaning or conclusion from evidence.
5. Evaluation: your ability to judge if a certain idea is valid in light of evidence of some sort.
6. Synthesizing: your ability to create; to refashion the knowledge we start with into something novel.

Giving the participants instructions about: (10 minutes)

- Forming groups
- Choosing the problem
- Conducting the literature review
- Messenger interaction

Participants read and sign the contract of commitment in research: (10 minutes)

Participants ask questions: (10 minutes)

Appendix 6: The Critical Thinking Questions Sheet

Remembering questions:

Who was...? Who were the main…?

What is…? How is…? When did…happen? How did…happen?

Can you recall…? Can you list three…? Can you describe…?

Comprehension questions:

Which statements support…?

How would you compare…contrast…?

State or interpret in your own words…

How would you rephrase the meaning?

How would you summarize?

Explain what is meant by…

What is the main idea of…?

Analysis questions:

How is…related to…?

What is the relationship between…?

Differentiate, compare / contrast, distinguish x from y

What is missing/ needed in …?

Reasoning questions:

What conclusions can you draw…?

What inferences can you make…?

Evaluation questions:

What changes would you make to solve…?

How would you improve…?

How would you change / modify the plan?

Do you agree with the author's idea? Why

What is your opinion of…?

Would it be better if…?

Why did the author said…?

Appendix 7: The Students' Handout

The literature review:

One of the essential preliminary tasks when you undertake a research study is to go through the existing literature in order to acquaint yourself with the available body of knowledge in your area of interest. It has value even before the first step; that is, when you are merely thinking about a research question that you may want to find answers to through your research journey. In relation to your own study, the literature review can help in three ways. It can:

1. Bring clarity and focus to your research problem.

2. Improve your research methodology.

3. Broaden your knowledge base in your research area.

Bringing clarity and focus to your research problem:

When reviewing the literature you learn what aspects of your subject area have been examined by others, what they have found out about these aspects, what gaps they have identified and what suggestions they have made for further research. All these will help you gain a greater insight into your own research questions and provide you with clarity and focus which are central to a relevant and valid study.

Improving your research methodology:

A literature review tells you if others have used procedures and methods similar to the ones that you are proposing, which procedures and methods have worked well for them and what problems they have faced with them. By becoming aware of any problems and pitfalls, you will be better positioned to select a methodology that is capable of providing valid answers to your research question.

Broadening your knowledge base in your research area:

It is important that you know what other researchers have found in regard to the same or similar questions, what theories have been put forward and what gaps exist in the relevant body of knowledge.

Sources of literature:
- Books.

- Journals (Eric, Sage, Jstore…).
- Internet (Google Scholar, Academia.edu…)

How to conduct a literature review?

1. Select an area that you want to investigate. For example, sociolinguistics, psycholinguistics, learning and teaching, ICTs, etc.

2. Chose a topic that is interesting and that you are interested in. for instance, the effect of teacher feedback on learners' motivation, the effect of first language on second language writing production, etc.

3. Collect sources related to your topic.

4. Skim and scan to filter the sources.

5. Write an essay composed of:

   ➢ An introduction about the topic.

   ➢ Four or more body paragraphs that contain a summary of different recent published studies about the topic. Ask these questions: who is the author? What is the problem investigated? What is the research site? What is the methodology used by the researcher (approach, design, data collection methods)? What are the most important results of the study?

   ➢ A conclusion that synthesizes the previously mentioned studies. It may contain differences, similarities, contradictions, and gaps. At last you need to state your research problem in clear unambiguous words.

   Ps: this is the simplest and easiest essay form for writing a literature review about your problem.

Note: this handout is prepared on the basis of Dr. Houadjly.A.H's lectures and Kumar.R book "Research Methodology: A Step by Step Guide".

Appendix 8: Contract of Commitment in Research

Contract of commitment in research

This contract of commitment in research is made and effective on ……/……/…….

Between: ………………………………………….. (EFL third year student)

And: NACER Imane (student of master conducting a research for the requirements of a master degree in applied linguistics)

The researcher and the participant agree on the following:

Terms:

Participant's signature on this contract of commitment in research is to serve as an authoritative document that ascertains his/her understanding and agreement of his/her responsibilities towards the researcher, the research project, and his/her group members.

Description of participation responsibilities:

- Participants should be present in one hour meeting scheduled, after an agreement on timing, between the researcher and the participants.

- Each Participant should have a messenger account that he/she will use in order to interact with his/her group members as well as the researcher.

- Participants should respect each other; do not use aggressive language or sexist language, If you don't like an idea, address the idea, not the person (for example, "I don't think that idea will work because…" not "That's stupid").

- Participants are not allowed to discuss irrelevant topics i.e. the discussion is related only to the research project.

- Participants of each group should schedule a time for discussion that have to be respected by all group members.

- Participants have the freedom to form the groups. However, each group must not exceed four members.

- Participants will sit for a critical thinking evaluation after completing the research projects.

After reading through this document, you need to sign at the end then, return it to the researcher.

Signature:

ملخص الدراسة

التفكير النقدي هو حجر الأساس في مراحل التعلم المتقدمة خاصة في التعليم العالي. وبالتالي، يتم حث طلاب الجامعة على تطوير هذه المهارة من أجل التكيف مع بيئة التعلم الخاصة بهم. بحثت هذه الرسالة في فعالية تنفيذ المشاريع التعاونية بمساعدة الماسنجر في تعزيز مهارات التفكير النقدي لمتعلمي اللغة الإنجليزية كلغة أجنبية في السنة الثالثة. كما سعت إلى اكتشاف قدرة تفاعلات الماسنجر في عكس مهارات التفكير النقدي لدى المتعلمين أولاً، وثانيًا في إظهار تأثير الطريقة المقترحة على تعزيز هذه المهارات لديهم. لقد استخدم البحث الحالي نهجًا مختلطًا من خلال تطبيق تصميم توضيحي متسلسل، في حين بلغت عينة هذه الدراسة عشرة طلاب في السنة الثالثة من كلية اللغة الإنجليزية في جامعة بسكرة. بالنسبة للبيانات فقد تم جمعها باستخدام الاختبارات والوثائق وتحليلها من خلال الإحصاء الوصفي والإحصاءات الاستنتاجية وتحليل المحتوى. حيث كشفت النتائج الأولية عن فجوة في مهارات التفكير النقدي لدى المتعلمين. ومع ذلك، أثبتت النتائج فعالية المشاريع التعاونية بمساعدة الماسنجر في تحسين مهارات التفكير النقدي لدى المتعلمين. من ناحية أخرى، كانت القدرات الاستفهامية للمتعلمين محدودة، وبالتالي لم تتمكن من عكس مهارات التفكير النقدي لديهم. بالإضافة إلى ذلك، لم يتم إيجاد أي علاقة إيجابية ذات دلالة إحصائية بين مدى أسئلة المتعلمين والتحسن في مهارات التفكير النقدي لديهم . وفقًا لذلك، فشلت تفاعلات الماسنجر في إثبات تأثير العلاج على تعزيز مهارات التفكير النقدي. أخيرًا، اختتم الباحث بعدد من التوصيات لمواصلة البحث على أساس الدراسة الحالية وبشكل جوهري امكانية استكشاف الأبحاث المستقبلية لمدى انطباق الاستنتاجات المستخلصة من العينة التي تم فحصها على عينات أخرى أيضًا.