

Boosting EFL Learners Critical Thinking through Guided Discovery: a Classroom-Oriented Research on First-Year Master Students

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Abstract

Critical thinking is widely recognized as a necessary skill for growth and intellectual development due to a variety of factors, including globalization, the revolution of information technology, modernity, and connectivity. EFL teachers can lay the groundwork for their students to attain critical thinking through various methods, models, and strategies. The present investigation suggests that the teacher could promote EFL learners' critical thinking through guided discovery model of instruction. Henceforth, the current paper endeavors to enlighten the adequacy of applying guided discovery for developing learners' critical thinking skills. It is an experimental research that investigates: how may guided discovery contribute to the development of EFL learners' critical thinking? It attempts to examine the utility of discovery learning in teaching students how to process and think critically about the education they receive where information has become readily available and accessible. To this aim, 40 EFL Master students who took educational psychology courses were nominated from the university center of Naama, Algeria. The researcher selected Peter Honey Critical Thinking test and focus group discussions to attain data on students' critical thinking skills. The test results demonstrated that the experimental group outperformed the control group. The students become more autonomous, reflect on their learning experiences, and identify the most useful strategies. Furthermore, the analysis of focus group interviews revealed that the experimental group participants hold positive attitudes toward discovery learning. They perceive it as a precious method that can enhance their awareness about the value of thinking critically.

Keywords: Classroom-oriented research, critical thinking, EFL learners' at Naama University Center, discovery learning, guided discovery, reflection

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Introduction

In higher education, the process of teaching English as a foreign language aims to prepare students for the requirements of the professional career and the social life. Of the various requests, that are generally acknowledged, is the need for developing critical thinking skills in learners. Indeed, higher education research has extensively scrutinized critical thinking. Scholars have thrown substantial attention to the significance of reflective thinking (Lizarraga, Baquedano & Oliver, 2010; Marin & Halpern, 2011; Swartz, 2003). Typically, teaching practitioners believe that critical thinking skills are vital to the students' success, especially in nowadays' society that is featured by diversity and an immense amount of information (Moreno, 2010). Learning to think critically is helpful in a variety of ways. It aids EFL learners to choose the useful information relevant to them. It supports them to monitor the information received and decide on the appropriate strategies for achieving their selected goals. Accordingly, critical thinking skills are vital to become self-directed learners able to make decisions and solve problems.

Considerably, teaching critical thinking does not necessarily mean presenting it as a concept or an interest area in philosophy. The purpose of dealing with critical thinking in classes is to "teach for and about it" (Facione, 2000, p. 80). To teach about it, teachers train students to use related skills for solving problems. Whereas, the main objective of 'teaching for' is to engage students in critical thinking through offering opportunities, instigating relevant perceptions, and boosting their disposition to apply those skills (Lin, 2018). Accordingly, teachers can make critical thinking an integral part of instruction with careful planning of problem-solving environments that allow for experiment, engagement, reasoning, and decision-making (Eggen & Kauchak, 2010). Deriving from the theory of constructivism, discovery learning is assumed as a tool for enhancing critical thinking.

According to (Salkind, 2009), discovery learning encourages learners' mindful involvement and active inquiry in the acquisition of knowledge. There are two models of discovery learning. First is the pure discovery or the unstructured discovery. This form of education involves learning experiences in which learners receive minimal scaffolding. Using this model, teachers provide relevant materials and ask learners to discover concepts, solutions, and strategies. Whereas the second model, guided discovery, entails teachers' scaffolding of students learning development. Through guided discovery, teachers highlight the learning objectives, classify the information, and monitor the discovery process. Thus, the main goal of the present research work is to assess the role of guided discovery in promoting EFL learners' critical thinking. The study aims to scrutinize the question of how may guided discovery be useful to enhance EFL learners' critical thinking skills?

Substantially, the interest of the present research is in two folds: it anticipates to demonstrate that the skill of critical thinking as a practical dimension of EFL learning entails a place in the curriculum. Besides, it tends to prove that guided discovery can promote learners critical thinking. Unfortunately, higher education in Algeria gives little attention to the relevance of developing critical thinking skills in learners. Mainly, the English section's pedagogical team at Naama University Center instructs learners for three years to get the 'Licence Degree' or 'B.A' in the Anglo-Saxon educational system. Throughout the three years, English learners study the essential skills required for learning the target language. Indeed, teachers receive the content of

teaching in the form of limited guidelines. According to the provided guidelines, the teacher develops the instructional points. Hence, the curriculum does not consider critical thinking as a skill. Thus, guided discovery dynamics to support EFL learners' critical thinking is placed at the heart of research for the present investigation. Such a puzzling discussion between guided discovery and reflective learning constitutes a motive towards conducting this inquiry.

As a classroom-oriented experiment, the current study has significant benefits in terms of exploring guided discovery as a model of instruction that may enhance critical thinking skills. It aims to provide EFL teachers with valuable and evident data based on experimental results. Moreover, the study theorizes that a better understanding of critical thinking offers teachers a better procedure to cope with this skill. It struggles, then, to raise the issue of critical thinking in Algerian higher education, use guided discovery as a model of instruction instead of direct instruction, to introduce a valuable contribution to the development English language teaching profession.

To this end, the present research work tries to investigate and analyze the learners' critical thinking levels before and after applying guided discovery, the degree to which guided discovery promotes high levels of learners' critical thinking, and the factors that may encourage the learners' cognitive involvement. It also aims to scrutinize learners' perceptions of guided discovery as a model of instruction. In this respect, the study sets around the following research questions:

- Can critical thinking be taught in the classroom?
- What might be the effect of guided discovery on EFL learners' critical thinking skills?
- To what extent do EFL learners show evidence of thinking critically while experiencing guided discovery?
- Are EFL learners conscious about the value of developing critical thinking qualities?

Indeed, the use of guided discovery model, in EFL classroom-based instruction, is still not being examined. Moreover, the use of models and strategies to develop learners' critical thinking still needs more recommendations. According to Gibson (2012), "the assimilation of higher-order thinking skill in L2 classroom has been marginal. This is surprising given the growing body of empirical evidence there is to support the effectiveness of such a model" (p. 127).

To investigate the raised questions, the researcher puts forward a number of objectives. First, the present study intends to argue that critical thinking needs to be associated with the teaching of any material. In this vein, Lin (2018) maintained that teachers have to deal with essential thinking skills, as they are crucial for meaningful learning. Second, the study recommends guided discovery to develop a high-order thinking in EFL learners. According to Sukartiningsih and Jacky (2019), learners show higher-order thinking while experiencing learning through discovery-based activities. Third, the study anticipates that learners, who study through methods supporting their cognitive components, are more likely to develop critical thinking abilities. Thus, it endeavors to show that learners do not tend to think critically without receiving appropriate instruction.

To probe the potential advantages of guided discovery on critical thinking, the researcher has opted for a particular methodology to discover answers to the research questions. The selected methodology relied on classroom-oriented experiment to contend systematically that critical thinking is teachable through guided discovery. The latter inclines to promote skills such as observing, inferring, generalizing, reasoning, evaluating, and transferring. The study also tends to argue for the practical effect of guided discovery on raising EFL learners' awareness about the significance of being critical thinkers able to seek answers to probing and stimulating questions.

Literature Review

Critical Thinking

Whether it is a problem with a course, an assignment, or a project, experiences in learning a foreign language present challenges that demand learners' critical thinking to analyze the situation and formulate a solution prudently. Rote learning does not prepare learners for these problems. Learners need to experiment high-level thinking tasks that prepare them for the professional life. According to Lin (2018), "Thinking skills are essential skills if students are to achieve academic success at college and in their professional careers and social lives" (p.1). Therefore, critical thinking requires integration into everyday education.

Scholars defined critical thinking in various ways, but most of the definitions argue on the individual's skill to generate and evaluate deductions based on evidence. Essentially, critical thinking is an interrogative, stimulating process of knowledge. It encompasses analyzing ideas or information from an objective stand and then examining it based on personal values and attitudes. To do so, individuals need to develop specific skills necessary to represent thinking in an expanded form ((Butler et al., 2012; Ennis, 1985; Facione, 1990; Halpern, 2003).

As a compound skill, critical thinking involves thought processes, abilities, affective variables, and intellectual principles. Vardi (2013) defined it as "a process of reasoning aimed at coming to a sound, justifiable decision, conclusion or judgment" (p.1). Given that, critical thinking is a cognitive process allied to the mind's use. Cottrell (2005) contended that thinking in a critical, analytical, and evaluative manner is based on mental operations, including attention, categorization, selection, and judgment. This process aids in making informed decisions about whether something is credible to be accurate, operative, or productive. According to Chaffee (1988), critical thinking refers to "our active, purposeful, and organized effort to make sense of our world by carefully examining our thinking, and the thinking of others, in order to clarify and improve our understanding" (p. 29).

As a process, critical thinking encompasses a variety of skills and attitudes. As far as the skills are concerned, critical thinking involves the ability to evaluate reasons appropriately, to assess pertinent evidence, or to determine misleading arguments. Alternatively, some argue that it is an attitude or a disposition, such as the desire to seek probing questions, a critical alignment, or an attribute intrinsic to the individual. Instead, Mason (2008) stated that critical thinking might be established by dispositional knowledge in the sense of a set of principles that persuades the act of thinking.

Academic Models to Critical Thinking

Starting from the 1950s, many schools of thought appeared to explain the nature of critical thinking. Bloom (1956) created a hierarchical taxonomy with “knowledge” at the bottom and “evaluation” at the top. The taxonomy included six levels: knowledge, comprehension, and application as the foundation, and analysis, synthesis, and evaluation are said to signify critical thinking. Though criticized for lacking the precision necessary to guide instruction, Bloom’s taxonomy is probably the most cited source in teaching and assessing higher-order thinking researches (Sternberg, 1986).

In the same line of thought, Facione (1998) defended the conception of critical thinking as a set of cognitive skills and affective dispositions. Along with forty-six experts, Facione (1990) defined six fundamental dimensions of critical thinking, including interpretation, analysis, evaluation, inference, explanation, and self-regulation. In this sense, critical thinking is considered as an automated process that entails the use of cognitive skills to make judgments. According to Facione (2000), the possession of skills leads to better performance, “Skills are manifest in performance. Persons with stronger skills tend to be able to perform a range of tasks requiring those skills with fewer mistakes” (p. 72). Henceforth, Facione (2000) suggested that critical thinking education should develop to offer students with possibilities to practice relevant skills.

As a prominent researcher in critical thinking, Halpern (2003) described it as a purposeful, reasoned, and goal-directed process. Halpern’s approach to critical thinking defended the term ‘critical’ that implies evaluation and judgment. It is the kind of thinking that involves decision-making, problem-solving, verbal reasoning, argument analysis, assessing likelihood and uncertainty, and hypothesis testing.

More recently, the Partnership for 21st Century Skills (2011) has notified four areas of critical thinking skills: (1) reasoning effectively, (2) using systems thinking, (3) making judgments and decisions, and (4) solving problems. These areas entail the students’ inquiry for information to ascertain its applicability to the task. In this sense, critical thinking is systematic and cautious, involving original reflection. It denotes the individual’s aptitude to deeply process knowledge for determining relations across disciplines and finding solutions to problems. Critical thinkers often employ thoughtful decision-making and insightful problem solving to examine situations, assess arguments, and draw reasonable inferences (Stobaugh, 2013).

Consequently, critical thinking is significant in education, as it is a crucial way of inquiry for solving problems and making appropriate decisions (Simpson & Courtney, 2002). In this manner Shirkhani and Fahim (2011) stated, “Language development and thinking are closely related and the teaching of higher-order thinking skills should be an integral part of an L2 curriculum” (p. 111). Thus, students need a dynamic engagement in the learning process to put on their knowledge for solving learning problems, and analyzing information so they can make formative decisions. Furthermore, through critical thinking, students can develop to be open-minded and creative in selecting the suitable learning strategy and the appropriate technique of solving problems (Tiwari, Lai & So, 2006).

Teaching for Critical Thinking

Besides the debate on its definition, the discussion about critical thinking in the present research work extends to whether or not it can be taught in the classroom, and if so, how can it be taught to EFL learners in Algerian Higher Education. To answer this question, Ennis (1992) determined three different ways of teaching critical thinking. First, there is the general approach, which endeavors to devote separate courses for teaching critical thinking. In this case, essential courses of thinking are presented independently without using school subjects. The second is infusion and immersion. Infusion of critical thinking entails developing the essential abilities of thinking through the teaching of a subject matter. In this approach, the teacher explicitly teaches students to think critically on the subject. Parallel to infusion, immersion is based on a thought-provoking approach to teaching a subject matter; however, critical thinking skills are implicitly taught. Lastly, the mixed approach merges the general approach with the infusion approach. It teaches critical thinking in a separate course while students are engaged in the learning of a subject matter.

Moreover, several researchers have contended that critical-thinking skills cannot develop without explicit instruction (Abrami et al., 2008 and Facione, 1990). Halpern (1998), for instance, affirmed that there are various, qualitatively dissimilar sorts of evidence viewing that students can turn out to be improved thinkers as a result of a proper education. She suggested that instruction in critical thinking requires responses to particular questions. The basic principles to answer these questions derive from cognitive psychology, the empirical branch of psychology that investigates issues like how people think, learn, and remember, or more precisely, how people tend to acquire, use, organize, and recall knowledge. She further asserts,

It is clear that a successful pedagogy that can serve as a basis for the enhancement of thinking will have to incorporate ideas about the way in which learners organize knowledge and internally represent it and the way these representations change and resist change when new information is encountered. (p. 45)

Therefore, this research considers that one possible way to build critical thinking in EFL learners is through discovery learning. At a first sight, it deliberates discovery learning as a crucial model that cultivates knowledge construction and higher-order thinking. Second, this model encourages the discovery of authentic and meaningful questions and problems. According to Sukartiningsih and Jackey (2019):

Critical thinking is a form of high-level thinking that involves all thought processes such as how to obtain information, understand information, analyze, correlate, interpret, evaluate, make judgments, and make judgments about good and bad or right and wrong. This is synergistic with discovery learning models. (p.88)

Additionally, Henson (1996) believed that when the teacher applies discovery learning in the classroom, his/her role entails asking thought-provoking questions, permitting sufficient time for students to think on the possible answers to the raised questions, and directing students' knowledge construction using appropriate questioning. In the same line of thought, Tiwari et al. (2006) argued that the students' active participation in the learning process could add to their critical thinking development, "Where active participation is encouraged, as in problem-based learning, critical thinking is enhanced". (p. 584)

To scrutinize the purposes of the study, the teacher-researcher has used an infusion approach. That is to say, the teacher encouraged critical thinking through discovery learning in the context of educational psychology courses. The scope of the present paper does not test the effectiveness of the infusion approach. However, it aims to prove that encouraging EFL learners' critical thinking through discovery learning is more effective than non-interventions.

Discovery Learning

Cognitive constructivist learning implicates engaging the student actively in a research process to cultivate meaningful understandings. Subsequently, cognitive constructivists favor inductive learning approaches such as discovery and inquiry-based learning. Often contrasted with direct instruction or expository learning, discovery learning is a student-centered approach that assists engaged and long-lasting understanding (Salkind, 2009). Bruner (1961) recommended the discovery learning method in his paper "The Act of Discovery," representing a form of the curriculum that fortifies the students to dynamically explore and figure out solutions for given problems rather than memorizing rules and instructions offered by the teacher (Moreno, 2010).

Kirschner, Sweller and Clark (2006) refer to discovery learning is also referred to as problem-based, inquiry, experiential, and constructivist learning. In this vein, Schunk (2012) stated, "discovery involves constructing and testing hypotheses rather than simply reading or listening to teacher presentations. Discovery is a type of *inductive reasoning*, because students move from studying specific examples to formulating general rules, concepts, and principles". (p. 266)

Based on constructivism, the discovery learning method allows students to construct knowledge structures that would lead to intellectual ingenuity, persistence, and increased motivation. Nevertheless, learning by discovery does not mean permitting students to do what they want; it implicates direction. Teachers arrange experiences that allow students to search, explore, and investigate. Accordingly, Safrida, Andalia and Zulfajri (2019) stated, "The discovery learning model is a component of educational practice including a teaching method to promote active learning and process-oriented" (p. 14). For instance, the teacher presents a discovery situation, and then enthusing students learn new knowledge pertinent to the domain and exercise problem-solving skills such as developing rules, testing hypotheses, and collecting information (Bruner, 1961). In a common view, Fahmi, Elmawati and Sunardi (2019) proclaimed, "In applying the discovery learning method the teacher acts as a mentor by providing opportunities for students to learn actively, the teacher must be able to guide and direct the learning activities of students in accordance with the objectives". (p. 348)

Therefore, teaching for discovery entails presenting questions, problems, or puzzling situations to search for a solution. Besides, it boosts learners to make spontaneous predictions when they are not foolproof. Depending upon the complexity and level of the course, students may require minimal or significant guidance. That is either pure discovery or guided discovery. Nonetheless, Mayer (2004) upheld that when students experience learning through pure discovery methods, they often become lost and frustrated, and this confusion sometimes results in misunderstandings. Thus, the study suggests guided discovery as a suitable model for developing EFL learners' critical thinking skills.

Guided Discovery for Promoting Critical Thinking

Various studies conducted on learners' critical thinking skills revealed that higher-order thinking required the teachers' careful planning and consideration (Fahmi et al., 2019; Gibson, 2012; Shirkhani & Fahmi, 2011; Tiwari et al., 2006). In this context, Rahman (2017) and Wahyudi, Rukmini and Bharati (2019) confirmed that discovery learning is operative to stimulate the students' critical thinking and creativity. Likewise, Kusumawardani, Malya and Faizah (2019) claimed that guided discovery learning-based activities promote learners' critical thinking skills. As a model of instruction, guided discovery is the form of discovery that requires the teacher to afford clues and tips about the way to solve a problem or answer a question. This way keeps the students on the path. For instance, the teacher poses a question and prompts students to elucidate their thinking. Afterward, he/she guides the class debate until the students realize the right answer to the problem.

Moreno (2010) considered guided discovery as a very useful learning method. Though teachers' direct instruction may take less time than guided discovery, recent research finds that guided discovery endorses deeper learning than giving students the selected information to be learned. Purely transferring novel information is unsuccessful in supporting learners to create their understandings dynamically. Alternatively, encouraging student research only is not satisfactory to produce thoughtful knowledge construction. Research requires to be complemented by suitable guidance to assist students' learning.

Commonly, Eggen and Kauchak (2010) asserted that effective discovery learning should be highly scaffolded, and the teacher has a critical role in managing the students' actions, examinations, and forming of conceptions. According to Mayer (2002), "Guided discovery may take more or less time than expository instruction, depending on the task, but tends to result in better long-term retention and transfer than expository instruction" (p. 68).

When applying guided discovery in the classroom, teachers would devote minimal time clarifying and extra time asking questions. This way, the students would have further opportunities to share thinking with the teacher and peers. They also transform their developing understanding into words (Dean & Kuhn, 2007). Besides, Lutz, Guthrie, and Davis (2006) maintained that guided discovery endorses high student cognitive involvement; thus, it is disposed to raise students' intrinsic interest and motivation to learn.

As a form of learning, guided discovery belongs to the cognitive theories of learning, namely the human memory model and social constructivism. The teacher-researcher lessons on educational psychology were applying a guided discovery model adopted from Eggen and Kauchak (2010), aiming primarily at developing learners' critical thinking. The following table sketches the steps of guided discovery and their corresponding cognitive learning components.

Table 1. *The relationships between phases and cognitive learning components in guided discovery*

Phase	Cognitive Learning Component
<i>Introduction and Review:</i> The teacher begins with a form of introductory focus and reviews previous work.	<ul style="list-style-type: none"> • Attract attention. • Activate prior knowledge.
<i>The Open-Ended Phase:</i> The teacher provides examples and asks for observations and comparisons.	<ul style="list-style-type: none"> • Provide experiences from which learners will construct knowledge. • Promote social interaction.
<i>The Convergent Phase:</i> The teacher guides students as they search for patterns in the examples.	<ul style="list-style-type: none"> • Begin schema production. • Promote social interaction
<i>Closure:</i> With the teacher's guidance, students state a definition of the concept or a description of the relationship among concepts.	<ul style="list-style-type: none"> • Complete schema production.
<i>Application:</i> The teacher has students use the concept or principle to explain another (ideally) real-world example.	<ul style="list-style-type: none"> • Promote transfer.

Note 1. Adapted from Eggen and Kauchak, (2010, p. 418)

Accordingly, teaching for critical thinking through discovery, the teacher-researcher presented questions, problems, or wondering situations to seek solutions and motivated learners to utter both their certain and uncertain suggested answers. Throughout class discussions, the teacher asked new questions that did not have readily available answers. This strategy aimed at forcing students' thinking to construct knowledge. Furthermore, discoveries were not restricted to classroom accomplishments. After a lesson on behaviouristic learning, the teacher encouraged students to discover how experiments on animals are relevant to human education. Students might look for answers in classroom workplaces, in the university library or media center, and on or off the university grounds. Extensive teacher scaffolding was offered at the beginning of the academic year when students were not accustomed to the discovery method and needed thorough contextual knowledge. Thus, the teacher provided structure by asking questions and providing proposals on how to inquire for answers and solutions.

Researchers conducted few studies on the utility of guided discovery model to enhance EFL learners' critical thinking. Wale and Bishaw (2020) maintained that inquiry-based instruction improved EFL students' critical thinking skills. They justified that the inquiry process incorporated activity-oriented method and collaboration. Similarly, Ghaemi and Misaeed (2017) also posited that the participation in inquiry-based learning class had a vital influence on EFL learners' critical thinking skills. Wahyudi et al. (2019) found improvements in the students' scores after learning through the discovery-based speaking assessments module. Although there are studies on the use of discovery learning in the EFL context, the use of guided discovery in particular still needs investigation. Definitely, most of the investigations focused on discovery learning in general.

Methods

The current investigation centers on the classroom-oriented approach to research relying on experimental methodology. The goal of selecting this approach is to establish a 'cause-and-effect' relationship between two different incidents. It aims to prove that a definite set of actions or situations (guided discovery) causes modifications in a specific outcome (critical thinking). Thus, an experimental research design, with an experimental and control groups of subjects, is devoted

to scrutinizing guided discovery effects on learners' critical thinking skills. The experimental group received the content of learning through the guided discovery model of instruction. On the other hand, the control group learners received the same instruction without guided discovery. The two groups filled out the pretest and posttest to check the possible effects of the intervention on the experimental group. Throughout the experiment, the teacher-researcher scrutinized both groups to see their progress. Moreover, the researcher used the paired sample t-test to see the effect of the treatment.

Participants

The participants were 40 Master one EFL learners of different genders, learning linguistics as a branch at Salhi Ahmed University Center of Naama, Algeria. They belonged to the same academic background and had approximately the same level of proficiency in English. Their ages range from 21 to 28. The subjects were enrolled in Semester one and experimented while taking the course of educational psychology during the academic year of 2019-2020. To ensure probability, the researcher randomly selected the participants from three available groups. In fact, simple random selection entails that each participant has an equal probability to be part of the study. Thus, the investigator has chosen this type to get a representative sample.

After selecting two groups randomly from the entire Master one population, the researcher considered the total number of students in each group. Nonetheless, researcher disqualified a number of them for missing more than four courses or failing to take one of the designed tests. In this sense, the number of participant students ($N = 40$) was equally divided into two groups, with 20 students in each group. The participants' average age was 23.52.

Instruments

The researcher adopted Peter Honey Critical Thinking test to measure the level of EFL learners' critical thinking skills in the two groups before and after the treatment. This questionnaire is created by Honey (2005) for the sake of assessing the related skills of analysis, inference, evaluation, and reasoning. The questionnaire contains 30 Likert-type items, each has five choices, including Never (1), Rarely (2), Sometimes (3), Often (4), and Always (5). Henceforth, each student's score could range from 30 to 150. Besides, focus group interviews were conducted as a final phase to inquire about the last research question. 14 participants were selected randomly from both groups to play a part in four focus groups. The arranged focus groups followed a semi-structured guide that contains four broad open questions followed by two closed questions. The opened questions addressed the critical thinking-related components. Whereas, the closed questions sought for possible issues or concerns that require further discussion.

Procedures

The data attainment in the current investigation followed three main stages. Before the experiment, the researcher distributed Peter Honey's critical thinking test to measure the participants' critical thinking skills in both groups. Throughout the experiment, the participants received the same content of learning, but through different methods of instruction. Regarding the experimental group, the teacher-researcher explicitly integrated critical thinking skills in the designed courses. That is to say, the teacher taught lessons of educational psychology through the guided discovery model to address the cognitive learning components related to critical thinking.

Adopting the infusion approach, the teacher explicitly stressed learners' critical thinking in addition to the content knowledge. The students knew that they would develop critical thinking skills through the discovery process. The addressed thinking skills revolved around the components of: attracting attention, reasoning, evaluating prior knowledge, experiencing problem-solving, detecting misconceptions, encouraging social interaction, constructing knowledge, and promoting transfer.

On the contrary, the teacher-researcher, in the control group, taught the content of instruction with no reference to the critical thinking skills. The control group participants did not receive any training in critical thinking. After the treatment process, the researcher administered Peter Honey's Critical Thinking questionnaire as a posttest to both control and experimental groups. The objective was to identify whether EFL learners show evidence of thinking critically after the treatment they received throughout the semester. It also aimed at measuring the potential effect of guided discovery on learners' critical thinking.

To assess their awareness of developing critical thinking skills, seven participant students from each group (control and experimental groups) participated in four focus group interviews. In this phase, the heterogeneous sample that consists of dissimilar participants intended to provide varied and rich data that show the possible effect of the instructional approach.

Results

Peter Honey Critical Thinking Questionnaire

To investigate the hypothesized effect of guided discovery as a model of instruction on boosting EFL learners' critical thinking skills, the researcher administered Peter Honey Critical Thinking Questionnaire as a pretest and posttest to the experimental group and control group. Also, the researcher processed the participants' scores through the Paired Samples t-test.

Sample characteristics

Before running the paired samples t-test, it is significant to look at the descriptive statistics. Tables two and three allocate the means and standard deviations among the two groups in the pretest and posttest, correspondingly.

Table 2. *Pretest scores*

Group	N	Mean	Standard Deviation
Experimental group	20	64.65	10.77
Control group	20	62.4	11.39

The table demonstrates that learners exhibit almost similar critical thinking skills at the beginning of the semester. Before the treatment, the participants in the experimental group obtained a mean score of (62.4). Meanwhile, the control group scored a mean of (64.65). The noted difference was only (2.25). Moreover, the standard deviation of the experimental group (SD=11.39) and the control group (SD=10.77) was relatively small relating to the mean scores of the corresponding groups indicating the homogeneity of the studied population. As a result, the pretest scores

indicated low-level critical thinking, because the two groups were not able to reach the average (=75) in Peter Honey Critical thinking Questionnaire.

Table 3. *Posttest scores*

Group	N	Mean	Standard Deviation
Experimental group	20	125.5	16.72
Control group	20	62.5	12.65

The statistics in the table reveal that the scores of learners' critical thinking skills are above the average, and the group is homogeneous. In the posttest, the experimental group achieved a mean score of (125.5) which was higher than the one recorded in the pretest. Regarding the control group, the participants reached a mean of (62.5) which is only (0.1) higher than the mean recorded in the pretest.

The analysis of the inferential statistics attained through the procedure of the Paired Samples t-test is used to determine whether the differences between the means recorded in the pretest and posttest are statistically significant.

Normality Assumption

Considerably, analyzing the assumption of the normal distribution is fundamental before running the Paired Samples t-test. The researcher tested the normal distribution of the two groups' scores in terms of skewness and kurtosis.

Table 4. *Normality tests*

	Group	Skewness	Kurtosis
Pretest	Experimental group	0.5504	-0.5124
	Control group	0.0247	-0.4550
Posttest	Experimental group	-0.9713	0.5588
	Control group	-0.2277	-0.1857

The statistics in the table affirm that the assumption of the normal distribution is realized, because the Skewness and Kurtosis levels are less than the maximum acceptable values for a t-test (i.e., Skewness and Kurtosis are in the range of -2 to +2). Consequently, the results of the Paired Samples t-test can be considered as the scores are normally distributed.

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Table 5. *Paired samples correlations*

Groups	Correlation	Sig.
Experimental group (pretest to posttest)	0.5474	0.00
Control group (pretest to posttest)	0.5046	0.00

Correspondingly, the correlation between the pretest and posttest scores in both groups is valued at (.54) and (.50) that are incredibly significant at (.00) and (.00). These correlations advocate that

the participants are disposed to have the same ranking in the pretest and posttest. That is to say, higher scores in the pretest are associated with higher scores in the posttest.

Table 6. *Paired-samples t-test on experimental group's pretest and posttest*

Experimental Group's Pretest and Posttest	Mean	SD	T	Sig (2-tailed)
	-60.85	-5.95	-18.82	0.05

The statistics of the experimental group indicate a t-value (-18.82) that is extremely significant at (0.05). As a result, the posttest mean is statistically higher than the pretest mean

Table 7. *Paired-samples t-test on control group's pretest and posttest*

Control Group's Pretest and Posttest	Mean	SD	T	Sig (2-tailed)
	-0.1	-1.26	-0.36	0.05

As shown in the table, the posttest mean is approximately similar to the pretest mean. The control group participants' scores from the pretest to the posttest point to a t-value (-0.36) that is extremely not significant at (0.05). Since they did not receive the instructional treatment, learners in the control group did not show evidence of thinking critically.

The findings revealed that teaching through guided discovery helped EFL learners develop their critical thinking ability in reasoning, evaluating, problem-solving, and constructing knowledge. The students who benefited from the instructional treatment outperformed the students who learnt the same content of instruction without any reference to critical thinking skills.

Focus Group Interviews

The researcher conducted four focus groups comprising seven students from each group. The focus groups aimed to identify significant differences among the students and explore their awareness towards developing critical thinking qualities. Throughout the focus groups, the researcher arranged the participants to form a circle. However, the interviewer intentionally asked the control group students to join each other forming half a circle being completed by the students of the experimental group. Having the moderator at the middle, this arrangement targeted to answer the fourth research question and assess the role of fitting instruction on developing learners' awareness to think critically.

The focus interviews revealed diverse perspectives on how learners addressed problems and issues while learning. The results also indicated different views on the importance of looking for appropriate ways to solve problems in the classrooms. Throughout the focus interviews, the researcher noticed that experimental group participants were the first to answer questions and discuss the raised points. On the contrary, the control group participants were passive listeners who speak only when personally asked, giving short answers that were not subject to further discussion. For instance, when asked about the desirable way for long-lasting learning, one control group participant voiced that memorization of content instruction is useful for better learning. Moreover, their answers to the core discussion concerning the importance of developing critical thinking were not surprising, because the related questions did not attract their attention. Most of

the control group participants reported that they had not discussed content instruction thoughtfully with teachers before. The instruction they received in higher education embodied either presented or printed courses, which they had to memorize for exams. Furthermore, their answers to probes were in terms of yes/no answers.

Quite the opposite, the experimental group participants stated that the problem-solving environment that allowed for questioning, exploring, and experimenting was fitting for meaningful and long-lasting learning. Most of the experimental group participants reported that they have not thought critically before experiencing the discovery learning method in the classroom. When learning through this method, they have developed their critical thinking skills, including interpretation, analysis, evaluation, and explanation. For example, one of the participants reported that his critical thinking skills developed after learning through the guided discovery process. He further stated that he has learned the techniques to interpret, analyze, and evaluate information. According to him, these techniques are significant to form meaning and construct knowledge without rote memorization.

In another focus group discussion, an experimental group participant expressed that the learning method allowed her to be aware of critical thinking skills in learning. The same participant added that her knowledge was based only on memorization before learning through discovery. After taking the intervention lessons, she recognized that it is crucial to reflect on the presented information. Similarly, another participant also reported that learning through guided discovery helped her to cope with anxiety and encouraged her to negotiate meaning. She developed personal perspectives, searched for evidence, and evaluated information. She further clarified that her critical thinking improved because of the instruction given through guided discovery.

Another respondent said that the discovery-based activities stimulated his awareness to develop critical thinking. He further elucidated that he could analyze and evaluate information either individually or cooperatively. While using this method, he tried to find solutions for problems and immediately engaged in a discussion with the group partners. Furthermore, the majority of the experimental group participants reported that they developed critical thinking skills while learning through discovery. This development was relevant not only to better and meaningful learning, but to their real-life experiences as well.

The focus interviews' results indicated that learners' awareness of developing critical thinking is dependent on appropriate instruction. Being aware of thinking critically, learners can operate cognitive learning components for evaluating content learning, making relevant decisions and creating meaning. The focus group discussions revealed vast differences between the experimental group participants and their control group counterparts. Most of the experimental group participants believed that their critical thinking abilities improved definitely. Consequently, it is worth mentioning that there should be opportunities for EFL learners to have enough exposure to discovery learning.

Discussion

Notwithstanding the existence of empirical evidence supporting the significance of critical thinking, ELT professionals in Algerian Higher education do not consider its planning in the

designed curricula. The results of the current study have significant benefits in terms of directing attention towards the efficiency of applying guided discovery to develop EFL learners' critical thinking skills. The research data involved the scores of critical thinking tests and focus group interviews. The Critical Thinking test results showed significant differences between the students' critical thinking scores before and after the instructional treatment. As the researcher assigned the participants in the two groups randomly, the final considerable differences are potential effects of the treatment the experimental group received. This result had a strong effect size and power.

Considerably, the experimental group achieved (125,5) as the posttest mean score. The latter is extremely higher than the mean recorded in the pretest (64,65). In contrast, the mean score of the control group posttest (62,5) did not reveal significant development in comparison with the posttest mean (62,4). These results may answer the first research question, "Can critical thinking be taught in the classroom?". Indeed, learners in the experimental group developed critical thinking qualities because they received an instructional treatment. Thus, critical thinking can be taught. In this vein, Shirkhani and Fahim (2011) revealed that promoting critical thinking skills is the teachers' task through selecting suitable materials and activities. These activities, according to Gibson (2012) and Tiwari et al. (2006), careful organization to result in the acquisition of content material and critical thinking skills. Lin (2018) found that the infusion lessons helped EFL students in improving their critical thinking ability and encouraged them to use the target language to express their ideas.

The results also demonstrated that guided discovery has a prospective effect on the experimental group critical thinking skills. The experimental group statistics indicated a t-test value (-18,82) that is extremely significant at (0,05). On the contrary, the statistics of the control group participants from the pretest to the posttest show a t-value (-0,36) that is not significant at (0,05). These results may answer the second question, "What might be the effect of guided discovery on EFL learners' critical thinking skills?" One explanation for the results is the guided discovery nature of discussions. This explanation is in line with what Safrida et al. (2019) found. Their research findings revealed that during the discovery process, the students became more active, creative and confident as the teacher offered them with incentives in the form of problems correlated with subject area knowledge. According to them, these problems can help the students to think, question and create solutions. In this context, various other studies support the efficacy of discovery learning as an instructional approach. In a theoretical study, Fahmi et al. (2019) contended that learning through the method of discovery is significant to train students' critical thinking skills. They further claim that the method of discovery allows learners to recognize essential structures or concepts for a discipline through active cognitive involvement. Besides, Wale and Bishaw (2020) maintained that ELT material developers need to consider the discovery approach to design inquiry-based learning activities so that students develop critical thinking skills.

The experimental group participants have shown high-levels of critical thinking after the guided discovery treatment. Presenting materials in the form of problem-solving situations is useful for students to attain knowledge that they have not recognized through given reports, but through self-discovery. This result may answer the third research question, "To what extent do EFL learners show evidence of thinking critically while experiencing guided discovery?" In this context, Wahyudi et al. (2019) found significant improvements in the students' speaking skill,

critical thinking, and creative thinking as the results of the discovery-based assessment module. Similarly, Kusumawardini et al. (2019) specified that guided discovery activities assist the teacher to build the teaching learning activities. In an experimental study, Ghaemi and Miesaeed (2017) proved that inquiry-based learning, as an approach that encourages students' discovery, engaged the students in the learning process, activated their creative thinking, and inspired them to develop positive attitudes towards the inquiry process.

As far as the last research question is concerned, "Are EFL learners conscious about the value of developing critical thinking qualities?" the focus group interviews indicated positive responses toward the instructional approach on the part of the experimental group participants. They believed that they had developed much in subject area knowledge, thinking skills, and most essential of all, awareness to improve critical thinking qualities. These findings extend the previous empirical research documenting the significant role of discovery learning in growing learners' critical thinking skills. For instance, Sukartiningih and Jacky (2019) contended that discovery learning offers learners with the choice to learn for finding their own notions. For them, this model activates the students' thought processes. Furthermore, Rahman (2017) noticed that the use of discovery learning provides learners with the possibilities to develop creative thinking abilities.

Conclusion

This study aimed to investigate the degree to which guided discovery model could promote EFL learners' critical thinking. It attempted to offer a suggestion to develop learners' critical thinking in Algerian Higher Education. The researcher took the English section of the foreign languages department at Naama University Center as case to apply the instructional treatment. The findings of this study unveiled that the learners who did not have the chance to learn how to think critically (e.g., learners in the control groups) performed less than the ones who benefited from the instructional treatment. Consequently, guided discovery as a model of instruction directs students to think critically about the information they receive. It motivates the students to cooperate with the teacher and peers. Also, guided discovery inspires the students to analyze the reliability of presented information and encourages them to check alternate standpoints. The advantageous results achieved from critical thinking instruction fortified the researcher to assume that guided discovery will generate extensive outcomes if teachers apply it for more extended periods.

An additional assumption that the current study recommends is that critical thinking skills are teachable in higher education through the guided discovery model. However, the present study did not experiment the significance of this model to infuse critical thinking within the teaching of linguistic skills. Thus, this field requires further investigations. Moreover, it is vital to scrutinize whether learners would be able to transfer critical thinking skills across the curriculum.

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