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ORIGINAL ARTICLE

The Impact of International Baccalaureate (IB) Program on Critical Thinking Skills, Disposition, and Critical Reading among EFL Learners

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ABSTRACT

EFL learners usually face major difficulties in developing critical thinking skills which can serve as a basis to enhance their language learning process. The present study examined the impact of the International Baccalaureate (IB) program on promoting critical thinking skills, disposition, critical reading among a cohort of EFL learners in grade 11 and 12 in an Iranian high school that offers both IB and non IB curriculum. The research method was quasi-experimental with a pre-test/post-test design and control group. In so doing, sixty students were randomly assigned in experimental and control group based on the results of a proficiency test. Thirty participants who studied in the IB program participated as the experimental group, and the other 30 participants from a non-IB program were selected and assigned as the control group. The results of a series of one-way ANCOVA tests revealed that the mean of critical thinking skill of experimental group increased from 67.23 to 109.76, indicating that IB program learners significantly outperformed the control group in terms of critical thinking skill, disposition, and the critical reading ability. The pedagogical implications for EFL contexts are discussed.

KEYWORDS

critical thinking, critical thinking disposition, critical reading, IB Program, EFL learners

Extended Abstract

Introduction

As a higher-order thinking process, critical thinking is rational reasoning and logical thinking that places emphasis on one's decisions on what to believe or achieve (Ennis, 1993). It is considered resourceful, creative, and flexible in that it stirs a search for the resources it needs and their employment freely (Cornejo, Campos, Campos, & Quiñones, 2019). Facilitating good judgment and being anchored on well-established standards, self-improvement, and sensitivity to context, critical thinking includes elements such as interpretation, analysis, evaluation, inference, and explanation (Ghasemizad, Mohammadkhanim, & Rad, 2019).

Critical thinking plays a determining role in shaping an individual's thinking processes (Halpern & Riggio 2013). Paul and Elder (2013, p. 17) viewed critical thinking as "the art of thinking about your thinking while you are thinking in order to make your thinking better, clearer, more accurate, and more defensible." Central to critical thinking is the critical thinking disposition, as it includes specific thinking and cognitive skills as well as affective disposition (Zhang et al., 2017). Ennis (1993) believed that critical thinking skills include abilities such as interpreting arguments, evaluating sources for credibility, recognizing the problem's focus, and answering and asking to clarify and/or challenge questions, while the attitudes and dispositions entail readiness to determine and sustain a focus on the conclusion or question, inclination to consider all aspects to a situation, preparedness to seek and offer reasons, openness to figure out the alternatives, and moderation or avoidance of making judgmental decisions unless there is inadequate evidence and justifications. Accordingly, to promote critical thinking, targeting to boost both elements of skill and disposition are essential and needed as critical thinkers must possess a positive attitude and disposition toward the importance and application of critical thinking skills along with the ability to apply those cognitive skills (Gul et al., 2010). The significance of both the skill and disposition aspects is recognized in the educational context as there are students who are capable of thinking critically but often do not wish to put their skills to use (Fahim & Nilforooshan 2014).

Similarly, Giancarlo and Facione (2011) believe that thinking skills and thinking attitudes or dispositions should be taken into account in any discussion of critical thinking. Critical thinking skills are referred to as cognitive abilities which make analyzing and judging the circumstances possible. Therefore, individuals who are willing to or disposed toward attentive problem solving and adept at problem-solving activities have a higher probability of success at critical thinking. Given the fact that critical thinking skills can be taught and acquired (Fahim & Nilforooshan, 2014), the examination of the use of critical thinking skills and the ways to promote them in pedagogical and professional contexts have recently gained widespread popularity and prominence (Kong, 2015; Mandernach, 2006; Marine & Halpern, 2011; Rafi, 2009). As almost all the definitions proposed for critical thinking include reflective and logical thinking skills, which have a pivotal function in individuals' decision-making and problem-solving processes (Butler, 2012), one plausible way to endorse critical thinking seems to be the application of reflective practices. Yet, few studies have delved into the impact of reflective practices on the criticality of learners and staff members, most of which have been conducted in the realm of medical studies. Moreover, most studies on critical thinking are correlational targeting to further illuminate the aspects with which the concept could be defined better (e.g., Facione, Facione, Giancarlo, 2000; Ghasemizad et al., 2019) or the extent to which critical thinking can affect learning (e.g., Gandimathi & Zarei, 2018).

In recent studies, the importance of fostering students' critical thinking skills at a higher education level has been stressed (Akatsuka 2020). Several studies aiming to examine which educational practices can lead to the promotion of critical thinking have been conducted in medical, particularly nursing, contexts (e.g., Naber & Wyatt, 2014; Zhang et al., 2011). However, the context of language learning is a realm in which the implementation of critical thinking is vital. Elder and Paul (2004)

introduced critical thinking as playing a crucial role in reading which is central to developing this skill in language learning, highlighting the prominence of engaging in continuous questioning in the process of reading. Critical thinking has also been shown to contribute to other areas of language acquisition, such as writing (Rafi, 2020) and oral communication ability (Kusaka & Robertson, 2006). The paucity of such studies in foreign/second language acquisition, therefore, points to the need for further studies in different aspects and skills in this field. On the other hand, there are theoretical postulations about how critical thinking can be enhanced among foreign language learners (Shirkhani & Fahim, 2011). Yet, there is scarcity of experimental studies scrutinizing the effect of the designed intervention on enhancing critical thinking skills and dispositions.

Very few studies have looked into how classroom practices can be altered to promote critical thinking among language learners. Rafi (2020), for instance, drawing on Paul and Elder's (1997) studied the framework of critical thinking in language learners' writing practices. One program in which reflection is viewed as an inseparable element is the International Baccalaureate (IB) program which claims to employ an inquiry-based learning framework that includes reflection and enhances learners' critical thinking and analytical abilities (Dickson, Perry, & Ledger, 2018). Despite the large number of studies on the notion of critical thinking, there are still numerous elements of doubt and controversy in this regard. Indeed, critical thinking is a multidimensional construct that is difficult to pin down to a fixed concept. That is the reason cognitive scientists, philosophers, psychologists, and educators have proceeded to investigate critical thinking theories based on multiple research traditions. (Davies 2015; Facione, 2011; Halpern, 2014; Lai 2011; Lim, 2015; Shiraev & Levy, 2020).

Many scholars seem to have reached a consensus on what consititutes the major critical thinking topics. First, critical thinking researchers mostly agree on the sub-skills covered by the term that include examining arguments, claims, or evidence (Davies 2015; Halpern, 2014; Lim 2015), making inferences using inductive or deductive reasoning (Davies 2015; Facione, 2011), judging or evaluating (,Lai 2011; Facione, 2011; Halpern 2013) and making decisions or solving problems (Facione 2011; Halpern, 2013; Willingham, 2007). Other abilities or behaviors associated with critical thinking include asking and answering questions for clarification (Fisher 2011), defining terms (Lai 2011), identifying assumptions (Aryani & Wirawan 2017.), interpreting and explaining (Facione, 2011), reasoning verbally, particularly in respect to concepts of likelihood and uncertainty (Halpern, 2014), predicting (Davies 2015), and understanding both sides of a situation (Willingham, 2007).

In modern education, critical thinking is considered an important and vital topic; as a result, numerable educators have focused on teaching critical thinking in various instructional contexts. Numerous studies have stressed the relevance of critical thinking for students and the necessity of including it as one of the key educational goals (Azer, 2008; Moon, 2007; Abdi, 2012). Indeed, critical thinking is one of the key goals of educational systems in numerous countries, without which acquired information and literacy become a "hodgepodge of concepts and facts" (Tieso, 2002, p. 118). According to Facione (2007), teaching students how to think critically is an essential issue. Available documents outlining the goals in educational systems from several countries, place emphasis on critical thinking as one of their major pursued goals.

Despite the emphasis on critical thinking development, it is not an easily attainable educational goal (Brunt, 2005; Facione 1990). According to Paul (2005), fragmentation and lower order learning are the two most pressing issues in education today. Indicating that the concept of coherence, connection and depth of understanding are missing based on his point of view. However, this is not sufficient. Barnett and Francis (2012) stated that the global economies have increased the pressure on educational settings, which requires higher-order thinking skill curricula development, thus making mere memorization of facts no longer sufficient.

There are several approaches to teaching critical thinking and incorporating it into the

curriculum. Educationalists (for example, Adeyemi, 2012; Domenech & Watkins 2015) believe that curriculum elements have an unavoidable impact on critical thinking growth, improvement and disposition. A successful curriculum, according to the Council of Higher Education (2001), seeks to build excellent relationships between assessments, education, and personal growth through providing learners with certain areas of their education and encouraging self-evaluation and reflection. According to Thompson (2011), critical thinking abilities cannot be fully developed through specific disciplines, courses, or faculties. Across disciplines, Ramsay (2009) advocated for integrating critical thinking with reading and writing. His research has revealed that critical thinking is successfully integrated into reading and writing across the post-secondary curriculum, demonstrating that reading and writing are related. Both processes were thought to be expressions of how students assess, communicate, and interpret information.

Critical thinking has long been a contentious issue since it is difficult to define (Castle, 2009; Raymond & Profetto-McGrath, 2005). Throughout the literature, the concept of critical thinking has been described in a variety of ways, and even the current definitions touch on different aspects of critical thinking. Furthermore, according to Facione (2010), critical thinking is a goal-oriented and judgement activity that focuses on the processes utilized in thinking while producing a variety of materials, themes, questions, and issues. According to Brookfeild (2009) since critical thinking incorporates certain abilities such as self-control, assessment, observation, perception and analysis, it can be considered as a lifelong learning process, which leads to individual's intellectual growth and enhances cognitive skills.

Although critical thinking is essential, it is believed that it cannot be achieved without real dispositions. Consequently, it is something more than just using the appropriate cognitive skill in proper situations, claims Kanik, (2010). In truth, critical thinking requires specific attitudes, dispositions, and mental characteristics, all of which are required for the effective application of critical thinking abilities in real-life situations. Jones (2015) believes that a critical thinker must exhibit particular dispositions i.e., thinking critically, being reasonably judgmental and self-centered. He further claims that increasing intellectual modesty, pursuing self-understanding of a given state, building intellectual bravery, evolving intellectual moral faith, and establishing confidence in logic are among the criteria for critical thinking development. Dispositions are the necessary components of critical thinking without which it cannot fully develop. Facione (1990) identified two variables for emotional dispositions in critical thinking. The first dimension represents basic methods to life and living, while the second represents specific approaches to specific topics, questions, or difficulties. To be termed a critical thinker, however, an individual does not need to master all of them.

Lipman (1995) proposed two approaches to critical thinking skills instruction: skill-oriented approach, and content-oriented approach. The first approach considers thinking skill as a collection of skills such as ordering, classifying, organizing, comparing, matching, calculating, and predicting. They are all applicable to all subjects allowing comprehensive applicability (Lipman, 1995). The proponents of the skill-oriented approach recommended teaching critical thinking skills explicitly through separate instructional courses. Critical thinking skills and principles of good thinking should be taught and practiced in those courses specifically to train individuals in these skills. This approach, however, has its own critics who believe that teaching critical thinking through separate courses lead to training skill technicians, who use these skills mechanically.

The second approach (Lipman, 1995), the content-oriented one, proposes teaching critical thinking skills and dispositions through content and they believe that thinking skills cannot be taught separately. According to Zohar and Dori (2003), effective learning can be achieved by implementing thinking skills throughout courses, encouraging learners to apply the skills in a relevant situation and assisting them in improving their comprehension of the subject matter and applying it in other contexts. This method focuses on the integration of critical thinking abilities throughout the curriculum. The proponents believe that teaching critical thinking through content could take place explicitly or implicitly within the context of academic

disciplines. Those who opt for the implicit teaching of the aforementioned skills state that teachers should provide with opportunity to reflect on the information they have received through in-depth and meaningful subject material education. Consequently, the ideas of critical thinking are implicitly presented during this process. As a result, students learn to use these critical thinking abilities while they are engaged in the subject material. On the other hand, the proponent of explicit teaching of critical thinking skills through content emphasize integrating thinking-skill development with instruction in the subject matter completely directly to make students master both critical thinking skills and content by raising their attention. This approach seems to have received much more attention in the literature (Eggen & Kauchak, 2001; Johnson, 2000).

One educational program that has reflectivity as a central element of its core curriculum is the International Baccalaureate (IB) Diploma Program (DP) curriculum. As the approach in this program is theoretically based on the content-based approach (Dickson, Perry, & Ledger, 2018), it can be regarded to be in line with the second approach proposed by Lipman (1995) above. The theoreticians and practioners of the IB program strongly claim that it is designed to successfully promote the development of the learners' critical thinking abilities (Dickson, Perry, & Ledger, 2018; IBO, 2014). The IB program includes two components that directly address critical thinking skills. Theory of Knowledge (TK), the first component, accentuates teaching critical thinking skills in a domain-general fashion. And the second component, labeled "the Extended Essay" requires students to produce an essay by applying their critical thinking skills in a deeper, more domain-specific manner. As breifely mentined above, the literature is not short of studies investigating critical thinking development among International Baccalaureate students (for example: Cole, Ullman, Gannon, & Rooney, 2015; Dickson et al., 2018; Wright & Lee, 2014). The majority of studies, however, have been carried out in fields other than foreign language learning. The paucity of language related studies in this area in an Iranian context, and the need to investigate the possible role and effectiveness of IB programs in developing crtitical learning skills, disposition, and reading among Iranian EFL learners provided the researchers with the incentive to formulate the research proposition that the IB program might have a significant effect on developing critical thinking skills, critical thinking desposition and critical reading of Iranian EFL learners who receive their diplomas through this program. In order to investigate the research proposition stated above, the following questions were formulated:

1. Does the IB program have a significant effect on EFL learners' critical thinking skills?
2. Does the IB program have a significant effect on EFL learners' critical thinking disposition?
3. Does the IB program have a significant effect on EFL learners' critical reading?

Significance and Purpose of the Study

In educational policy sections aimed at defining curriculum objectives, critical thinking is commonly of paramount importance. Critical thinking has almost always been envisioned as a required outcome of higher education (Tsui, 2002) that should be incorporated into all curriculum elements by educational administrators and policymakers (Piaw, 2010). This study intended to present empirical results on the efficacy of pedagogical tasks incorporated in IB program to see whether existing English curricula are concerned with individuals' critical thinking abilities. It aims to compare the critical thinking of high school English learners trained in International Baccalaureate (IB) diploma program with those not enrolled in IB and studying according to the curriculum designed and introduced to schools by the Ministry of Education in Iran.

Dulun and Lane (2022) believe that many educators and researchers have investigated different ways to develop and support learners' critical thinking. The reason why this particular program has been selected to investigate the effectiveness of pedagogical tasks on critical thinking is that reflectivity plays a central role in IB (The International Baccalaureate Organization, n.d.). Therefore, given the role of

reflective practices in critical thinking (Butler, 2012), theoretically it is expected that IB can pave the way for critical thinking development. However, empirical backing is needed to prove the superiority of such programs focusing on the role of reflection on action over regular programs.

Despite widespread agreement on the importance of critical thinking growth through education, critical thinking does not appear to be an incontrovertible and recognized value in modern educational systems (Rezaei, et al., 2011). Educators can benefit from both empirical data and specific guidelines with regard to the ways specific classroom activities can lead to gains in critical thinking abilities. Therefore, this study targets to empirically examine whether curricular practices demanding reflective practices on students' side can significantly increase students critical thinking skills, bring about a more positive disposition, and promote critical reading.

The first piece of evidence with regard to the significance of this study lies in the fact that it bridges the gap in the literature with regard to adopting and adapting pedagogical tasks to foster critical thinking skills and disposition. This study explores the ways in which the use of certain pedagogical activities centered on reflection in IB program can impact critical thinking skills and disposition in addition to the application of critical thinking in reading comprehension which has not been adequately studied previously in an Iranian English as a foreign language (EFL) context. This study can shed some light on how curricular activities motivating learners to get involved in reflective practices can foster the use of higher cognitive skills such as critical thinking skills. The present study can provide language teachers and curriculum planners with guidelines as what type and sequence of activities in language classes can empower learners to employ critical skills and motivate them to adopt a more positive attitude and disposition toward the use of critical thinking which is of a high importance in learning.

The current study has the potential to make a significant contribution to the field in terms of highlighting the possible effects of training program designed to foster reflectivity on not only critical skills of the participants but also their disposition and willingness to employ those skills. Curriculum developers can make use of the suggested guidelines to restructure the existing curricula to enhance the elements of critical thinking. Moreover, EFL instructors can gain increasing insights into how critical thinking can be taught and how the related obstacles can be overcome. Furthermore, the study's findings are hoped to pave the way for a shift in emphasis from acquiring knowledge to knowledge transformation and evaluation.

The Method

The Design

The design of the study is a quasi-experimental one, meaning that it enjoys all the elements of an experimental study except random selection of the participants. Although this can be considered one of the limitations of the study, the researchers had no other choice mainly because the IB program is offered in a limited number of schools in Iran, thus limiting access to an adequately large population to facilitate randomization. As a result, intact classes were chosen; however, propoer measures were taken to systematically screen the candidates so as to select as homogenous a group as possible both in the experimental and control group.

The participants

A total of 60 participants took part in this study 30 of whom had enrolled in the IB program in Mahdavi high school in Tehran. This sample served as the experimental group while an equal number of students from the regular education program from the same school formed the control group of the study. In order to make sure that the two groups were homogenous in terms of the required entry criteria, the following procedure was closely and precisely implemented. As the main entry criterion and screening tool, a Preliminary English Test (PET; Hashemi & Thomas, 1996) was administered to two grade 11 classes and two grade 12 classes, in total consisting of 52 students with an age mean of 17.2. In order to find the cut-off point for including the students in the program, combing through the literature of similar studies provided the researchers with a commonly deployed criterion: the learners whose score in the homogeniety test (the PET) (M=64, SD= 3.4) were between one standard deviation below and above the mean (60.5 and 67.5 respectively).

This procedure handed the researchers 34 out of 52 students, out of which 30 students were randomly chosen to form the experimental group.

In an attempt to form a control group that matched the experimental group as much as possible, exactly the same procedure was followed with the same number of classes and almost the same initial number of students; this time, however, in the regular educational program of the school (the Mahdavi School offers both channels for students to obtain their high school diplomas). In short, 58 students from two 11th graders classes and two 12th grade classes were randomly chosen to take the entry criterion test (the PET) (M= 58, SD = 4.1). Considering the almost similar mean and standard deviation of the screening test, and by applying the same cut-off point in the case of experimental group, the researchers selected 30 students out of the 36 who had reached the required entry criterion to form the control group.

The IB Course

International Baccalaureate (IB) Diploma Program (DP) curriculum is offered by authorized schools worldwide (Bunnell, 2008; Resnik, 2012; Culross & Tarver, 2011; Hallinger & Lee, 2012). The program offers six subjects: 1- studies in language and literature, 2- language acquisition, 3- individuals and societies, 4- Sciences, 5- mathematics, and 6- the arts. Through the IB DP, students are urged to consider the nature of the knowledge they acquire. By the end of the course, they must conduct independent research and accomplish a project that generally includes community service.

The participants in the experimental group who had enrolled in IB program, like the regular high school learners, needed to pass an English language course at each grade as a requirement for their Diploma degree. Like the learners in other high schools, they studied the materials developed by the Ministry of Education. They were, however, required to reflect on their learning and knowledge every session. They kept reflective journals in which they recorded their reflective notes on their learning experiences in their English course and all the other subjects.

In the present study, data were gleaned before the learners in the IB program were asked to hand in an extended essay and carry out their project so that the independent variable would be constrained to the reflective activities carried out by learners throughout the year. This also helped to rule out any advantage that essay writing would create for the experimental group thus creating a gap with the control group.

Instrumentation

Critical Thinking Skills Test

A Critical Thinking Skills test (Naieni, 2005) developed on the basis of the original questionnaire by Honey (2000 and 2005) was employed to check students' critical thinking skills. The original questionnaire (Honey, 2000) was redesigned for Iranian language learners (Naieni, 2005). The content and construct validity of the questionnaire was studied by Honey (2000) and Naieni (2005). According to their analysis, the questionnaire enjoys a well-defined content and construct validity. The researchers of this study, however, did not suffice with the reported validity of the questionnaire. In fact, to further validate the questionnaire, they recruited a Ph.D. holder psychologist and a Ph. D. holder of English as a foreign language instructor to examine the questionnaire's face and content validity. The results of this examination attested to the validity of the questionnaire with a high level of consistency between the two experts' independent evaluations.

This questionnaire was administered to assess the participants' critical thinking abilities in both the pretest and post-test. In fact, this deviceThis scale was used to gauge the impact of the treatment (i.e., IB program) on the development of participants' critical thinking skills. This questionnaire consists of 30 Likert-type items assessed via "six alternatives including Never (1), Rarely (2), Sometimes (3), Often (4), Usually (5), and Always (6)" that is aimed at evaluating the skills of analysis, inference, evaluation, and reasoning. Therefore, the score for each participant could vary from 30 to 180. Cronbach's Alpha was used to determine the questionnaire's reliability and internal

consistency following the pretest and post-test administrations, and the results were.72 and.78, respectively.

Critical Thinking Disposition Test

The Critical Thinking Disposition Test (CTDA) developed by Ricketts and Rudd in 2005 was implemented to assess the participants' critical thinking disposition in both pre and post-tests. The CTDA scale contains 26 items assessing individuals' disposition toward employing critical thinking activities, such as analyzing and problem-solving, via a six-point Likert score (Min = 26, Max = 156). Three subscales of the CTDA scale are Engagement, Cognitive Maturity, and Innovativeness. Ricketts and Rudd (2005) argue that individuals who score high in the engagement sub-scale believe in the necessity of well-thinking, justify their thinking skills, and pursue an opportunity to employ cognitive skills to solve problems and make decisions. Moreover, Ricketts and Rudd (2005) proclaimed that individuals with high cognitive maturity are aware that difficulties are multifaceted and more intricate than they appear to be. Finally, individuals with a high innovativeness disposition have an appetite for learning and acquiring knowledge.

As for the validity of this instrument, the following study has played a determining role. In a study by Pakmehr, Mirdrogi, Ghanaei and Karami (2013) titled "Reliability, Validity and Factor Analysis of Ricketts and Rudds' Critical Thinking Disposition Scales in High School" the researchers carried out a specific study on the indexes of this questionnaire, especially of concern here its validity. In their study, 472 high school students (270 girls and 202 boys) in Mashhad, Iran, in the school year 2010-2011 were chosen using multistage cluster sampling, who then were asked to complete Critical Thinking Disposition Questionnaire. The researchers assessed the validity of the questionnaire using content validity, construct validity and factorial validity. They reached the conclusion that the Critical Thinking Disposition Questionnaire has acceptable validity in Iranian society and is an appropriate instrument for assessing critical thinking disposition among high school students.

In the present study and as it was the case with the first instrument, the researchers decided to go the extra mile and put the questionnaire to one further validity examination by a Ph.D. holder psychologist and a Ph. D. holder of English as a foreign language instructor who inspected the Likert-type scale for content and face validity. The experts did confirm its validity and demonstrated high consistency in their independent evaluation of the device.

Moreover, the reliability of the instrument was measured via Cronbach's alpha in both pre and post-test for the scale as well as for each subscale. Cronbach's alphas were consecutively 0.82 and 0.79 for Innovativeness, 0.85 and 0.81 for Maturity, and 0.78 and 0.87 for Engagement in the pre and post-test. The reliability of the whole scale as estimated through measures of internal consistency was 0.88 in the pretest and 0.89 in the post-test. Given that Norris and Ennis (1989) proposed reliability ratings of 0.65 and 0.75 for any instrument measuring various critical thinking aspects, obtained reliability coefficients were deemed satisfactory in the current study.

Critical Reading Test

On the basis of the critical thinking skills list proposed by Facione (1990), Zhou, Jiang, and Yao, (2015) developed the Critical Reading Scale (CRS). In order to develop the scale, they also had to go through the process of validation by collecting data from a large sample of high school and college freshmen students (Zhou, et. al., 2015). The results of their inquiry indicated high face and content validity for the CRS. Although the researchers of the present study could rest assured with this reported validity for the scale, they once again decided to seek the contribution of the two experts already involved in validity checks in this study. To achieve this goal, the researchers provided the Ph.D. holder psychologist and the Ph. D. holder of English as a foreign language instructor with two pieces of document: the critical thinking skills list proposed by Facione (1990), which had been used by the developers of the CRS, as well as the Critical Reading Scale itself. The experts were asked to check all the items of the scale and make sure that the CRS had closely followed the

Facione's list in content. The results of their meticulous examination displayed that the CRS had acceptable face and content validity as far as the Facione's stated list was concerned, thus corroborating its vality for this study.

It should also be noted that the Critical Reading Scale (Zhou, et. al., 2015) consists of two main parts, the participants' personal background information (gender, major, grade) and their critical thinking abilities. The second part assesses critical thinking and needs them to describe their routine reading behavior on a Likert-type scale (Min = 22, Max = 132). In this study, participants were asked to answer the 22 items of the questionnaire on a Likert-type scale ranging from 1 to 6 (6= always; 5=usually; 4=often; 3=sometimes; 2=seldom; 1=never). In the pre and post-test, the CRS reliability was measured through internal consistency measures, and the estimated Cronbach's alphas for pre and post-test were consecutively 0.83 and 0.75.

Procedure

At the outset of the 2019 educational year, and having chosen the learners in the experimental and control groups, the researchers administered each pretest on a separate day. The three scales (i.e., Critical Thinking Skills, Critical Thinking Disposition, and Critical Reading) were administered to the participants. They were told they would not be judged or scored based on their answers to the questions, and their responses to the questionnaires would not impact their class evaluation. One of the researchers was present in the sessions; therefore, the questionnaires were being answered by participants ensuring that they could ask any questions if needed. The participants were also told they could ask the researcher for the Persian equivalent of words, phrases, or sentences ad were asked to reply to the items accurately and honestly.

The same testing procedure was followed six months later towards the end of the year. The participants were once again asked to complete the three questionnaires so that the researchers could measure the impact of the treatment on critical thinking skills and critical thinking disposition. The collected data were analyzed through Analysis of Covariance (ANCOVA) tests. In order to find out whether the program had led to gains in different aspects of critical thinking, pretest scores were taken as a covariate to ensure the possible initial discrepancies would be taken into account.

Results

First, to realize whether the parametric test of ANCOVA could be applied to examine the differences among the experimental and control groups in the critical thinking skills post-test, preliminary checks were carried out, which included the examination of the normality of the pre and post-test scores, reliability of the covariate (the pretest), the linearity of the relationship between dependent variable and covariate, homogeneity of regression slopes, and homogeneity of variances. Then, the means and standard deviations of the experimental and the control groups on the critical thinking test were calculated, which are shown in Table 1.

Table 1. *Descriptive Statistics for the Critical Thinking Skills Test*

	Pretest		Post-test		
Groups	Mean	SD	Mean	SD	N
Experimental	62.26	17.31	127.56	3.82	30
Control	60.46	11.94	67.77	3.80	30

As Table 1 demonstrates, the experimental group (M = 127.56, SD = 3.82) obtained a higher mean score compared to that of the control group (M = 67.77, SD = 3.80) in the critical thinking skills test. However, to determine whether the difference was statistically significant and investigate whether the IB program significantly affected the participants' critical thinking skills, the researchers conducted a one-way between-subjects ANCOVA on critical thinking test scores, the results of which are displayed in Table 2.

Table 2. *One-way ANCOVA: Tests of Between-Subjects Effects, Test of Critical Thinking Skills*

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	2510.87	1	2510.87	5.74	.020	.09
Pretest	13682.42	1	13682.42	31.28	.000	.35
Groups	53593.96	1	53593.96	123.37	.00	.68
Total	662890.00	60				

As Table 2 depicts, the results of the one-way ANCOVA on the critical thinking skills test yielded significant differences between the performances of the learners in the experimental (M = 127.56, SD = 3.82), and the control group (M = *67.77*, SD = *3.80*) in the post-test, F (1, 123.37) = 53593.96, $p < .05$; $\eta^2 = .68$, when the differences in the pretest scores were taken into account. This revealed that the reflection could significantly increase participants' critical thinking skills.

The Impact of Reflection on Critical Thinking Disposition

To find out whether the parametric test of ANCOVA could be applied to probe into the effect of the IB program on participants' attitude and disposition toward the importance and use of critical thinking skills, the researchers carried out preliminary checks, including the examination of the normality of the pre and post-test scores, reliability of the covariate (the pretest), the linearity of the relationship between dependent variable and covariate, homogeneity of regression slopes, and homogeneity of variances. Then, having made sure of no violation of the prerequisite conditions, descriptive statistics (i.e., means and standard deviations) for experimental and the control groups on the critical thinking disposition test were estimated, which are displayed in Table 3.

Table 3. *Descriptive Statistics for the Critical Thinking Skills Test*

	Pretest		Post-test		
Groups	Mean	SD	Mean	SD	N
Experimental	67.23	17.20	109.76	7.64	30
Control	69.26	18.96	71.13	14.69	30

As it can be seen in Table 3, the experimental group (M = 109.56, SD = 7.64) outperformed the control group (M = 71.13, SD = 14.69) in the critical thinking disposition post-test. Next, to determine whether the observed difference in the post-test was statistically significant, the researchers ran a one-way between-subjects ANCOVA on critical thinking disposition test scores. Table 4 displays the results of the critical thinking disposition ANCOVA test.

Table 4. *One-way ANCOVA: Tests of Between-Subjects Effects, Critical Thinking Disposition Test*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	20342.48	1	20342.48	165.68	.00	.74
Pretest	1066.44	1	1066.44	8.68	.00	.13
Groups	1674.46	1	1674.46	13.63	.00	.19
Total	512803.00	60				

As Table 4 shows, the results of the one-way ANCOVA on the critical thinking disposition test revealed significant differences between the performances of the learners in experimental (M = 109.56, SD = 7.64), and the control group (M = 71.13, SD = 14.69) in the post-test, F (1, 1674.46) = 13.63, $p < .05$; $\eta^2 = .19$, when the initial discrepancies in the pretest scores were

taken into consideration. This indicated that the reflection could significantly change participants' critical thinking disposition into a more positive one.

The Effect of IB on Different Aspects of Critical Thinking

In order to ascertain whether critical reading data gleaned through the critical reading test could be analyzed using the parametric test of ANCOVA test, the researchers ran preliminary checks comprising the examination of the normality of the pre and post-test scores, reliability of the covariate (the pretest), the linearity of the relationship between dependent variable and covariate, homogeneity of regression slopes, and homogeneity of variances.

First, the normality of the distribution of the critical reading scores was assessed via Kolmogorov-Smirnov and Shapiro-Wilk tests. Having ensured there was no violation of the prerequisite condition, the authors calculated descriptive statistics (i.e., means and standard deviations) for the experimental and the control groups on the critical thinking disposition test, which are shown in Table 5.

Table 5. *Descriptive Statistics for Critical Reading*

	Pretest		Posttest		
Groups	Mean	SD	Mean	SD	N
Experimental	56.23	10.70	125.43	11.45	30
Control	55.70	11.78	59.56	15.79	30

As it can be inferred from Table 5, in the pretest the experimental group (M = 56.23, SD = 10.70) gained a score almost similar to the control group (M = 55.70.43, SD = 11.78). Nevertheless, the mean score obtained in the post-test by the experimental group (M = 125.43, SD = 11.45) was much higher than that of the As Table 6 depicts, the results of the one-way ANCOVA on the critical reading test revealed a significant difference between the performances of the learners in experimental (M = 125.43, SD = 11.45), and the control group (M = 59.56, SD = 15.79) in the posttest, $F(1, 766.74) = 4.24$, $p < .05$; $\eta^2 = .07$, when the initial inconsistencies in the pretest scores were taken into consideration. This indicated that the IB program could significantly boost participants' critical reading.

control group (M = 59.56, SD = 15.79). Next, to determine whether the observed difference in the post-test was statistically significant, the researchers used a one-way between-subjects ANCOVA on critical reading test scores. Table 6 displays the result of the critical reading ANCOVA test.

Table 6. *One-way ANCOVA: Tests of Between-Subjects Effects, Test of Critical Reading*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	12371.88	1	12371.88	68.47	.00	.55
Pretest	3448.88	1	3448.88	19.08	.00	.25
Groups	766.74	1	766.74	4.24	.04	.07
Total	589492.00	60				

Discussion

The ability to think critically, which enables individuals to examine a problem through an objective lens, is a vital skill in today's classroom and workplace (Halpern, 2003). By analyzing the data gleaned from the three questionnaires, the researcher concluded that reflective activities in the IB course could promote critical thinking skills and disposition. Moreover, the ability to apply critical thinking in the reading skills was found to have positively impacted by the IB program that included and valued reflective notes and reflection upon knowledge.

In order to discuss the findings of this study and their interpretations as well as the implications for an Iranian context, we first need to compare the results with other relevant studies from the literature. The findings of this research show close congruence with a number of previous studies. For example, and most notably, Wright and Lee (2014) explored the potential of International Baccalaureate Diploma Program in schools to respond to changing social and economic dynamics by prioritising "21st-century skills" particularly the critical thinking skills in China. The findings of their study revealed that the IB program had significantly led to the development of critical thinking skills. This is in direct alignment with the findings of this study. These common findings can be attributed to the provision of the three IB program "Core Requirements", which are Creativity, Action, Service (CAS), Extended Essay (EE) and Theory of Knowledge (TOK). In spite of such obvious superiority of IB program depicted by the results of this study, the widespread implementation of this program into the mainstream educational policies of Iran should be approached cautiously and after adequate deliberation on its acceptance by the public, and the affordability of the program as it does entail much higher costs on the part of the families as well as the government.

Moreover, the findings of this study on the effectiveness of IB program in developing critical thinking skills compared with the regular educational programs are also corroborated by a number of other studies such as Palmer (2016) who also reported that students in an IB program could understand complex issues using inquiry and analytical skills. In a similar vein, in a study comparing IB graduates' critical thinking skills to those of non-IB counterparts, Cole, Ullman, Gannon, and Rooney (2015) discovered that university students who had previously studied the in the IB program had higher critical thinking skills when compared to their non-IB peers. Furthermore, there are reports of schools deciding to outspread the IB's critical thinking components, such as reflection, to all students, including those who were not enrolled in the Diploma Program, as they believed it was effective in developing critical thinking (Resnik, 2012). To interpret such notable results, we can once again refer to the philosophy behind the IB programs especially the theoretically based attempts to cultivate the core requirements of critical thinking through asking students to develop argumentative writing skills in the Extended Essay task and the Theory of Knowledge (TOK) component in which learners are explicity taught to critically assess various theories of knowledge in the history of mankind.

As for the second question of this study and its findings with regard to critical thinking disposition, the results are congruent with Djoub's (2017) findings regarding the benefits of reflective writing in promoting critical thinking. He reported that being involved in reflective writing provides learners with opportunities to act as active agents able to make decisions and judgments about their learning and thus promote metacognition linked to critical thinking. As Djoub (2017) has also indirectly pointed out, such results can be interpreted to be the direct results of the IB program emphasis on developing three required components of Creativity, Action, and Service which urge learners to be actively involved in process of learning rather than being the mere receivers of information without personal deliberation and comtemplation.

We can take a further step and delve into other fields to find out if the findings of this study chime with those conducted in areas other than social sciences. For examole, the findings of this study are consistent with the ones obtained by Naber and Wyatt (2014) in a study carried out in the context of nursing education. Having examined the effectiveness of a novel reflective writing intervention, they reported that critical thinking skills and dispositions in nursing students as measured through a questionnaire were increased. They argued that the results gained in their study motivate nursing schools to include reflective writing in their curriculum. Reflective activities seemed to have helped students concentrate on the depth of knowledge, proving to boost critical thinking (Bransford et

al., 2000; Cotton, 1991). Such findings and commonalities between social sciences and basic sciences is another feather in the cap of the IB program by claiming that the effectiveness of its philosophy of education can transcend discipline boundaries and establish common grounds in interdisciplinary areas.

Moreover, the findings of this study are further strengthened and consolidated by the study carried out by Colley, Bilics, and Lerch (2012) who introduced reflection as a central component to critical thinking, stating that critical thinking results from reflecting on one's learning and developing a meta-awareness. They conducted a qualitative study to examine and analyze critical reflection through student writing in three different college settings and reported changes in students' thinking throughout the semester. On the other hand, the results gained in the present quantitative study corroborate the findings of Colley et al.'s (2012) qualitative study, confirming that reflection on action can trigger more self-awareness and thus critical thinking. According to Brockbank and McGill (2007), reflection on action and feeling can prompt metacognitive activities that will pave the way for critical learning.

As for the third question of this study on the effects of IB programs on critical reading, the findings concerning the impact of the IB program and reflective activity on critical reading comprehension are corroborated by the findings gained by Alem (2019), who reported critical reflection motivated thirty-two EFL learners to implement critical reading in a quasi-experimental study. Alem (2019) found that practicing critical reflection in reading classes through reflection techniques such as diaries, conversations, and journal writing boosted participants' motivation, assessed through pre and post-intervention questionnaires, to get involved in learning critical reading. Similarly, the present study results illuminated that reflective activities as the central part of the IB program could promote critical thinking while reading among the participants and enhanced their ability to implement critical reading strategies. Reflection is considered to encourage students' critical thinking by using their natural story-telling propensities (Shermer, 2002). It has been suggested that reflecting on course content allows students to connect previous experiences with present learning material, resulting in active learning. Active learning increases motivation to learn by making possible connections to the taught information (Driscoll, 2005).

As Schiller (2009) discusses, reflection motivates learners to participate in the activity by adding to efficient external delivery of the new material. However, reflection can only become effective in critical thinking skills improvement if it does not merely report the actions and profoundly reflects on the experience (Bain, Ballantyne, Mills, & Lester, 2002). Reflection makes processing, evaluation, and analyzing the content possible and enriches the learning experience. Therefore, the results gained in this study point to the value of implementing effective reflection in pedagogical programs through providing empirical evidence. This study has proved that the programs, such as the IB program, focusing on training learners to reflect on the nature of the learning experience critically can critically develop the critical thinking abilities of individuals.

This study revealed that applying reflective activities in the IB program could enhance critical thinking skills and critical thinking disposition. Moreover, the ability to use critical thinking in reading skills was positively affected by the IB program, which valued reflection upon the knowledge that helps learners connect between educational experiences and real-world situations. Therefore, if students learn to reflect using the same set of reflective skills, they will be capable of moving beyond the surface level and master deeper understanding as well as active learning. In fact, reflective thinking provides the students with the necessary skills to process their learning mentally, identify what they have learned, rectify their understanding with the new information, and utilize their

knowledge in different situations to help students develop their reflective ability on their learning.

Conclusion

The results of this study are congruent with previous researches attesting that implementing critical reading skills to the students and helping them become aware of their learning skills can consequently nurture them become critical readers in the future. Moreover, the findings revealed the strong relationship between reading comprehension, critical thinking, and prior knowledge. As prior knowledge is considered the foundation for critical thinking and making inferences, which can operate as an effective tool to activate prior knowledge.

Moreover, the current study is in-lined with other researches, which was gleaned from the existing literature that emphasizes the crucial role of critical thinking in student's learning outcomes. Their findings have proved that critical thinking skills have significantly enhanced student's critical reading ability. Believing that critical thinking and reading comprehension are considered as important skills for students to analyze the texts easier, as critical thinking help students to think logically relying on their knowledge. Therefore, apart from comprehending the texts, students must master critical thinking to improve their schemata to analyze the text. To be more precise, critical thinking has a significant relationship with reading comprehension ability, leading to improvement in students' critical reading skills. In fact, a serious revision of curricula is required to develop critical thinking skills, and such a paradigm shift requires reflection on lecturers' and students' role, assessment methods, learning outcomes, and most importantly, considering the fact that learners construct their own knowledge in accordance with their experiences and backgrounds.

The prime implications of the findings call for increased attention to higher-order thinking (critical thinking) skills. To this end, administrators in charge of policy and curriculum should pay more attention to critical thinking and critical thinking disposition in the educational process to empower the students with knowledge acquisition. In fact, consistent with the increasing social and economic challenges for all stakeholders including, policy-makers, syllabus designers, and teachers, the emphasis should necessarily move away from absolute reliance on receiving factual and conceptual knowledge toward engaging students in activities that increase their adaptability, creativity, and critical thinking.

The findings of the present study call for further attention to the existing pedagogical program since developing critical thinking skills seem to be missing in many educational systems. Although critical thinking is valued across disciplines some courses such as philosophy and critical thinking are claimed missing in most school curriculum. Many educators and researchers believe that integrating critical thinking across the curriculum must be incorporated (Hatcher 2013, Ennis 2018). Despite the fact that most individuals are aware of the importance of critical thinking, it is not taught in most schools, stating that today's generation lacks critical thinking skills. According to Riazi and Razmjou (2004), educational planning curriculum renewal is a continuous process that helps instructors and curriculum developers incorporate new expectations and insights in educational programs with regard to skills and contents covered so that in the future life the prospective graduates of such programs become creative and critical thinkers.

In addition, the educational system is believed to be less concerned with imparting information and focusing on the memorization of knowledge to open a new chapter in educational systems that would prepare students for the ever-changing world. Therefore, improving students' meta-knowing knowledge should be an essential aspect of the curriculum to empower the individuals to become autonomous outlooks on the encountered challenges (Feuerstein, 1999). Syllabus designers and materials developers need to provide curricula, materials, and course books that invoke critical thinking as one of the practical aspects and motivate students to reflect

on their progress and control their thinking. Based on the findings of this research and considering the significant role of critical thinking and critical thinking disposition on IB program among students, teachers and educators should investigate the principles of critical thinking and try to teach those skills effectively to the students in different educational levels to foster critical thinkers in school and their future life.

Conflict of Interest

This article has no conflict of interest and has not been published in any other publications. It has been submitted to the Quarterly of Iranian Distance Education Journal for review and puclishation.

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