

Critical Thinking and Gender Differences in Academic Self-regulation in Higher Education

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Abstract

In congruence with the studies corroborating the significant role of higher-order thinking skills and metacognitive abilities, this study intended to investigate the association between the two subcomponents of critical thinking, inference-making and deduction, and one subcomponent of self-regulation, self-monitoring, as well as the role of gender in each of these constructs. To attain the purpose of the study, 120 EFL university learners were selected according to a convenience sampling. They were requested to complete the Watson-Glaser's Critical Thinking Appraisal and the Self-Regulation Trait Questionnaire. They were also asked to indicate their gender on their questionnaires. It was revealed that there were significant interrelationships among all variables as follows: self-monitoring and inference-making ($r = 0.353$), self-monitoring and deduction ($r = 0.350$), and inference-making and deduction ($r = 0.389$). In addition, gender did not play a part in students' inference-making, deduction, and self-monitoring. This study has some implications for EFL instructors, curriculum designers, and learners to make appropriate use of these relationships and take the required steps for encouraging EFL university students' self-monitoring, inference-making, and deduction irrespective of their gender.

Keywords: inference-making, deduction, EFL learners, self-monitoring, gender

INTRODUCTION

According to different researchers and theorists in the field of critical thinking, there is a wide range of definitions proposed for it. A groundbreaking and early definition of critical thinking was suggested by Bloom (1956) as critical thinking is the mastery of a mixture of skills such as knowledge, comprehension, application, analysis, synthesis, evaluation, and applying the best when an individual faces with a novel situation; furthermore, the three higher levels, i.e. analysis, synthesis, and evaluation, are often reported to reflect critical thinking. Subsequently, Ennis (1987) defined critical thinking as the assortment of inclination or habits of using skills besides the skills introduced by

Bloom (1956). Paul (1995) introduced critical thinking as set of intellectual standards that individuals can use while thinking.

Ormrod (2006) referred to self-regulation as “the process of setting goals for oneself and engaging in behaviors and cognitive processes that lead to goal completion” (p. 347). Considering academic self-regulation, Zimmerman (2000) described it as how much learners are motivationally, metacognitively, and behaviorally active in their learning process and in accomplishing their goals. Therefore, from this we can reasonably infer that successful students actively participate in their own learning procedure. In fact, as Wolters, Pintrich, and Karabenick (2003) pointed out motivation, management, monitoring, behavior, and the like are among the main components of self-regulation.

The major purpose of the present study is to empirically inspect the theorized association between self-monitoring, a component of self-regulation, and inference-making and deduction, two components of critical thinking, as well as the role of gender in EFL learners' inference-making, deduction and self-monitoring. The researchers of the present study set to explore this connection based on logical reasoning as well as theoretical contention in the literature implying a close association between self-regulatory skills and critical thinking ability (Phan, 2010).

REVIEW OF THE RELATED LITERATURE ON CRITICAL THINKING

Halpern (1999), the ex- president of the American Psychological Association, defined critical thinking as, “the use of cognitive skills or strategies that increase the probability of a desirable outcome ... where desirable is defined by the individual, such as making good career choices or wise financial investments.” She mentions that critical thinking is purposeful, goal directed, and logical. She continues to say that critical thinking is the kind of thinking used in predicting probable outcomes, problem solving, drawing inferences, and making decisions.

Benesch (1999) explained critical thinking as becoming conscious of the assumption under which we think and act. In fact, Elder and Paul (1998) discussed about a strong relationship between critical thinking and Socratic Questioning and stated that it adds systematicity and profundity in evaluation of the conceivable degree of truth and actuality.

Holding a more holistic view of critical thinking, Ku (2009) claimed the maturation of the conceptualization of critical thinking from an obsession with cognition to one which has both a cognitive and a dispositional aspect to it. Simply put, “besides the ability to engage in cognitive skills, a critical thinker must also have a strong intention to recognize the importance of good thinking and have the initiative to seek better judgment” (p.71).

Facione (1990) carried out a Delphi to reach an agreement on critical thinking. The Delphi suggested that there are two aspects of critical thinking in each individual: disposition and skill. These two mentioned facets accompanied by each other, equip

educators with a much more holistic understanding of critical thinking. Over the past decade, there has been particular attention to the dispositions of critical thinking by academics as a vehicle for increasing students' capacity for critical thinking (Ennis, 1996; Facione & Facione, 1992; Paul, 1990; Siegel, 1988; Tishman & Andrade, 1995; Ghanizadeh & Moafian, 2011; Hashemi & Ghanizadeh, 2012). As Zoller, Ben-Chaim, and Ron (2000) put, a student's disposition to think critically is a necessary prerequisite to critical thinking and can significantly affect critical thinking capability. Scholars in the field of critical thinking continue to share this view that critical thinking consists of the aspects of skill and disposition (Dewey 1933; Norris & Ennis, 1989).

Kopitski (2007) suggests that inferring, one of the sub-components of critical thinking, requires higher-order thinking skills, which makes it a difficult skill for many students. Inferential thinking skills are when a reader combines clues from the text with their own background knowledge in order to draw conclusions. The answers are not right in the text, so readers often need to become detectives, using the clues the author gives to help make sense of a text. Much of the meaning comes from the readers as they add their personal experiences and existing knowledge to the author's words. Readers need to read between the lines and develop their own ideas to make the story come to life (Kopitski, 2007). In fact, "Inference is the heart of the comprehension process....Even the simplest of texts requires inferencing." (Dole, Duffy, Roehler, & Pearson, 1991, p. 8). Often times, struggling readers miss the gist of the story because they do not search for clues or make connections that help them draw inferences (Tovani, 2000).

Another sub-component of critical thinking studied in this article is deduction. Edmonds (2005) defined deduction as an argument in which the premises can reasonably prove the conclusion. To say the conclusion did not follow from the premises would be nonsense (Edmonds, 2005). In fact, as Evans (2003) stated, for a deductive argument to be valid, it is of utmost importance that its conclusion essentially follows from the premise. Moreover, everything which exists in the conclusion of a valid deductive argument, must be included in the premises as well (Evans, 2003). Consequently, it can be concluded that all valid deductive reasoning is actually circular by its very nature. However, that should not be misinterpreted that the conclusion is worthless (Evans, 2003).

REVIEW OF THE RELATED LITERATURE ON SELF-REGULATION

There are diverse conceptualizations for self-regulation and self-regulated learning. Even the terms and related derivatives educators apply to label the concept differ (Boekaerts, Pintrich, & Zeidner, 2000), including autonomous learning, self-planned learning or self-education, and self-efficacy (Hiemstra, 2004). Definitions regard self-regulation as an ability or capacity (Lemos, 1999), or as a process (Pintrich, 2000). Other interpretations situate self-regulation as strategies (Pintrich, 1999), or "self-generated thoughts, feelings and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2000, p. 14). Most self-regulated learning theorists concur with the notion that these thoughts, feelings and actions have

interrelated dimensions of cognitive, affective, motivational, and behavioral (Montalvo & Torres, 2004).

Self-regulation is regarded as a cyclical process since the tasks previously accomplished function as a reference to adjust current performance (Zimmerman, 2000). In addition, it takes an intentional, judgmental, and adaptive process in which students cyclically adjust their methods to perform tasks that they undertake at different times and in various contexts (Butler & Winne, 1995).

In educational contexts, self-regulation includes tasks that require setting some goals by the students to acquire more knowledge, the implementation of strategies to achieve these goals, and the monitoring of student's accomplishments concerning the goals (Butler & Winne, 1995). Good self-regulated learners set goals hierarchically; prioritizing their goals from more immediate to more long term (Zimmerman, 2000). In addition, they select the strategies to accomplish their goals and know how to manage their resources. They also put effort into the task and know how to react to the feedback externally provided as well as their outcomes (Nicol & Macfarlane-Dick, 2006). Schunk and Zimmerman (1994) described self-regulated students as: (a) self-starters, who demonstrate great determination in learning tasks; (b) assertive, scheduled, and resourceful in encountering and solving problems; and (c) usually active in accomplishing tasks. Self-regulated learning is done when people set goals, monitor, and regulate their learning process to attain the goals set up.

Self-monitoring, one of the sub-components of self-regulation studied in this article, occurs when an individual identifies whether or not a certain behavior has taken place (Nelson & Hayes, 1981). Self-monitoring encompasses an active involvement of the individual, and the occurrences of self-observing of a target behavior (Lee, Palmer, & Wehmeyer, 2009). It can also involve self-recording the regularity of the behavior (Lannie & Martens, 2008). It has been demonstrated that self-monitoring is promoted when self-assessment is accompanied by self-recording (Graham, MacArthur, Schwartz, & Page-Voth, 1992). The process of self-monitoring may also incorporate self-reinforcement for satisfying or enhancing an established criterion or purpose (Nelson & Hayes, 1981). The technique serves to increase or decrease target behavior(s) or skills (Lalli & Shapiro, 1990). Self-monitoring helps draw attention to an aspect of the student's learning or academic production that needs to be accomplished (Lee et al., 2009).

Phan (2010) mentions that establishing a strong association between critical thinking and self-regulation can lead to an individuals' growth and progress. Abilities pertaining to critical thinking and evaluation can be situated as self-regulatory components in learning processes (Zimmerman 1990). Elder and Paul (1994) also believe that the ability of thinkers to have control over their own thinking is an essential pre-condition of critical thinking.

PURPOSE OF THE STUDY

The major purpose of the present study is to empirically inspect the theorized association between self-monitoring, a component of self-regulation, and inference-making and deduction, two components of critical thinking, as well as the role of gender in EFL learners' inference-making, deduction and self-monitoring. To achieve the purpose of this study, the following research questions were posed and investigated in the present study:

- 1) Is there any relationship between EFL university students' self-monitoring, inference-making, and deduction?
- 2) Is there any relationship between EFL university students' gender and their abilities in self-monitoring, inference-making, and deduction?

METHOD

Participants

The participants of the present study included 120 EFL university learners studying English Literature at Hakim Sabzevari University, Iran. Out of 120 participants, 97 students were female and 23 were male. After a brief explanation of the purpose of the research, all participants received the Watson-Glaser's Critical Thinking Appraisal and also Self-Regulation Trait (SRT) Questionnaire. To gather reliable data, the purpose of completing the questionnaire was explained and the participants were assured that their views would be confidential.

Instruments

The Farsi version of the Watson-Glaser's Critical Thinking Appraisal (CTA)

To evaluate students' inference-making and deduction, two subtests of *Watson-Glaser Critical Thinking Appraisal (CTA)* were employed. During the history of CT researches, various general tests of CT have been utilized by several researchers. For the purpose of the present study, WGCTA was used because it has been widely employed by CT researchers (e.g. Fahim, Bagherkazemi & Alemi, 2010).

In the present study, the Persian version of the *Watson-Glaser* test was applied. According to Mohammadyari (2002), this test and its subcomponents do have reliability and validity in Iranian culture. To analyze the reliability of the questionnaire, she employed split-half reliability estimate. Moreover, with the adapted version in Iran, the reliability was found to be 0.98 and the results of the factor analysis offered some support for the inventory hypothesized structure (Mohammadyari, 2002).

Table 1. Subtests of CTA Used in this Research along with the Corresponding Descriptions

Subtest	Description
Test 1. Inference	Discriminating among degrees of truth or falsity of inference drawn from given data.
Test 2. Deduction	Determining whether certain conclusions necessarily follow from information in given statement or premises.

Self-Regulation Trait (SRT) Questionnaire

To measure self-monitoring, the *self-regulation trait* (SRT) questionnaire designed by O'Neil and Herl (1998) was utilized. This subtest consists of 8 questions ranging from *almost never*, to *sometimes*, *often*, and *almost always*. The following table depicts the subscale of the SRT used in this research:

Table 2. Subscale of SRT Used in this Research along with the Corresponding Descriptions

Factor	Definition	Items
Self-monitoring	The extent to which one needs a self-checking mechanism to monitor goal achievement	2-6-10-14-18-22-26-30

The reliability and validity of the scale have been verified in multiple studies (Herl et al., 1999).

Data Collection

The study was conducted at Hakim Sabzevari university of Sabzevar, a city in the north east of Iran. The participants were asked to complete the *self-monitoring* scale of the *Self-Regulation Trait* questionnaire and the *inference* and *deduction* scales of the *Watson-Glaser Critical Thinking Appraisal*. The questionnaires were coded numerically and they were asked not to write their names. No one took the test home, or left the class while taking the test. They were also asked to indicate the grade point average (GPA) of their previous term and their reading and writing scores. Since the participants were already briefed on the purpose of the study and given that all participants were guaranteed anonymity and confidentiality, it was hoped that these would add the validity to the students' report of their academic scores.

Data Analysis

To check the normality of data distribution, the Kolmogorov-Smirnov test was employed. To investigate the relationship between variables, multiple Pearson Product-Moment correlations were applied to the data. To explore the role of gender in each construct, independent samples *t*-tests were utilized.

RESULTS

Descriptive statistics

To check the normality of data distribution, the Kolmogorov-Smirnov test was employed. This test is used to check whether the distribution deviates from a comparable normal distribution. If the *p*-value is non-significant ($p > .05$), we can say that the distribution of a sample is not significantly different from a normal distribution, therefore it is normal. If the *p*-value is significant ($p < .05$) it implies that the distribution is not normal. Table 3 presents the results of the Kolmogorov-Smirnov test. As it can be seen, the obtained sig value for all variables (self-monitoring, inference-making, and

deduction) is higher than .05. Therefore, it can safely be concluded that the data is normally distributed across all four variables.

Table 3. The Results of K-S Test for Self-monitoring, Inference-making, and Deduction

	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Self-monitoring	.076	120	.088
Inference-making	.092	120	.061
Deduction	.096	120	.052*

Table 4 presents descriptive statistics of EFL learners' self-monitoring, inference-making, and deduction. The results are as follows: self-monitoring ($M=22.60$, $SD=3.35$), inference-making ($M=6.10$, $SD=2.53$), and deduction ($M=9.53$, $SD=2.12$).

Table 4. Descriptive Statistics of Self-monitoring, Inference-making, and Deduction

	N	Minimum	Maximum	Mean	Std. Deviation
Self-monitoring	120	12.00	30.00	22.6000	3.53470
Inference-making	120	2.00	14.00	6.1083	2.53313
Deduction	120	4.00	14.00	9.5333	2.12995
Valid N (listwise)	120				

The relationship between self-monitoring, inference-making and deduction

To probe the link between self-monitoring, inference-making, and deduction, multiple Pearson Product-Moment correlations were run. Table 7 indicates the results.

Table 5. The Correlation Coefficients between Self-monitoring, Inference-making, and Deduction

	1	2	3
1. Self-monitoring	1.00		
2. Inference-making	.353**	1.00	
3. Deduction	.350**	.389**	1.00

**Correlation is significant at the level of 0.05

According to Table 5, there are significant interrelationships among all variables as follows: between self-monitoring and inference-making ($r = 0.353$, $p < 0.05$), self-monitoring and deduction ($r = 0.350$, $p < 0.05$), and inference-making and deduction ($r = 0.389$, $p < 0.05$).

The role of gender in self-monitoring, inference-making, and deduction

To examine whether there is any significant difference between males and females regarding their level of self-monitoring, inference-making, and deduction, independent samples *t*-tests were run. Table 6 presents the descriptive statistics of male and female

students (0= male, 1= female) in their scores in the above variables. As the table indicates, there are some differences in the mean scores of males and females.

Table 6. Descriptive Statistics of Self-monitoring, Inference-making, and Deduction across Males and Females

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Self-monitoring	.00 (Male)	23	22.3478	4.35482	.90804
	1.00 (Female)	97	22.6598	3.33506	.33862
Inference-making	.00	23	6.3043	2.45754	.51243
	1.00	97	6.0619	2.56098	.26003
Deduction	.00	23	10.2609	2.15781	.44993
	1.00	97	9.3608	2.09755	.21297

To see if these observed differences are statistically significant, Independent samples *t*-tests were run. The results represented in Table 7 indicated that male and female EFL learners do not differ in their self-monitoring ($t= -0.379, p < .05$), inference-making ($t= 0.411, p < .05$), and deduction ($t= 1.840, p < .05$).

Table 7. The Results of Independent T-Test for Determining the Role of Gender in each Variable

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Self-monitoring	-.379	118	.705	-.31197	.82274
Inference-making	.411	118	.682	.24249	.58955
Deduction	1.840	118	.068	.90004	.48910

DISCUSSION AND CONCLUSION

With respect to the nexus between self-monitoring, inference-making, and deduction, the researchers found significant interrelationships among all variables in question. Along the same line of research, Phan (2010) incorporated two theoretical orientations of critical thinking and self-regulation into one framework, and contented that "critical thinking, as a cognitive practice, helps in self-regulation in learning and teaching" (p. 288). He also added that the strong interaction between these two facets play a part in individuals' growth and success. Zimmerman (1990) also maintained that abilities related to evaluation and reflective thinking can be regarded as self-regulatory components in learning processes.

The findings of the present study are also consistent with empirical studies. Kupier (2002) mentioned that the development of self-regulatory strategies contributes to the promotion of critical thinking abilities. Leung and Kember (2003), likewise, identified positive associations between critical thinking and motivational variables such as self-regulation, and goal orientations. Moreover, Ignatavicius (2001) demonstrated that critical thinking ability has a facilitative role in improving EFL learners' self-regulation over time.

In an EFL context, Ghanizadeh and Mirzaee (2012) conducted a research and found that among the components of self-regulation, self-monitoring and self-efficacy had the highest correlations with critical thinking, and were the positive predictors of it. Identical results were reported in a study among EFL teachers. Ghanizadeh (2010) indicated the theoretical expectation of a linkage between self-regulation and critical thinking can be substantiated by the empirical data. It was also found that among the components of critical thinking, 'evaluation of arguments' and 'interpretation' had the highest correlations with teachers' self-regulation.

In addition, Phan (2010) asserted that the use of self-monitoring strategy of metacognitive self-regulation can provide learners with a basis to enhance their skills of reflection. The relationship between self-monitoring and critical thinking implies that once the learners begin to self-check and monitor their own thinking and learning processes, their ability to evaluate the values of perspectives and reasoning will be facilitated. This seems plausible given the fact that both of these variables belong to higher-order thinking skills, and are evaluative and interpretive in nature. In fact, critical thinking is a cognitive skill that equips learners with deep processing strategies in their learning. This cognitive reflection could comprise part of the cognitive strategies used by self-regulated learners, such as self-monitoring (Pintrich, 1999; Pintrich & Zusho, 2002; Zimmerman, 2002, 2008; Zimmerman & Schunk, 2001b). Besides, leafing through literature and scrutinizing the proposed definitions and conceptual frameworks related to critical thinking, one could easily find a trace of self-checking mechanisms in almost most approaches to critical thinking. Elder and Paul (1994) content that a basic perquisite of critical thinking is the ability of thinkers to have control over their own thinking process and to apply reasonable criteria for analyzing and assessing their own thinking. Facione and Facione (1996), defining the attributes of critical thinkers, considered self-monitoring as one of the major cognitive skills of critical thinkers. This suggests that regarding the students' ability of monitoring their own thinking and learning processes, developing the abilities associated with critical thinking is a crucial factor.

Since this study is unique in its own, there is no empirical study postulating the association between inference-making and deduction with self-monitoring. However, as these variables belong to the framework of critical thinking ability, one can reasonably infer that what has been mentioned pertaining critical thinking so far can hold true for inference-making and deduction as well.

The issue of gender differences in thinking skills gave rise to the sixth question to examine the role of gender in EFL learners' self-monitoring, inference-making, and deduction. The results indicated that male and female EFL learners do not differ in these variables. Gender, therefore, does not play a part in enhancing or declining the variables in question. This result is actually in line with what Halpern (2003) asserted regarding the fact that critical thinking can be learned through gaining life experiences and through teaching it to others. Thus, it is evident that critical thinking is not a matter of gender.

To the researchers' point of view, this can be justified in terms of the fact that time has taught women to be as good critical thinkers as men to overcome everyday difficulties, and to employ their critical thinking abilities despite their sex. It might also show that women are learning how to think critically to gain control of their own lives and be less dependent on others.

This finding obtained for self-regulation. No significant differences were observed among male and female students regarding their self-monitoring. This corroborates Zimmerman's contention that self-regulation is established and developed through active participation in environments that equips individuals with constant opportunities to be in charge of their own learning. In actual fact, it is not an acquired skill (Zimmerman, 2000). Pintrich (2000) also believed that individuals can learn how to keep their cognitive activities under their own control and regulate them irrespective of so many personal factors (including gender). He posited that self-regulation is not a measure of mental intelligence that is unchanged and constant after a certain point in life, nor is it a personal construct, genetically based early in life. In contrast, experience plays an important role in individuals' self-regulation.

Based on all the findings and results in this study and based on the literature of the research, various implications can be suggested for EFL teachers, curriculum designers, and learners. Applying these constructs, EFL teachers and curriculum designers can motivate students to enhance and apply their critical thinking and self-regulation abilities, which will result in their use of these abilities later in life.

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