Developing Critical Thinking with Debate: Evidence from Iranian Male and Female Students

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Abstract: This study investigates the difference between the performance of Iranian male and female EFL learners on the five dimensions of the California Critical Thinking Skills Test. Eighty-eight learners, out of 120, selected through a convenience sampling method, participated in this study. The researcher used a quantitative research method with one-group pretest posttest design. This group received "the Meeting-House Debate" strategy. Data analysis involved descriptive and inferential statistics. Results showed no significant difference between males and females on the sub-scales measured; i.e. evaluation, analysis, inference, deductive reasoning, and inductive reasoning. It was concluded that gender did not have a significant effect on the students' critical thinking skills.

Résumé: Le but de cette étude était d'employer les cinq dimensions de l'épreuve California Critical Thinking Skills pour étudier la différence entre la performance des apprenants mâles et femelles iraniens de l'anglais comme langue étrangère. 88 des 120 apprenants sélectionnés par la méthode d'échantillonnage de commodité ont participé à cette étude. La méthode de recherche quantitative utilisée consistait d'une conception posttest prétest d'un seul groupe. Ce groupe a reçu un enseignement sous la forme de débats structurés. L'analyse des données a été effectuée à l'aide de statistiques descriptives et déductives. Les résultats ont montré qu'il n'y avait aucune différence significative dans la performance des mâles et des femelles selon les sous-échelles de mesure; à savoir l'évaluation, l'analyse, l'inférence, le raisonnement déductif, et le raisonnement inductif. On a conclu que le sexe n'a pas eu d'effet significatif sur la pensée critique des élèves.

Keywords: critical thinker, critical thinking, California Critical Thinking Skills Test, gender, Meeting-House Debate strategy

1. Introduction

Our challenging and ever-changing world requires students to enhance their higher-order thinking skills, such as decision-making, problem solving, and critical thinking (CT) (Zoller, Ben-Chaim, & Ron, 2000). Researchers working in the area of CT have tried to provide a clear definition of this concept. Remeo (2010) explains that there is currently a lack of an accepted framework for CT, so that there is no widely accepted theoretical definition for it.

CT comprises two dimensions: (a) cognitive skills and (b) affective dispositions. Facione (2000) defines CT dispositions as consistent internal motivations to respond to events, persons, or circumstances in habitual, yet potentially malleable ways. Regarding cognitive skills, Wang, Woo, and Zhao (2009) stated that CT skills consist of analyzing, arguing, synthesizing, evaluating, and applying.

Roy and Macchiette (2005) stated that debate as a pedagogical method is one of the best strategies for applying the principles of CT skills. CT that includes debate allows for collaboration where teams can achieve higher levels of thinking through the use of persuasive praising evidence. This process allows students to retain information longer. Also, debate gives them an opportunity to engage in discussion and shared learning (Freeley & Steinberg, 2005). Similarly, Snider and Schnurer (2002) mentioned that in-class debate cultivates the active engagement of students. Additionally, Bellon (2000) asserted that the educational debate (e.g. the Meeting-House Debate strategy) requires students to obtain evidence, prepare material, create arguments, evaluate opposing data, and construct rebuttals. According to Chial and Riall (1994), the Meeting-House Debate strategy requires the debate teams to give their argument, and then other students offer comments or question the debaters. Finally, the debate teams give their closing argument. In this strategy, the teacher acts as a moderator. She/he ensures that each side receives an equal amount of questions.

Having the requisite cognitive CT skills included in debate strategy is essential to being a good critical thinker. Paul and Elder (2006) believed that a well-cultivated critical thinker solves a complex problem by gathering relevant information, raising vital questions, determining findings, and communicating effectively. Scriven and Paul (2006) claimed that a well-cultivated critical thinker (a) raises vital questions and problems, formulating them precisely and clearly, (b) gathers and assesses relevant information, using abstract solutions and ideas, testing them against relevant standards and criteria, (c) thinks open-

mindedly within alternative systems of thought, recognizing and assessing their assumptions, implications, and practical consequences, and (d) effectively communicates with others in figuring out solutions to complex problems.

It is worth noting that knowing the degree to which males and females are critical thinkers can be helpful in enhancement of the quality of language learning. On the one hand, Facione, Giancarlo, Facione, and Gainen (1995) stated that females are more open-minded and mature in their thinking while males are more analytical. Also, Walsh (1996) stated that females have higher levels of CT skills than males. On the other hand, traditional beliefs and stereotypes claimed that men are superior at analytical thinking, and they are better critical thinkers (cited in Vaseghi & Barjesteh, 2012).

Our increasingly complex society requires men and women to base their decisions and judgments on careful evaluation of evidence (Renaud & Murray, 2008). To be critical thinkers and decision makers in society, both males and females must be able to solve problems, analyze ideas, interpret information, and think critically. Thus, the purpose of educational systems should be producing thoughtful students (Harkreder, 2000) who make their decisions effectively and solve the problems potentially. According to Harkreder (2000), the final result of education must be the contemplative mind. To this end, the curricula must be customized appropriately for each field of study. Also, it is necessary to monitor the curricula in terms of CT improvements made (Greenlaw & DeLoach, 2003). This is done using CT test instruments. Ku (2009) suggests three well-known tests for measuring CT, i.e., the Cornell Critical Thinking Test (CCTT), the Watson–Glaser Critical Thinking Appraisal Test (WGCTAT), and the California Critical Thinking Skills Test (CCTST). The CCTT assesses students' skills in credibility, fallacies, induction, deduction, prediction, and experimental planning (Ennis, Millman, & Tomko, 2005). The WGCTAT is composed of five tests measuring inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments (Watson & Glaser, 1980). The CCTST focuses only on the cognitive elements of CT, such as make inferences, evaluate arguments, and the ability to recognize assumptions while leaving dispositional elements unexplored (Facione, 1990b). In this study, an attempt has been made to test CT skills through an available standardized CCTST.

Using CCTST analysis, points of view and arguments could be pulled apart to show why people think the way they do. It is the means to comprehend and mention the meaning or significance of situations, experiences, conventions, judgments, be-

liefs, rules, or criteria (Facione & Facione, 2010). Using CCTST evaluation, one can decide how weak or strong an argument may be. It is the means to assess the credibility of descriptions of a person's judgment, perception, belief, or opinion. It is also designed to assess the strength of relationships among statements, questions, descriptions, or other forms of representations (Facione & Facione, 2010). Further, the CCTST uses inference as a means to identify elements needed to draw reasonable conclusions based on evidence and reason to consider relevant information, to form hypotheses, and to deduce the consequences from data, statements, opinions, principles, evidences, beliefs, descriptions, questions, or other forms of representation (Facione & Facione, 2010). Additionally, deductive reasoning used in the CCTST is the means to determine if a conclusion is true, or if the premises leading to it are true. Clues are given in a particular situation and the test taker must look at the relationship between concepts, the sequence of events, and grammatical structure (Facione & Facione, 2010). The CCTST uses inductive reasoning skill which is the ability to generalize from particular evidence to a valid conclusion. It is explained as an argument's conclusion by the assumed truth of its premises (Ennis, 1987).

2. Review of the literature

Baxter-Magolda (1992) believed that gender difference in students' reasoning patterns, and ways they justify their thoughts are fluid, a continuum with numerous variations and combinations rather that a dichotomy between female and male students. According to her, no single reasoning pattern was used exclusively by women or by men, nor did female and male students limit themselves to one reasoning pattern over time or among different domains. Additionally, she found more similarities than differences in men and women's ways of knowing.

2.1 Studies on CT and gender

Research findings did not resolve the question of gender difference in CT skills. For instance, Semeric (2010) reported that the correlation between gender and sub-dimensions of CT were almost zero. Likewise, Claytor (1997) found gender to be independent of CT skills. In these studies, the CCTST was used for measuring CT skills. In another research that was conducted by Çıkrıkçı (1993) on university students, finding showed that there was not a significant difference between the male and female students' scores on the WGCTAT. Similarly, Myers and Dyer (2006) found that there was no difference between the CT skills

of female and male students. Also, Dow and Wood (2006) stated that females use CT skills as much as males but in a less direct style. On the contrary, a number of studies reported a significant difference between genders. Using WGCTAT, Walsh (1996) and Wilson (1989) concluded that females have higher levels of CT skills than males. In another study conducted by King, Wood, and Mines (1990), males scored higher than females on the WGCTAT, which was indicative of the fact that there was a significant difference between genders. Regarding nationwide studies, Jamshidian and Khamijani Farahani (2010) conducted a study using CCTSTon the correlation between CT and gender. Findings showed that there was no correlation between CT and gender. It should be noted that only a few nationwide studies have investigated the difference between the performance of Iranian male and female students on the dimensions of CT skills.

Fahim and Saeepour (2011) argued that the majority of students in the Iranian EFL (English as a foreign Language) context are not educated as critical thinkers. According to Aliakbari and Allahmoradi (2011), in the Iranian educational system, education does not lead necessarily to critical thought. Another problem is that the majority of teachers view education mainly as filling their students' memory banks with bits of information (Farimani & Khorasani, 2010). They disregard the learners' opinions and do not give them the chance to express themselves. Consequently, Iranian students do not learn to use their thinking skills (Fahim & Saeepour, 2011).

2.2 Purpose of the study

The purpose of this study is to investigate the difference between the performance of Iranian male and female learners on the five dimensions of CCTST including analysis, evaluation, inference, deductive reasoning, and inductive reasoning. In order to achieve this purpose, the following research questions are put forward:

1. Is there any significant difference in the performance of Iranian male and female participants on the analysis dimension of CCTST?

2. Is there any significant difference in the performance of Iranian male and female participants on the evaluation dimension of CCTST?

3. Is there any significant difference in the performance of Iranian male and female participants on the inference dimension of CCTST?

4. Is there any significant difference in the performance of Iranian male and female participants on the deductive reasoning dimension of CCTST?

5. Is there any significant difference in the performance of Iranian male and female participants on the inductive reasoning dimension of CCTST?

3. Methods

3.1 Research design

The present study was conducted using a quantitative research method with one-group pretest posttest design. In this study, there were two independent variables. The first variable referred to the instructional technique, "the Meeting-House Debate" strategy, used for teaching CT skills. The second variable referred to gender. Dependent variables referred to the CCTST pre-and post-test scores.

3.2 Participants

The research population included 120 high school students, 11th graders, in Lahijan City in Guilan Province, in northern Iran. The research sample consisted of 17-year male and female students. Out of 120 participants, 88 students were selected based on convenience sampling method because the high school authorities expressed their willingness to take part in this study.

3.3 Instruments

The instruments administered in this study consisted of Oxford Placement Test (OPT) and the CCTST. In order to ensure the homogeneity of participants as intermediate students, OPT comprising 50-items was distributed. Prior to this study, a pilot study was conducted by Danaye Tous. The sample was selected randomly from a group (15 boys & 15 girls) of 11-grade students in high school. In this study, Cronbach alpha coefficient was 0.80.

The CCTST predicts strength in CT skills in success on professional licensure examinations and in authentic problem situations. This test consists of two Forms (A & B). Items on Forms A and B parallel one another according to their responses and

questions. Both forms are suitable for post-baccalaureate and college level student populations. Further, the test is composed of five subscale scores including analysis, evaluation, inference, inductive reasoning, deductive reasoning, and a total CT skills score. The total score is considered to be a valuable predictor of success in workplace contexts and for the successful completion of educational programs, licensure examinations, and certification. The highest score is 34 and the scale must be completed during 45 minutes. Depending on the testing context, KR-20 Alphas range from 0.70 to 0.75 (Facione, Facione, & Giancarlo, 2000).The confident coefficient is 0.62 and the construct validity of all subscales is between 0.60-0.65 with highly positive correlation (Khalili & Soleimani, 2003). In this study, the Persian version of the CCTST- Form B was administered as the pre-and post-tests. Cronbach alpha coefficient for the reliability was 0.71. The following table shows the item number of each subscale.

Table 1

Subscale of CCTST

Scales	Items
Evaluation	1-2-3-4-25-26-27-28-29-30-31-32-33-34
Analysis	5-6-7-8-9-10-11-12-13
Inference	14-15-16-17-18-19-20-21-22-23-24
Inductive reasoning	3-13-20-21-24-25-26-28-29-30-31-32-33-34
Deductive reasoning	1-2-4-5-6-8-9-14-15-16-17-18-19-22-23-27

3.4 Procedure

In order to ensure that the debated topics were within the students' interest, "Brains Storming" strategy was adapted by the instructor. Through this strategy, all the students were invited to contribute their ideas concerning controversial and interesting topics. A list of six topics including Olympics, Customs, Actors, Technologies, Entertainments, and General Topics was developed. Then, the selected topics were divided into specific items. For instance, Entertainments were divided into computer games, Facebook, sports, and music. Next, three topics with the main focus of lie, love, and technology were selected through voting. After that, the key words (i.e., lies, love, and technology) were written in the center of a whiteboard. Students were asked to state the terms and phrases associated with the main topics. At the end, some phrases that seemed related to the key words were kept. Also, some of the terms that were not associated with the central concepts (i.e., lies, love, and technology) were eliminated.

After this step, both male and female learners were trained on the principles of the Meeting-House Debate strategy. They were randomly assigned to a team of "debriefers" and two groups of debaters, respectively. Debriefers were responsible for offering comments, asking questions, asking for reason, and giving critical opinions. Also, the two groups of debaters had responsibility to persuade the debriefers to accept their attitudes. First, a member of the affirmative group presented his/her argument. Then, the student on the opposing group presented his/her argument. Additional arguments in support of the previous argument were presented by one of the affirmative students. After that, one of the opposing students identified further areas of conflict. It is worth noting that the teams were taught how to interrupt someone (e.g. may I add something?), and how to ask for their opinions (e.g. could you tell me…?). Moreover, in order to assess the debaters, the following rubric designed by Glantz and Gorman (1997) was used.

- Is the student well organized?
- Does the student focus on the central ideas of the debate?
- Is every statement supported by cited researched evidence?
- Is the research recent?
- Is the research complete or are there large gaps of knowledge?
- Are an adequate number of sources used?
- Is the evidence presented with bias in some way?
- Does the student make frequent eye contact with the audience?
- Does the student respond to all of the opponents' points?
- Does the student challenge flaws in the opposition's arguments?
- Does the student avoid distorting information, making faulty generalizations, and oversimplifying issues?

Furthermore, the debate teams were asked to respect the debate etiquettes. They were required not to disagree with obvious truths, avoid exaggeration, avoid quarrelling, refrain from saying you are wrong, and attacking the idea not the person.

3.5 Data analysis

Combinations of descriptive and inferential statistics procedures were used in this study. The data were analyzed using the SPSS statistical package, version 20. Measures of central tendency and standard deviation were computed for the pre-and post-tests scores. Further, independent samples t-test was run to see if there was any significant difference between male and female students on the five dimensions of the CCTST.

4. Results

The homogeneity of participants regarding the level of language proficiency was checked by the mean score of students in the OPT. The performance of males showed that the mean score was 40.21 (*SD*=5.72). Forty-four males scored between 34 and 46 out of 50. The performance of females revealed that the mean score was 38.95 (*SD*=6.22). Forty-four females scored between 32 and 46 out of 50. The scores, which fell between one standard deviation above and below the mean, were considered as a homogeneous group. Further, the homogeneity of participants with respect to CT skills was checked by the mean score of students in the CCTST. The performance of male students showed that the mean score was 14.90 (*SD*=2.55). The performance of female students revealed that the mean score was 14.79 (*SD*=2.51). According to the criteria decided by the CCTST designers, students who got 20 or fewer scores (i.e., making 14 or more errors) were identified as poor critical thinkers whereas, students who got 21 or higher scores (i.e., making 13 or fewer errors) were identified as good critical thinkers. Forty four males and 44 females were in the score range of 10 to 20. Thus, they were identified as poor critical thinkers. Results of the two pretests showed that 44 males and 44 females could be selected as the sample of this study.

Furthermore, the results of descriptive statistics of males and females in pre-and post-tests are displayed in Table 2. The difference in the mean scores of male and female students on the pre-and post-tests of CCTST are also shown. Then, an independent-samples t-test was run to compare the males and females' CCTST general scores.

Table 2

Descriptive Statistics of males and females' CCTST general scores on pre-post-tests

Gender	Test-Time	N	Mean	Std. Deviation	Std. Error Mean
Male	Pre-test	44	14.79	2.56	0.386
	Post-test	44	15.86	3.19	0.481
Female	Pre-test	44	14.77	2.50	0.377
	Post-test	44	16.11	3.14	0.474

Difference in the mean of general scores of male and female students on the CCTST

Group Statistics

Gender	N	Mean difference (A)	Std. Deviation	Std. Error Mean
Male	44	1.34	2.49	0.376
Female	44	1.06	2.53	0.382

A: the mean scores' differences are computed through post-test CCTST scores subtracted from pre-test CCTST scores

Statistical Analysis of independent samples t-test of CCTST

Independent samples t-test								
Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
0.067	0.797	0.508	86	0.613	0.272	0.536	-0.793	1.33

Table 2 revealed that there was not a significant difference in the mean scores' differences of males (M = 1.34, SD = 2.49) and females (M = 1.06, SD = 2.53); t (86) = 0.508, p = 0.613 > 0.05. This result suggested that male and female students were almost at the same level of CT.

The mean and standard deviation of males and females are revealed in Table 3. This table also shows the difference in the mean scores of male and female students on the analysis dimension of the CCTST. An independent-samples t-test was run to compare the males and females' scores on the analysis dimension of the CCTST.

Table 3

Descriptive Statistics of males and females' scores on analysis dimension of pre-post-tests

Gender	Test-Time	N	Mean	Std. Deviation	Std. Error Mean
Male	Pre-test	44	2.84	1.11	0.168
	Post-test	44	3.40	0.89	0.135
Female	Pre-test	44	3.20	1.21	0.182
	Post-test	44	3.72	0.89	0.135

Difference in the mean scores of males and females on the analysis dimension of CCTST

Descriptive Statistics				
Gender	**N**	**Mean difference (B)**	**Std. Deviation**	**Std. Error Mean**
Male	44	0.568	1.26	0.190
Female	44	0.522	1.21	0.182

B: the mean scores' differences are computed through post-test CCTST scores subtracted from pre-test CCTST scores.

Statistical Analysis of independent samples t-test of analysis

Independent samples t-test								
Levene's Test for Equality of Variances		**t-test for Equality of Means**						
F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
							Lower	**Upper**
0.038	0.847	-0.172	86	0.864	-0.045	0.263	-0.570	0.479

Table 3 showed that there was not a significant difference in the mean scores' differences of males (M = 0.568, SD = 1.26) and females (M = 0.522, SD = 1.21); t (86) = -0.172, p = 0.864 > 0.05. This result suggested that male and female students were almost at the same level of analysis dimension.

Table 4 displayed the mean and standard deviation of males and females. The difference in the mean scores of male and female students on the evaluation dimension of the CCTST is displayed as well. An independent-samples t-test was run to compare the males and females' scores on the evaluation dimension of the CCTST.

Table 4

Descriptive Statistics of males and females' scores on evaluation dimension of pre-and post-tests

Gender	Test-Time	N	Mean	Std. Deviation	Std. Error Mean
Male	Pre-test	44	3.06	1.22	0.185
	Post-test	44	3.34	1.23	0.186
Female	Pre-test	44	3.29	1.54	0.233
	Post-test	44	3.04	0.98	0.148

Difference in the mean scores of males and females on the evaluation dimension of CCTST

Descriptive Statistics				
Gender	**N**	**Mean Difference (C)**	**Std. Deviation**	**Std. Error Mean**
Male	44	0.272	1.64	0.247
Female	44	-0.250	1.26	0.190

C: the mean scores' differences are computed through post-test CCTST scores subtracted from pre-test CCTST scores

Statistical Analysis of independent samples t-test of evaluation

Independent samples t-test								
Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
2.73	0.102	-1.67	86	0.098	-0.522	0.312	-1.14	0.098

Table 4 shows that there was not a significant difference in the mean scores' differences of males (M = 0.272, SD = 1.64) and females (M = -0.250, SD = 1.26); t (86) = -1.67, p = 0.098 > 0.05. This result suggested that male and female students were almost at the same level of evaluation dimension.

The mean and standard deviation of males and females are revealed in Table 5. This table shows the difference in the mean scores of male and female students on the inference dimension of the CCTST. Also, an independent-samples t-test was run to compare the males and females' scores on the inference dimension of the CCTST.

Table 5

Descriptive Statistics of males and females' scores on inference dimension of pre-post-tests

Gender	Test-Time	N	Mean	Std. Deviation	Std. Error Mean
Male	Pre-test	44	2.95	0.96	0.145
	Post-test	44	3.43	1.37	0.206
Female	Pre-test	44	2.81	1.48	0.223
	Post-test	44	3.61	1.36	0.206

Difference in the mean scores of males and females on the inference dimension of CCTST

Descriptive Statistics				
Gender	N	Mean Difference (D)	Std. Deviation	Std. Error Mean
Male	44	0.477	1.17	0.176
Female	44	0.795	1.54	0.233

D: the mean scores' differences are computed through post-test CCTST scores subtracted from pre-test CCTST scores.

Statistical Analysis of independent samples t-test of inference

Independent samples t-test								
Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
4.08	0.046	1.08	86	0.280	0.318	0.292	-0.263	0.900

Table 5 shows that there was not a significant difference in the mean scores' differences of males (M = 0.477, SD = 1.17) and females (M = 0.795, SD = 1.54); t (86) = 1.08, p = 0.280 > 0.05. This result suggested that male and female students were almost at the same level of inference dimension.

The mean and standard deviation of males and females are shown in Table 6. The difference in the mean scores of male and female students on the deductive reasoning dimension of the CCTST is revealed in this table. An independent-samples t-test was run to compare the males and females' scores on the deductive reasoning dimension of the CCTST.

Table 6

Descriptive Statistics of males and females' scores on deductive reasoning dimension of pre-post-tests

Gender	Test-Time	N	Mean	Std. Deviation	Std. Error Mean
Male	Pre-test	44	3.25	1.10	0.166
	Post-test	44	3.18	1.06	0.160
Female	Pre-test	44	2.72	1.70	0.256
	Post-test	44	2.81	1.22	0.184

Difference in the mean scores of males and females on the deductive reasoning dimension of CCTST

Descriptive Statistics				
Gender	**N**	**Mean Difference (E)**	**Std. Deviation**	**Std. Error Mean**
Male	44	-0.068	1.04	0.157
Female	44	0.090	1.50	0.227

E: the mean scores' differences are computed through post-test CCTST scores subtracted from pre-test CCTST scores.

Statistical Analysis of independent samples t-test of deductive reasoning

Independent samples t-test								
Levene's Test for Equality of Variances		t-test for Equality of Means						
F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
6.23	0.014	0.576	86	0.566	0.159	0.276	-0.390	0.708

Table 6 shows that there was not a significant difference in the mean scores' differences of males (M = -0.068, SD = 1.04) and females (M = 0.090, SD = 1.50); t (86) = 0.576, p = 0.566 > 0.05. This result suggested that male and female students were almost at the same level of deductive reasoning dimension.

The mean and standard deviation of males and females are displayed in Table 7. This table showed the difference in the mean scores of male and female students on the inductive reasoning dimension of the CCTST. An independent-samples t-test

was run to compare the males and females' scores on the inductive reasoning dimension of the CCTST.

Table 7

Descriptive Statistics of males and females' scores on inductive reasoning dimension of pre-post-tests

Gender	Test-Time	N	Mean	Std. Deviation	Std. Error Mean
Male	Pre-test	44	2.68	1.17	0.177
	Post-test	44	2.59	1.26	0.190
Female	Pre-test	44	2.72	1.42	0.214
	Post-test	44	2.88	1.20	0.181

Difference in the mean scores of males and females on the inductive reasoning dimension of CCTST

Descriptive Statistics				
Gender	**N**	**Mean Difference (F)**	**Std. Deviation**	**Std. Error Mean**
Male	44	-0.090	1.25	0.189
Female	44	0.159	1.36	0.205

F: the mean scores' differences are computed through post-test CCTST scores subtracted from pre-test CCTST scores

Statistical Analysis of independent samples t-test of inductive reasoning

Independent samples t-test								
Levene's Test for Equality of Variances		**t-test for Equality of Means**						
F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
							Lower	**Upper**
0.350	0.556	0.895	86	0.373	0.250	0.279	-0.305	0.805

Table 7 shows that there was not a significant difference in the mean scores' differences of males (M = -0.090, SD = 1.25) and females (M = 0.159, SD = 1.36); t (86) = 0.895, p = 0.373 > 0.05. This result suggested that male and female students are almost at the same level of inductive reasoning dimension.

5. Discussion and conclusion

These findings indicate that there was not a significant difference between male and female students' scores on the subscales of the CCTST. The non-significant difference between male and female students' scores on the subscales of CCTST showed that males used CT skills as much as females. This finding was not consistent with that of Wilson (1989). He reported that females had higher levels of CT skills than males. Further, the result of this study did not confirm the idea of King, Wood, and Mines (1990) who reported that males were superior to females in CT skills. Findings of this study were in line with those of Jamshid-

ian and Khamijani Farahani (2010), Dow and Wood (2006), Myers and Dyer (2006), Claytor (1997), and Çıkrıkçı (1993). They reported that there was not a significant difference between genders. It can be concluded that gender did not have an effect on CT skills. Thus, in the school setting where fostering CT skills is considered to be the essential goal of education (Kuhn, 1999), the teaching of CT skills has nothing to do with the students' gender.

Further, improvement in CT skills is time-consuming. Yang and Chou (2008) claimed that it may take longer than one semester to cultivate CT skills. The major limitation of this study was the duration of treatment. This study had only one month and a half treatment due to the school restrictions (i.e., final exams held in May). What is needed is a study which looks at the effect of instructing CT through the debate over a longer time period. In addition, "the Meeting-House Debate" strategy needs to be tested with other assessment tools like WGCTAT and CCTT.

The time constraint might have prevented this study from being successful in achieving all the expected results. Due to the time constraint, male and female students were less prepared to better demonstrate all subscales of CT. The findings showed that CT improvement occurred for females in four subscales, i.e., analysis, inference, deductive reasoning, and inductive reasoning dimensions. In addition, CT improvement occurred for males in three subscales, i.e., analysis, evaluation, and inference dimensions.

It is assumed that different factors are involved in students' CT improvement. For example, the higher achieved mean scores for females in analysis, inference, and inductive reasoning can be attributed to their interest in analyzing the evidence, their tendency to draw a conclusion, and their attention to generalization. Similarly, the higher observed mean scores for males in evaluation can be related to their interest in assessing the actual relationships among questions and claims. Also, it was revealed that females' mean scores on the deductive reasoning improved from pretest to posttest; however, the scores were slightly lower than those of their male counterparts. In contrast, there was no increase in males' pre-to-posttest scores; however, the lack of improvement in males' deductive reasoning was negligible.

More importantly, for a complete assessment of male and female students' CT, measuring the dispositions is also important. According to Perkins and Tishman (1998), taxonomies of critical thinking dispositions reflect the cultural orientation of the critical thinkers and their perceptions of how best to obtain

knowledge. One avenue of future study, then, could investigate cultural predictions of CT.

Given the objective of this study, there was no control group. Without any control group, the non-significant difference observed between male and female students may be attributed to the function of other factors except for the treatment. Further research is suggested that will consider student factors (e.g. personal assumptions, motivation, personality trait), and education factors (e.g. atmosphere, teacher support).

The result of this study may help Iranian teachers realize the importance of CT skills in the life of students. The need for improving students' CT skills, over a long period of time, through implementing the debate strategy, should be the concern of Iranian instructors. According to Fahim and Saeepour (2011), Iranian teachers disregard the learners' opinions and do not provide them with the opportunity to express themselves. Thus, Iranian students do not learn to use their thinking skills. It is also clear that Iranian teachers need to create a collaborative and cooperative learning atmosphere in the classroom as this can create a context for CT and cognitive growth.

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